



Rolling Diaphragm Air Cylinders

The friction free alternative



The “Rolling Diaphragm” Air Cylinder

The advent of the long stroke rolling diaphragm as a means of low-friction dynamic sealing has led to the development of the ControlAir Diaphragm Air Cylinder. These cylinders provide virtually frictionless conversion of pneumatic pressure to linear force, and offer such operating features as:

- **Super Sensitivity**
- **Absolutely No Lubrication Required**
- **Low Hysteresis**
- **No Blow-By Leakage**
- **Wide Temperature Variations.**

The rolling diaphragm creates the perfect seal for friction free cylinders. It is a durable, flexible membrane shaped like a top hat with the peak of the hat fastened to the end of the piston and the “brim” clamped to the cylinder cap. Inside of the cylinder this forms a long-lasting frictionless seal between the piston head and cylinder wall. The fabric reinforced elastomer rolling diaphragms are produced utilizing a microprocessor controlled process that is recognized as the leading edge mode of production. Custom diaphragm material design allows for operation of the cylinders at temperatures from -75°F to 400°F.

Ultra Cylinders-Linear Ball Bearings

For applications where the absolute minimum in friction free performance is required, ControlAir has developed the Ultra Cylinder. These cylinders combine the advantages of the rolling diaphragm seal with Grade “A” linear ball bearings and a hardened steel rod to produce virtually zero friction operation. For the ultimate in precise response to small pressure variations, choose “The Ultra.”

Modifications

Our standard Diaphragm Air Cylinders are easily modified to meet individual customer requirements. Modifications can include, but are not limited to, diaphragm, bearing, or rod materials, rod configurations, and spring design.

Applications

The performance advantages of our Diaphragm Air Cylinders make them ideal for applications such as Web Tensioners, Dancer Roll Tensioners, Roll Loaders, Valve Actuators, Accumulators, Positioners, and Impact Absorbers to name a few.

Rolling Diaphragm Air Cylinders

Operating Parameters

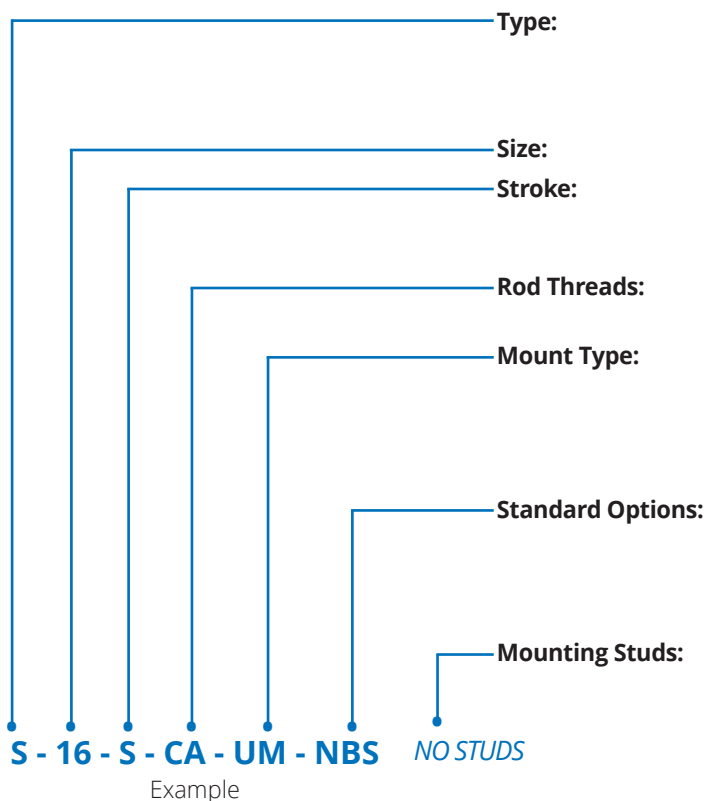
Single Acting Cylinders

| Cylinder Model | Effective Area | Equivalent Bore | Stroke | Initial Spring Force | Spring Rate | Weights |
|----------------|----------------|-----------------|----------|----------------------|-------------|---------|
| Standard Ultra | (inches) | (inches) | (inches) | (lbs.) | (lbs./inch) | (lbs.) |
| S-4-L US-4-L | 4 | 2.3 | 1.8 | 9 | 4 | 1.6 |
| S-6-L US-6-L | 6 | 2.8 | 2.4 | 9 | 4 | 2.3 |
| S-9-S | 9 | 3.4 | 2.2 | 17 | 4 | 5.3 |
| S-9-L US-9-L | 9 | 3.4 | 3.0 | 12 | 4 | 4.0 |
| S-12-S | 12 | 3.9 | 2.3 | 18 | 6 | 8.0 |
| S-12-L US-12-L | 12 | 3.9 | 3.6 | 18 | 6 | 9.5 |
| S-16-S | 16 | 4.5 | 2.6 | 24 | 8 | 11.0 |
| S-16-L US-16-L | 16 | 4.5 | 4.2 | 24 | 8 | 12.0 |

Double Acting Cylinders

| | | | | | | |
|-------|---|-----|-----|--|--|-----|
| D-4-L | 4 | 2.3 | 1.3 | | | 2.0 |
| D-9-L | 9 | 3.4 | 2.5 | | | 4.5 |

Ordering Information Use this coding system to order



- S** = Single Acting Cylinder
- US** = "Ultra" Cylinder with Ball Bearing
- D** = (Available Long Stroke Only) Double Acting Cylinder (Available Size 4, 9 Only)
- Effective Area (Square Inches)
- S** = Short Stroke
- L** = Long Stroke
- (See Operating Parameters for selection.)
- CA** = ControlAir Standard
- SM** = National Fluid Power Association Standard
- UM** = Universal Mount (Standard Mounting p.3)
- See page 4 & 5 for optional mounting styles
- (To order Rod Clevis see Rod Clevis Dimension section on p.6)
- Note: Cap Mounting Studs will be provided only when requested or required by mount option selected. See Page 6.
- NS** = No Spring
- NB** = No Bearing
- NBS** = No Spring and No Bearing
- NOTE: Add to end of ordering number if desired, otherwise leave blank. Options available for single acting cylinders only.
- WITH STUDS** = mounting studs on cap end supplied
- NO STUDS** = mounting studs on cap end not supplied
- Note: If cap mounting studs are NOT desired add "NO STUDS" to end of ordering data. Default is WITH STUDS. (see page 6). Not all sizes available as "NO STUDS". Sizes 12 and 16 no longer offer the "NO STUDS" option.

