

# Cylinders

In the early 1950s, Clippard introduced miniature pneumatic cylinders and valves to the industry. No other manufacturer can match Clippard's level of experience or knowledge of miniature components. Need to replace a cylinder from another manufacturer? Clippard's online Interchange Guide makes it easy—simply search the other manufacturer's part number online at [clippard.com](http://clippard.com) and the Interchange will display the most similar Clippard cylinder, along with a full comparison of specifications.

Clippard manufactures a wide variety of special cylinders with custom stroke and rod modifications, special mounting configurations and ports, special seals and lubrication, unique integrated valving, and more. Call **877-245-6247** today to discuss how we can help you optimize your system with the perfect components for your application.



 **Interchange**  
GUIDE



## STAINLESS STEEL

- Over 130 different models
- 14 bore sizes
- Superior design and long life
- Thousands of items in stock for same-day shipping

pp. 136-147



## ALL STAINLESS STEEL

- Durable 303 and 304 stainless steel
- 4 bore sizes
- FDA compliant grease lubrication
- Wipers standard

pp. 148-151



## CORROSION-RESISTANT

- Durable 303 and 304 stainless steel
- FDA compliant grease lubrication
- Wipers standard
- 5 bore sizes

pp. 152-155



## COMPACT EXTRUDED

- Interchangeable design allows for quick drop-in replacements
- 7 bore sizes
- Compact design for tight spaces

pp. 156-159



## BRASS

- Original miniature cylinder line
- 4 bore sizes
- Robust, heavy-duty design
- Hydraulic or pneumatic

pp. 160-162



## AIR VOLUME TANKS

- 10 standard models
- 1 to 16 cubic inches
- Custom sizes available
- Available in stainless, all stainless and polypropylene

p. 163

**POSITION SENSORS** ..... p. 166

**ACCESSORIES** ..... p. 164

Many items also available with metric ports.  
For more information, visit [clippard.com/link/metric](http://clippard.com/link/metric)

# CYLINDERS

## AVAILABLE OPTIONS

The following options are available for select Clippard cylinders.

Please note that not all options are available for all cylinders. Consult the charts (pp. 136-162) to see which options are available for a particular cylinder line or model.

### CUSHIONS (C, F, R)

Provide adjustment to slow the cylinder near the end of the stroke, reducing impact and prolonging the life of the cylinder. Clippard cylinder cushions feature a captive adjustment that can be adjusted up to a dead stop 1/2" from the end of the stroke.

**Read More:** p. 134

### MAGNETIC PISTON (M)

Equips the cylinder with an internal magnet, allowing it to be used with a reed switch or GMR sensor for accurate positioning.<sup>1</sup>

**Read More:** p. 166

### BUMPERS (B)

Reduce noise and shock to the load in applications where the cylinder is cycled with a light load and/or high speeds.<sup>1</sup>

**Max. Temperature:** 200°F

### WIPERS (W)

Added to cylinders to prevent contaminants from entering the cylinder assembly system.

Wipers are included standard on the All Stainless Steel line (no need to add a -W suffix to the part number).

### FKM SEALS (V)

Used in applications which require special chemical compatibility or more extreme temperatures.

**Temperature Range:** -20 up to 400°F

### ROD THREADS (N)

Various rod thread sizes are available, refer to cylinder charts for specifications. Rods are also available with no threads (N).

### SIDE PORTED (S)

Side ported rear heads are sometimes needed when the standard cylinder has the rear port out the back. This option changes the design of the rear head so the rear port is located on the side of the cylinder.<sup>1</sup>

### HEAVY SPRING (H)

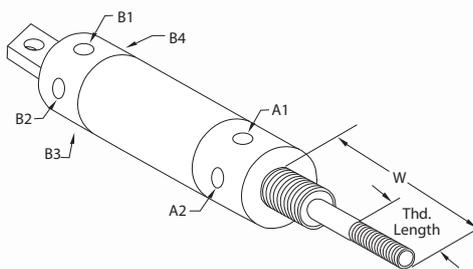
In single-acting, reverse-acting, or spring bias cylinders, this option provides a heavier spring to increase the standard spring force.