Operating Information

- Pressure** Airline pressures up to 145 psi (10 BAR)
- Temperature** -40° to 225°F (-40° to 107°C)

Materials

- Cylinder Shell** Anodized Aluminum (sizes 4-9), Steel (sizes 12-16)
- Head** Aluminum (sizes 4-16)
- Piston** Aluminum (sizes 4-9), Steel (sizes 12-16)
- Rod** Chrome Plated Steel
- Diaphragm** Neoprene Rubber with Dacron Fabric

Approximate Forces

Determining the force generated by a cylinder

Force = Airline Pressure x Effective Area less Spring Force

Effective Area = Cylinder Size

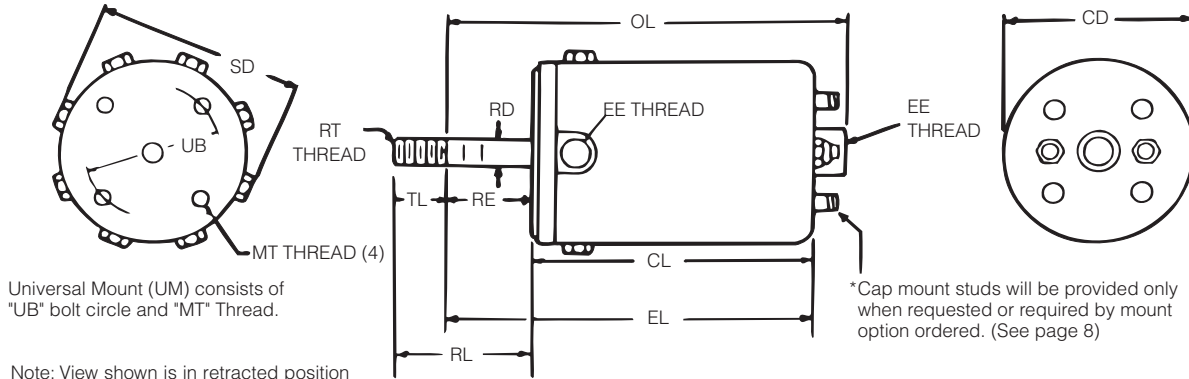
$$F = P (A_E) - [F_0 + K (S)]$$

- F** = Cylinder Force
- P** = Working Pressure
- AE** = Effective Pressure Area
- FO** = Spring Force at zero stroke
- K** = Spring Rate
- S** = Stroke

Rolling Diaphragm Air Cylinders

Standard Diaphragm Air Cylinders

Shown with Universal Mount



Universal Mount (UM) consists of "UB" bolt circle and "MT" Thread.

Note: View shown is in retracted position

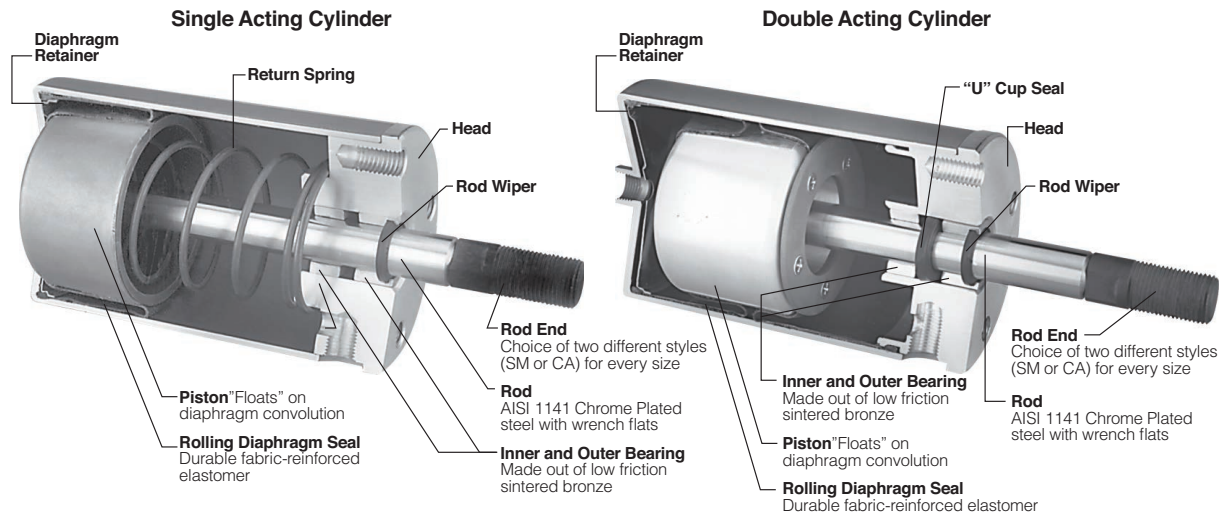
| Cylinder Model | Effec. Area Sq Inches | Stroke Inches | Universal Mount | | CA Rod End | | | | | SM Rod End | | | | | | | | | | |
|--------------------------------|-----------------------|---------------|-----------------|------|------------|--------|------|---------|-------|------------|------|--------|-------|------|-----|-------|------|------|---------|-------|
| | | | CL | CD | SD | EE | UB | MT | EL | RE | TL | RT | OL | RL | RD | EL | RE | TL | RT | OL |
| Single Acting Cylinders | | | | | | | | | | | | | | | | | | | | |
| S-4-L | 4 | 1.8 | 4.34 | 2.71 | 3.02 | 1/4npt | 2.00 | 1/4-20 | 6.32 | 1.98 | .75 | 3/8-24 | 6.72 | 2.73 | 1/2 | 6.07 | 1.73 | 1.00 | 7/16-20 | 6.47 |
| S-6-L | 6 | 2.4 | 5.28 | 3.27 | 3.58 | 1/4npt | 2.00 | 1/4-20 | 7.22 | 1.94 | .75 | 3/8-24 | 7.63 | 2.69 | 1/2 | 6.97 | 1.69 | 1.00 | 7/16-20 | 7.38 |
| S-9-S | 9 | 2.2 | 5.31 | 3.84 | 4.25 | 1/4npt | 3.00 | 7/16-14 | 7.23 | 1.92 | 1.00 | 1/2-20 | 7.63 | 2.92 | 3/4 | 7.11 | 1.80 | 1.12 | 3/4-16 | 7.51 |
| S-9-L | 9 | 3.0 | 6.34 | 3.84 | 4.25 | 1/4npt | 3.00 | 7/16-14 | 8.03 | 1.69 | 1.00 | 1/2-20 | 8.44 | 2.69 | 3/4 | 7.91 | 1.57 | 1.12 | 3/4-16 | 8.32 |
| S-12-S | 12 | 2.3 | 5.31 | 4.38 | 4.79 | 3/8npt | 3.00 | 7/16-14 | 7.23 | 1.92 | 1.00 | 1/2-20 | 7.78 | 2.92 | 3/4 | 7.11 | 1.80 | 1.12 | 3/4-16 | 7.66 |
| S-12-L | 12 | 3.6 | 7.28 | 4.38 | 4.79 | 3/8npt | 3.00 | 7/16-14 | 9.23 | 1.95 | 1.00 | 1/2-20 | 9.78 | 2.95 | 3/4 | 9.11 | 1.83 | 1.12 | 3/4-16 | 9.66 |
| S-16-S | 16 | 2.6 | 6.03 | 4.99 | 5.40 | 3/8npt | 3.00 | 1/2-13 | 8.09 | 2.06 | 1.00 | 1/2-20 | 8.64 | 3.06 | 3/4 | 7.97 | 1.94 | 1.12 | 3/4-16 | 8.52 |
| S-16-L | 16 | 4.2 | 8.38 | 4.99 | 5.40 | 3/8npt | 3.00 | 1/2-13 | 10.16 | 1.78 | 1.00 | 1/2-20 | 10.71 | 2.78 | 3/4 | 10.04 | 1.66 | 1.12 | 3/4-16 | 10.59 |

| | | | | | | | | | | | | | | | | | | | | |
|--------------------------------|---|-----|------|------|------|--------|------|---------|------|------|------|--------|------|------|-----|------|------|------|---------|------|
| Double Acting Cylinders | | | | | | | | | | | | | | | | | | | | |
| D-4-L | 4 | 1.3 | 4.34 | 2.71 | 3.02 | 1/4npt | 2.00 | 1/4-20 | 6.32 | 1.98 | .75 | 3/8-24 | 6.72 | 2.73 | 1/2 | 6.07 | 1.73 | 1.00 | 7/16-20 | 6.47 |
| D-9-L | 9 | 2.5 | 6.34 | 3.84 | 4.25 | 1/4npt | 3.00 | 7/16-14 | 8.03 | 1.69 | 1.00 | 1/2-20 | 8.44 | 2.69 | 3/4 | 7.91 | 1.57 | 1.12 | 3/4-16 | 8.32 |

| | | | | | | | | | | | | | | | | | | | | |
|--|----|-----|------|------|------|--------|------|---------|-------|------|------|--------|-------|------|-----|-------|------|------|---------|-------|
| Ultra Cylinders with Linear Ball Bearings | | | | | | | | | | | | | | | | | | | | |
| US-4-L | 4 | 1.8 | 4.34 | 2.71 | 3.02 | 1/4npt | 2.00 | 1/4-20 | 6.69 | 2.35 | .75 | 3/8-24 | 7.09 | 3.10 | 1/2 | 6.44 | 2.10 | 1.00 | 7/16-20 | 6.85 |
| US-6-L | 6 | 2.4 | 5.28 | 3.27 | 3.58 | 1/4npt | 2.00 | 1/4-20 | 6.69 | 1.41 | .75 | 3/8-24 | 7.09 | 2.16 | 1/2 | 6.44 | 1.16 | 1.00 | 7/16-20 | 6.85 |
| US-9-L | 9 | 3.0 | 6.34 | 3.84 | 4.25 | 1/4npt | 3.00 | 7/16-14 | 8.84 | 2.50 | 1.00 | 1/2-20 | 9.25 | 3.50 | 3/4 | 8.72 | 2.38 | 1.12 | 3/4-16 | 9.13 |
| US-12-L | 12 | 3.6 | 7.28 | 4.38 | 4.79 | 3/8npt | 3.00 | 7/16-14 | 8.85 | 1.57 | 1.00 | 1/2-20 | 9.38 | 2.57 | 3/4 | 8.73 | 1.45 | 1.12 | 3/4-16 | 9.26 |
| US-16-L | 16 | 4.2 | 8.38 | 4.99 | 5.40 | 3/8npt | 3.00 | 1/2-13 | 11.16 | 2.78 | 1.00 | 1/2-20 | 11.69 | 3.78 | 3/4 | 11.04 | 2.66 | 1.12 | 3/4-16 | 11.57 |