*Standard and heavy spring forces are listed in Spring Forces Chart, p. 135*

### ROTATED PORTS (P2-8)

For applications where ports need to be rotated to accommodate specific space requirements or specific port orientation for fittings and tube attachments.

**See diagram and chart (right)**



Option No.	Rear Port	Front Port
P2	B2	A2
P3	B1	A2
P4	B4	A2
P5	B3	A2
P6	B4	A1
P7	B3	A1
P8	B2	A1

### PTFE GREASE (TG)

Seals lubricated with PTFE grease.

### METRIC (M-prefix)

Compact Extruded line only.

### LARGE ROD (LR)

Available on 1-1/4" bore round body line only.

### ROD EXTENSIONS

If a special rod extension is required, refer to drawing above. For extensions on single- or double-acting cylinders, indicate desired "W" when rod is at rest with no pressure to either port. For reverse-acting, indicate "W" when rod is at rest with no pressure to either port.

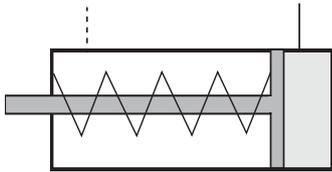
<sup>1</sup>Use of this option may add to the overall length of the cylinder.

# CYLINDERS

## CYLINDER & ROD TYPES

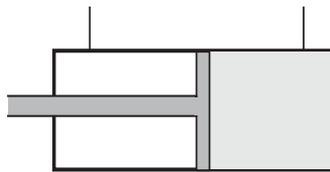
### Cylinder Types

#### Single-Acting (S)



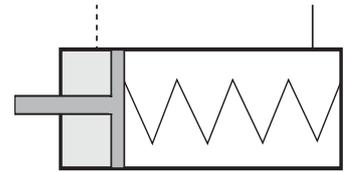
Single-acting cylinders provide power only on the extension ("push") stroke. A separate force—an internal spring—returns the piston to its original position for the next stroke.

#### Double-Acting (D)



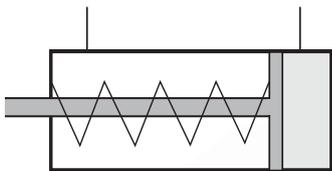
Double-acting cylinders have dual pressure chambers and provide pneumatic power on both extension ("push") and retraction ("pull"), eliminating the need for a spring.

#### Reverse-Acting (R)



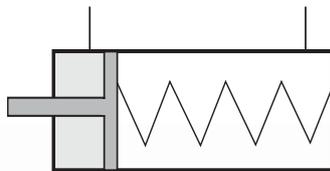
Reverse-acting cylinders are similar to single-acting but with a port on the opposite end to provide power only on the retraction ("pull") stroke.

#### Front Spring Bias (F)



Front spring bias cylinders are double-acting cylinders with the addition of a spring on the front end. If all air is removed from the cylinder, the front spring bias cylinder will behave like a single-acting cylinder and shift to the retracted position.

#### Rear Spring Bias (B)



Rear spring bias cylinders are double-acting cylinders with the addition of a spring on the back end. If all air is removed from the cylinder, the rear spring bias cylinder will behave like a reverse-acting cylinder and shift to the extended position.

### Rod Types

- **Double-Ended\*** (D)
- **Rotating** (R)
- **Non-Rotating** (N)
- **Hollow** (H)

*\*Double-Acting cylinders only*

Need to replace a cylinder from another manufacturer?

Clippard's online **Interchange Guide** makes it easy to identify Clippard cylinders that are compatible with cylinders from other manufacturers. Just enter your cylinder part number into any search box on the [clippard.com](http://clippard.com) website to see a comparison.