Shown in inches

The Inside Story on ControlAir Diaphragm Air Cylinders



Rolling Diaphragm Air Cylinders

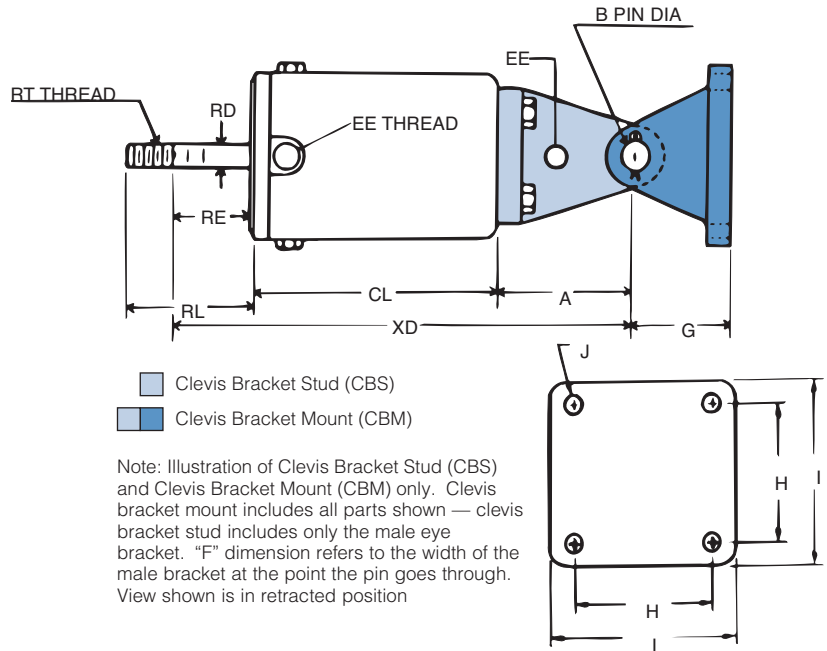
Clevis Bracket Stud / Clevis Bracket Mount

Dimensions

| Cylinder Model | CL | EE | RD | B | CA Rod End | | | | SM Rod End | | | | J | H | I | G | A | F |
|--|------|---------|-----|------|------------|------|-------|--------|------------|------|-------|---------|-----|------|------|------|-------|------|
| | | | | | RL | RE | XD | RT | RL | RE | XD | RT | | | | | | |
| Single Acting Cylinders | | | | | | | | | | | | | | | | | | |
| S-4-L | 4.34 | 1/4 npt | 1/2 | .625 | 2.73 | 1.98 | 8.45 | 3/8-24 | 2.73 | 1.73 | 8.20 | 7/16-20 | 1/4 | 2.38 | 3.12 | 1.38 | 2.125 | .93 |
| S-6-L | 5.28 | 1/4 npt | 1/2 | .625 | 2.69 | 1.94 | 9.35 | 3/8-24 | 2.69 | 1.69 | 9.09 | 7/16-20 | 1/4 | 2.38 | 3.12 | 1.38 | 2.125 | .93 |
| S-9-S | 5.31 | 1/4 npt | 3/4 | .750 | 2.92 | 1.92 | 9.98 | 1/2-20 | 2.92 | 1.80 | 9.86 | 3/4-16 | 1/4 | 3.00 | 4.00 | 1.69 | 2.750 | .99 |
| S-9-L | 6.34 | 1/4 npt | 3/4 | .750 | 2.69 | 1.69 | 10.80 | 1/2-20 | 2.69 | 1.57 | 10.67 | 3/4-16 | 1/4 | 3.00 | 4.00 | 1.69 | 2.750 | .99 |
| S-12-S | 5.31 | 3/8 npt | 3/4 | .750 | 2.92 | 1.92 | 10.23 | 1/2-20 | 2.92 | 1.80 | 10.11 | 3/4-16 | 1/2 | 3.00 | 4.00 | 1.75 | 3.00 | 1.24 |
| S-12-L | 7.28 | 3/8 npt | 3/4 | .750 | 2.95 | 1.95 | 12.23 | 1/2-20 | 2.95 | 1.83 | 12.11 | 3/4-16 | 1/2 | 3.00 | 4.00 | 1.75 | 3.00 | 1.24 |
| S-16-S | 6.03 | 3/8 npt | 3/4 | .750 | 3.06 | 2.06 | 11.09 | 1/2-20 | 3.06 | 1.94 | 10.97 | 3/4-16 | 1/2 | 3.00 | 4.00 | 1.75 | 3.00 | 1.24 |
| S-16-L | 8.38 | 3/8 npt | 3/4 | .750 | 2.78 | 1.78 | 13.16 | 1/2-20 | 2.78 | 1.66 | 13.03 | 3/4-16 | 1/2 | 3.00 | 4.00 | 1.75 | 3.00 | 1.24 |
| Double Acting Cylinders | | | | | | | | | | | | | | | | | | |
| D-4-L | 4.34 | 1/4 npt | 1/2 | .625 | 2.73 | 1.98 | 8.45 | 3/8-24 | 2.73 | 1.73 | 8.20 | 7/16-20 | 1/4 | 2.38 | 3.12 | 1.38 | 2.125 | .93 |
| D-9-L | 6.43 | 1/4 npt | 3/4 | .750 | 2.69 | 1.69 | 10.76 | 1/2-20 | 2.69 | 1.57 | 10.67 | 3/4-16 | 1/4 | 3.00 | 4.00 | 1.69 | 2.750 | .99 |
| Ultra Cylinders with Linear Ball Bearings | | | | | | | | | | | | | | | | | | |
| US-4-L | 4.34 | 1/4 npt | 1/2 | .625 | 3.10 | 2.35 | 8.82 | 3/8-24 | 3.10 | 2.10 | 8.57 | 7/16-20 | 1/4 | 2.38 | 3.12 | 1.38 | 2.125 | .93 |
| US-6-L | 5.28 | 1/4 npt | 1/2 | .625 | 2.16 | 1.41 | 8.82 | 3/8-24 | 2.16 | 1.16 | 8.57 | 7/16-20 | 1/4 | 2.38 | 3.12 | 1.38 | 2.125 | .93 |
| US-9-L | 6.34 | 1/4 npt | 3/4 | .750 | 3.50 | 2.50 | 11.60 | 1/2-20 | 3.50 | 2.38 | 11.47 | 3/4-16 | 1/4 | 3.00 | 4.00 | 1.69 | 2.750 | .99 |
| US-12-L | 7.28 | 3/8 npt | 3/4 | .750 | 2.57 | 1.57 | 11.85 | 1/2-20 | 2.57 | 1.45 | 11.73 | 3/4-16 | 1/2 | 3.00 | 4.00 | 1.75 | 3.00 | 1.24 |
| US-16-L | 8.38 | 3/8 npt | 3/4 | .750 | 3.78 | 2.78 | 14.16 | 1/2-20 | 3.78 | 2.66 | 14.04 | 3/4-16 | 1/2 | 3.00 | 4.00 | 1.75 | 3.00 | 1.24 |

Model Numbering

| Cylinder Model | Clevis Bracket Stud P/N | Clevis Bracket Mount P/N |
|----------------|-------------------------|--------------------------|
| S-4-L | 4-CBS | 4-CBM |
| S-6-L | 6-CBS | 6-CBM |
| S-9-S | 9-CBS | 9-CBM |
| S-9-L | 9-CBS | 9-CBM |
| S-12-S | 12-CBS | 12-CBM |
| S-12-L | 12-CBS | 12-CBM |
| S-16-S | 16-CBS | 16-CBM |
| S-16-L | 16-CBS | 16-CBM |
| D-4-L | 4-CBS | 4-CBM |
| D-9-L | 9-CBS | 9-CBM |
| US-4-L | 4-CBS | 4-CBM |
| US-6-L | 6-CBS | 6-CBM |
| US-9-L | 9-CBS | 9-CBM |
| US-12-L | 12-CBS | 12-CBM |
| US-16-L | 16-CBS | 16-CBM |



Note: Mounts ordered as separate items

Rolling Diaphragm Air Cylinders

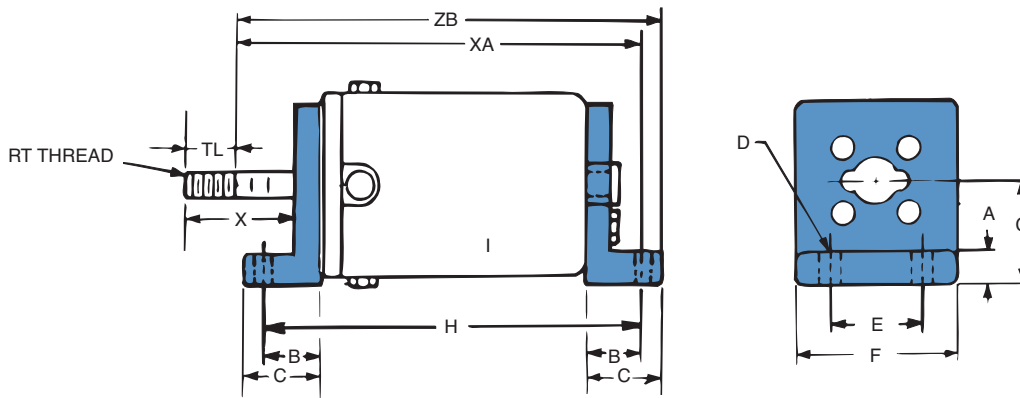
Foot Mount

| Cylinder Model | Foot Mount P/N | CA Rod End | | | | | | | | | | | | SM Rod End | | | | | |
|--------------------------------|----------------|------------|-------|-------|------|------|-------|------|------|------|--------|-------|-------|------------|------|------|---------|-------|-------|
| | | A | B | C | D | E | F | G | TL | X | RT | XA | ZB | H | TL | X | RT | XA | ZB |
| Single Acting Cylinders | | | | | | | | | | | | | | | | | | | |
| S-4-L | 4-FM | .380 | 1.125 | 1.500 | .312 | 2.00 | 2.625 | 1.88 | .75 | 2.41 | 3/8-24 | 7.44 | 7.94 | 6.59 | 1.00 | 2.41 | 7/16-20 | 7.19 | 7.69 |
| S-6-L | 6-FM | .380 | 1.125 | 1.500 | .312 | 2.00 | 2.625 | 1.88 | .75 | 2.38 | 3/8-24 | 8.35 | 8.84 | 7.53 | 1.00 | 2.38 | 7/16-20 | 8.10 | 8.59 |
| S-9-S | 9-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.24 | 1/2-20 | 8.86 | 9.67 | 8.56 | 1.12 | 2.24 | 3/4-16 | 8.74 | 9.55 |
| S-9-L | 9-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.06 | 1/2-20 | 9.67 | 10.41 | 9.59 | 1.12 | 2.06 | 3/4-16 | 9.55 | 10.28 |
| S-12-S | 12-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.30 | 1/2-20 | 8.86 | 9.68 | 8.56 | 1.12 | 2.30 | 3/4-16 | 8.73 | 9.56 |
| S-12-L | 12-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.33 | 1/2-20 | 10.86 | 11.68 | 10.53 | 1.12 | 2.33 | 3/4-16 | 10.73 | 11.48 |
| S-16-S | 16-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.31 | 1/2-20 | 9.72 | 10.54 | 9.28 | 1.12 | 2.34 | 3/4-16 | 9.59 | 10.34 |
| S-16-L | 16-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.16 | 1/2-20 | 11.78 | 12.53 | 11.62 | 1.12 | 2.16 | 3/4-16 | 11.66 | 12.40 |