[clippard.com/link/interchange](http://clippard.com/link/interchange)

**Interchange**  
GUIDE

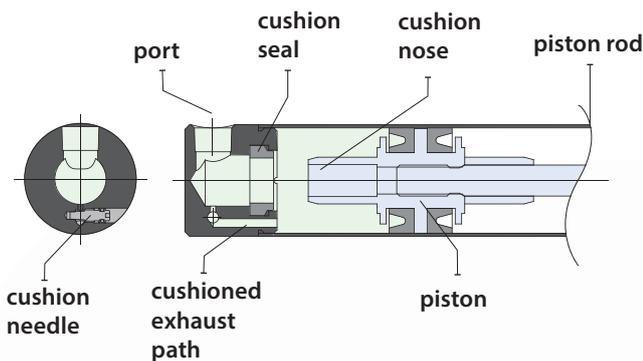


# CYLINDERS

## CUSHIONS

Pneumatic cushions decelerate the piston and rod assembly at the end of the cylinders travel, reducing internal impact force/noise and enabling faster piston velocities. In fast cycling applications, cushioned cylinders will provide superior life and a better machine environment.

- Easily accessible, stainless steel needle for fine adjustment of cushion
- Long-lasting nitrile cushion seal
- Cushions the last 1/2" of stroke
- Available at front, rear, or both ends of cylinder
- Available with magnetic pistons



Cushions cannot be added to existing cylinders because this option requires additional components and machining. A cushion nose is located on either or both sides of the piston, depending on which cushion option is selected. The heads of a cushioned cylinder have a cushion pocket with a cushion seal. When the cushion nose enters the cushion seal, the air exiting the cylinder is trapped causing it to compress. This provides a resistance force that decelerates the piston.

In this design, a needle valve in the head provides a parallel path for the air to exit and is used to fine-tune the cushion's effectiveness. This needle design has a high flow gain which allows the user to tune the cushion anywhere from little effect to actually stopping the cylinder. The cushion seal collapses when air coming through the adjacent port is introduced, allowing for a fast breakaway.

## CYLINDERS AVAILABLE WITH CUSHIONS

Bore Size	Part No.	Mounting	Both (C)	Front (F)	Rear (R)	Pg.
3/4"	SDD-12-	Stud	•	•		140
	SDH-12-	Stud	•	•	•	
	SDR-12-*	Stud	•	•	•	
	UDR-12-	Universal	•	•	•	
7/8"	SDD-14-	Stud	•	•		141
	SDH-14-	Stud	•	•		
	SDR-14-*	Stud	•	•	•	
	UDR-14-	Universal	•	•	•	
1-1/16"	SDD-17-	Stud	•	•		142
	SDH-17-	Stud	•	•	•	
	SDR-17-*	Stud	•	•	•	
	UDR-17-	Universal	•	•	•	
1-1/4"	SDD-20-	Stud	•	•		143
	SDR-20-*	Stud	•	•	•	
	UDR-20-	Universal	•	•	•	
1-1/2"	CDR-24-	Clevis	•	•	•	144
	EDR-24-	End Stud	•	•	•	
	SDD-24-	Stud	•	•		
	SDR-24-*	Stud	•	•	•	
1-3/4"	SDD-28-	Stud	•	•		145
	SDR-28-	Stud	•	•	•	
	UDR-28-	Universal	•	•	•	
2"	SDD-32-	Stud	•	•		146
	SDR-32-*	Stud	•	•	•	
	UDR-32-	Universal	•	•	•	
2-1/2"	SDD-40-	Stud	•	•		147
	SDR-40-*	Stud	•	•	•	
	UDR-40-	Universal	•	•	•	

1-1/16" and 1-1/2" bore cylinders with only one cushion include bumpers on the non-cushioned end

\*SDR- models have side ported rear heads

Cushioned cylinders are not designed to decelerate machine members or take the place of shock absorbers in applications with high kinetic energy. Note also that bumpers cannot be used with cushions, but can be used opposite a cushion (as with the 1-1/16" and 1-1/2" bore cylinders).

# CYLINDERS

## FORCE FACTORS

The chart shown at right can be used to calculate cylinder force. The "force factors" listed indicate the nominal area for the bore and rod sizes shown. To calculate cylinder force, multiply the appropriate extend or retract force factor by the pressure being used. Clippard also recommends adding a 25% safety factor for normal load movement, or 40% for high speed applications.