| | | | | | | | | | | | | | | | | | | | |
|--------------------------------|------|------|-------|-------|------|------|-------|------|------|------|--------|------|-------|------|------|------|---------|------|-------|
| Double Acting Cylinders | | | | | | | | | | | | | | | | | | | |
| D-4-L | 4-FM | .380 | 1.125 | 1.500 | .312 | 2.00 | 2.625 | 1.88 | .75 | 2.41 | 3/8-24 | 7.44 | 7.94 | 6.59 | 1.00 | 2.41 | 7/16-20 | 7.19 | 7.69 |
| D-9-L | 9-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.99 | 1/2-20 | 9.67 | 10.41 | 9.59 | 1.12 | 2.06 | 3/4-16 | 9.55 | 10.28 |

| | | | | | | | | | | | | | | | | | | | |
|--|-------|------|-------|-------|------|------|-------|------|------|------|--------|-------|-------|-------|------|------|---------|-------|-------|
| Ultra Cylinders with Linear Ball Bearings | | | | | | | | | | | | | | | | | | | |
| US-4-L | 4-FM | .380 | 1.125 | 1.500 | .312 | 2.00 | 2.625 | 1.88 | .75 | 2.72 | 3/8-24 | 7.81 | 8.30 | 6.59 | 1.00 | 2.78 | 7/16-20 | 7.56 | 8.06 |
| US-6-L | 6-FM | .380 | 1.125 | 1.500 | .312 | 2.00 | 4.00 | 1.88 | .75 | 1.78 | 3/8-24 | 7.82 | 8.30 | 7.53 | 1.00 | 1.85 | 7/16-20 | 7.57 | 8.06 |
| US-9-L | 9-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 3.00 | 1/2-20 | 10.48 | 11.21 | 9.59 | 1.12 | 2.87 | 3/4-16 | 10.36 | 11.09 |
| US-12-L | 12-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 2.07 | 1/2-20 | 11.41 | 11.30 | 10.53 | 1.12 | 1.95 | 3/4-16 | 10.35 | 11.40 |
| US-16-L | 16-FM | .500 | 1.625 | 2.375 | .562 | 3.00 | 4.00 | 2.75 | 1.00 | 3.28 | 1/2-20 | 12.78 | 13.53 | 11.62 | 1.12 | 3.16 | 3/4-16 | 12.66 | 13.40 |

Note: Mounts ordered as separate items.



■ Foot Mount (FM)

Note: Illustration of footmount only. View shown is in retracted position.

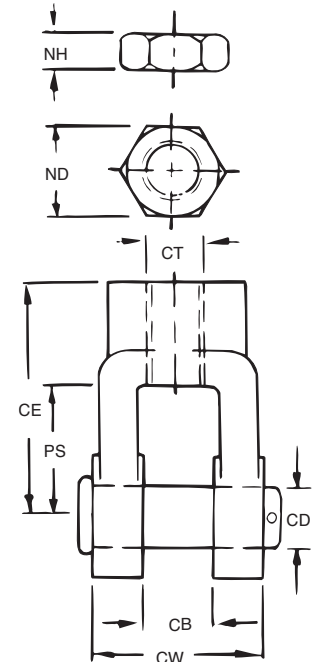
Rolling Diaphragm Air Cylinders

Rod Clevis Mount

Two styles available to match rod thread—CA or SM. Must be ordered as a separate item.

Dimensions (Inches)

| | 4-L | 6-L | 9-S | 9-L | 12-S | 12-L | 16-S | 16-L |
|---------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| CA - ControlAir Standard | | | | | | | | |
| (CT) Clevis Thread | 3/8-24 | 3/8-24 | 1/2-20 | 1/2-20 | 1/2-20 | 1/2-20 | 1/2-20 | 1/2-20 |
| (CE) Clevis Extension | 1-15/16 | 1-15/16 | 1-15/16 | 1-15/16 | 1-15/16 | 1-15/16 | 1-15/16 | 1-15/16 |
| (PS) Pin Spacing | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| (CW) Clevis Width | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 | 1.38 |
| (CB) Clevis Gap | .56 | .56 | .56 | .56 | .56 | .56 | .56 | .56 |
| (CD) Pin Diameter 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| (NH) Nut Height | 7/32 | 7/32 | 5/16 | 5/16 | 5/16 | 5/16 | 5/16 | 5/16 |
| (ND) Width Across Flats | 9/16 | 9/16 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| SM --*NFPA Standard | | | | | | | | |
| (CT) Clevis Thread | 7/16-20 | 7/16-20 | 3/4-16 | 3/4-16 | 3/4-16 | 3/4-16 | 3/4-16 | 3/4-16 |
| (CE) Clevis Extension | 1-15/16 | 1-15/16 | 2-3/8 | 2-3/8 | 2-3/8 | 2-3/8 | 2-3/8 | 2-3/8 |
| (PS) Pin Spacing | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| (CW) Clevis Width | 1.38 | 1.38 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 |
| (CB) Clevis Gap | .56 | .56 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| (CD) Pin Diameter | 1/2 | 1/2 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| (NH) Nut Height | 1/4 | 1/8 | 27/64 | 27/64 | 27/64 | 27/64 | 27/64 | 27/64 |
| (ND) Width Across Flats | 11/16 | 11/16 | 1-1/8 | 1-1/8 | 1-1/8 | 1-1/8 | 1-1/8 | 1-1/8 |



Note: Illustration shown attached to rod.

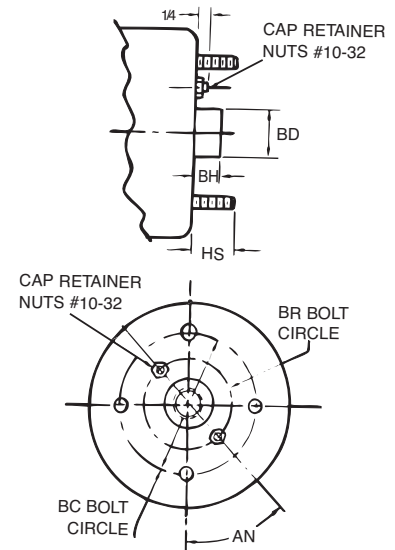
Ordering Information Example: 12 — CA — RC

- (1) Cylinder Size: Area in sq. in. 4, 5, 9, 12, 16
 (2) Rod End Thread Size: CA (ControlAir Standard) SM (NFPA Standard)
 (3) Mount Type: RC indicates Rod Clevis Mount

Cylinder Cap End Mounting Studs

Cap end mounting studs are supplied when required by mount accessory selected (Clevis Bracket Stud, Clevis Bracket Mount, Foot Mount) or when specifically requested by customer (WITH STUDS). If mounting studs on the cap end are NOT desired add "NO STUDS" to end of ordering data. Not all sizes available as "NO STUDS". Sizes 12 and 16 no longer offer the "NO STUDS" option.

| | Cylinder Size | | | | | | | |
|--------------------------------|---------------|--------|--------|--------|---------|---------|---------|---------|
| | 4-L | 6-L | 9-S | 9-L | 12-S | 12-L | 16-S | 16-L |
| # Cap Studs | 2 | 2 | 4 | 4 | 4 | 4 | 4 | 4 |
| (BC) Bolt Circle of Studs | 1-5/16 | 1-1/2 | 2 | 2 | 2-5/16 | 2-5/16 | 2-5/16 | 2-5/16 |
| (HS) Height of Studs | 5/8 | 5/8 | 5/8 | 5/8 | 5/8 | 5/8 | 5/8 | 5/8 |
| (SS) Stud Size | 1/4-20 | 1/4-20 | 1/4-20 | 1/4-20 | 1/4-20 | 1/4-20 | 3/8-16 | 3/8-16 |
| (BD) Boss Diameter | 11/16 | 11/16 | 11/16 | 11/16 | 1 | 1 | 1 | 1 |
| (BH) Boss Height | 13/32 | 13/32 | 13/32 | 13/32 | 17/32 | 17/32 | 17/32 | 17/32 |
| (BR) Bolt Circle Retainer Nuts | 1-3/8 | 1-3/8 | 1-3/8 | 1-3/8 | 1-11/16 | 1-11/16 | 1-11/16 | 1-11/16 |
| (AN) Angle (Degrees) | 90 | 90 | 45 | 45 | 45 | 45 | 45 | 45 |

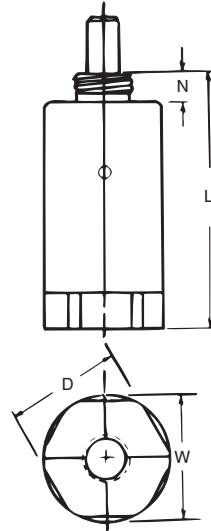


Rolling Diaphragm Air Cylinders

Mini Might

The MiniMights offer the same friction free performance as ControlAir's larger sized diaphragm air cylinders. These cylinders are highly sensitive with low hysteresis. They are available with threaded or unthreaded rod ends, flush or extended.

| Specifications | MM-1 349-180-007 | MM-2 349-180-009 |
|--------------------------|---------------------|---------------------|
| Stroke | 0.70" | 0.70" |
| Effective Pressure Area | 0.384 sq. in. | 0.384 sq. in. |
| Bore | 0.7" | 0.7" |
| Spring Load ("0" Stroke) | 2 lbs. | 2 lbs. |
| Spring Load (Max Stroke) | 7 lbs. | 7 lbs. |
| Max Operating Pressure | 125 psi | 125 psi |
| Dimensions | | |
| L | 2.81" | 2.81" |
| N | 0.438" | 0.438" |
| W | 15/16" | 15/16" |
| D | 7/8" | 7/8" |
| Nose Mount Thread Size | 1/2"-20 UNF | 1/2"-20 UNF |
| Rod Diameter | 1/4" | 1/4" |
| Rod Extension | Flush | 3/4" |
| Rod Thread | — | 1/4"-28 UNF |
| Pipe Connection | 1/8"-27 NPSF | 1/8"-27 NPSF |

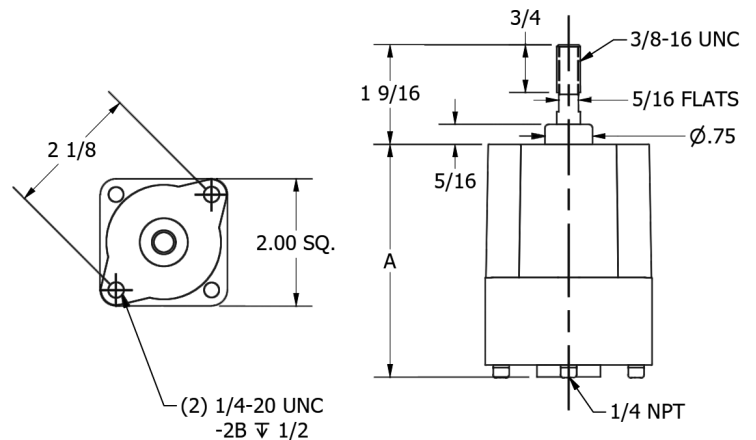


Materials: Aluminum Alloy Cylinder, Polyester Fabric Reinforced Nitrile Diaphragm, Treated Steel Rod, Music Wire Spring, Sintered Bronze Bearing.

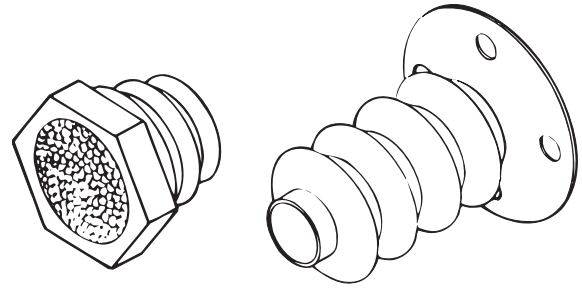
Compact Cylinders

Materials: Diecast aluminum cylinder and machined and anodized aluminum end cap. Chrome plated carbon steel rod. Oil impregnated bronze bearing. Polyester fabric reinforced Nitrile diaphragm. Music wire spring.

| Specifications | Part No. 139-190-002 | Part No. 139-190-001 |
|--------------------------|-------------------------|-------------------------|
| Stroke | 1" | 1 3/8" |
| Effective Pressure Area | 1.7 in. ² | 1.7 in. ² |
| Dimension A | 2 29/32" | 3 21/32" |
| Bore Equivalent | 1.5" | 1.5" |
| Spring Load ("0" Stroke) | 4 lbs. | 4 lbs. |
| Spring Load (Max Stroke) | 8 lbs. | 11 lbs. |
| Max Operating Pressure | 125 psi | 125 psi |
| Mounting Hole Sizes | 1/4"-20 UNC | 1/4"-20 UNC |



Rolling Diaphragm Air Cylinders



Repair Kits

Repair kits and replacement components are available from stock. All ControlAir kits and components are completely interchangeable with similar competitive cylinders already in the field. The repair kits consist of the following:

Spring Return Diaphragm Kit

1. Diaphragm
2. Adhesive Disk
3. Cap Retainer Sealing Nuts (2)
4. Instructions

Spring Return Bearing Kit

1. Inner Bearing
2. Outer Bearing
3. Rod Wiper Ring
4. Instructions

Double Acting Diaphragm Kit

1. Diaphragm, Cap
2. Diaphragm, Head
3. Retainer Adhesive, Cap
4. Retainer Adhesive, Head
5. Retaining Screws
6. Nuts, Cap Retainer
7. Seal "O" Ring
8. Tube, Silicone, Sealant

Double Acting Bearing Kit

1. Inner Bearing
2. Outer Bearing
3. Rod Wiper
4. U-Cup Seal
5. Instructions

Ultra Cylinder Bearing Kit

1. Linear Ball Bearing
2. Instructions

| Cylinder Model | Diaphragm Kit # | Bearing Kit # |
|----------------|-----------------|---------------|
| D-4-L | D4L | CAB-1/2-D |
| D-9-L | D9L | CAB-3/4-D |
| S-4-L | S4L | CAB-1/2 |
| S-6-L | S6L | CAB-1/2 |
| S-9-S | S9S | CAB-3/4 |
| S-9-L | S9L | CAB-3/4 |
| S-12-S | S12S | CAB-3/4 |
| S-12-L | S12L | CAB-3/4 |
| S-16-S | S16S | CAB-3/4 |
| S-16-L | S16L | CAB-3/4 |
| S-36-S | S36S | CAB-1 |
| US-4-L | S4L | US-CAB-1/2 |
| US-6-L | S6L | US-CAB-1/2 |
| US-9-L | S9L | US-CAB-3/4 |
| US-12-L | S12L | US-CAB-3/4 |
| US-16-L | S16L | US-CAB-3/4 |

Accessories

Breather Vents Are used to prevent contamination from being drawn into the air relief port on the side of the cylinder head during the return stroke of the single acting cylinders. The BVF consists of a 40 micron bronze filter and is installed by threading into the side relief port.

To order: BVF-1 Fits cylinder sizes 4, 6, 9. 1/4" pipe tap.
BVF-2 Fits cylinder sizes 12, 16. 3/8" pipe tap.

Protective Bellows Are used for No Bearing or Ultra Cylinder applications to prevent contaminants from being drawn in through the cylinder head. The flange of the bellows is trimmed to accommodate the mounting configuration on the face of the cylinder head.

To order: PB-1 Fits cylinder sizes 4, 6. 2" bolt circle.
PB-2 Fits cylinder sizes 9, 12, 16. 3" bolt circle.
Mount Kit for PB-1: P/N 149-400-019
Mount Kit for PB-2: P/N 149-400-021

Limited Warranty & Disclaimer

ControlAir LLC products are warranted to be free from defects in materials and workmanship for a period of one year from the date of sale, provided said products are used according to Control Air LLC. recommended usages. ControlAir LLC's liability is limited to repair of, refund of purchase paid for, or replacement in kind of, at ControlAir LLC's sole option, any products proved defective. ControlAir LLC reserves the right to discontinue manufacture of any products or change products materials, design or specifications without notice.

Warning

These products are intended for use in industrial compressed-air systems only. Do not use these products where pressures and temperatures can exceed those listed under Specifications. Before using these products with fluids other than air, for nonindustrial applications, life-support systems, or other applications not within published specifications, consult ControlAir LLC.