**FORCE FACTOR** x **P** (Pressure) = **F** (Force)

**F** x **1.25** (25% Safety Factor) = **Normal Load Movement**

**F** x **1.40** (40% Safety Factor) = **High Speed Applications**

To calculate your own force factors:

**A** (Area) = **Radius**<sup>2</sup> x **π** (or **Diameter**<sup>2</sup> x 0.7854)

**F** = **P** x **A**

BORE SIZE	ROD SIZE	AREA OF ROD	EXTEND <sup>1</sup>	RETRACT <sup>2</sup>
5/16"	1/8"	0.01 in <sup>2</sup>	0.07 in <sup>2</sup>	0.06 in <sup>2</sup>
1/2"			0.19 in <sup>2</sup>	0.16 in <sup>2</sup>
9/16"	3/16"	0.03 in <sup>2</sup>	0.25 in <sup>2</sup>	0.22 in <sup>2</sup>
5/8"			0.31 in <sup>2</sup>	0.28 in <sup>2</sup>
3/4"	1/4"	0.05 in <sup>2</sup>	0.44 in <sup>2</sup>	0.39 in <sup>2</sup>
7/8"			0.60 in <sup>2</sup>	0.55 in <sup>2</sup>
1-1/16"	5/16"	0.08 in <sup>2</sup>	0.88 in <sup>2</sup>	0.80 in <sup>2</sup>
1-1/4"	3/8"	0.11 in <sup>2</sup>	1.20 in <sup>2</sup>	1.09 in <sup>2</sup>
1-1/2"	7/16"	0.15 in <sup>2</sup>	1.70 in <sup>2</sup>	1.55 in <sup>2</sup>
1-3/4"	1/2"	0.20 in <sup>2</sup>	2.40 in <sup>2</sup>	2.20 in <sup>2</sup>
2"	5/8"	0.31 in <sup>2</sup>	3.10 in <sup>2</sup>	2.90 in <sup>2</sup>
2-1/2"			4.90 in <sup>2</sup>	4.59 in <sup>2</sup>
3"	3/4"	0.44 in <sup>2</sup>	7.00 in <sup>2</sup>	6.56 in <sup>2</sup>

<sup>1</sup>Area of bore; <sup>2</sup>Area of bore minus area of rod

## MAXIMUM LOAD BY ROD LENGTH

BORE SIZE	ROD SIZE	1"	5"	10"	15"	20"	25"	30"	35"	40"
5/16"	1/8"	110 lbs.	12 lbs.	3 lbs.	1.3 lbs.					
1/2"										
9/16"	3/16"	262 lbs.	59 lbs.	15 lbs.	6.6 lbs.	3.7 lbs.				
5/8"										
3/4"	1/4"	478 lbs.	190 lbs.	47 lbs.	21 lbs.	12 lbs.	7.5 lbs.			
7/8"										
1-1/16"	5/16"	756 lbs.	451 lbs.	116 lbs.	52 lbs.	29 lbs.	19 lbs.	13 lbs.		
1-1/4"	3/8"	1,091 lbs.	786 lbs.	240 lbs.	106 lbs.	60 lbs.	38 lbs.	27 lbs.	20 lbs.	
1-1/2"	7/16"	1,490 lbs.	1,184 lbs.	444 lbs.	197 lbs.	111 lbs.	71 lbs.	49 lbs.	36 lbs.	28 lbs.
1-3/4"	1/2"	1,950 lbs.	1,645 lbs.	757 lbs.	336 lbs.	189 lbs.	120 lbs.	84 lbs.	62 lbs.	47 lbs.
2"	5/8"	3,055 lbs.	2,750 lbs.	1,795 lbs.	821 lbs.	462 lbs.	295 lbs.	205 lbs.	150 lbs.	115 lbs.
2-1/2"										
3"	3/4"	4,405 lbs.	4,100 lbs.	3,140 lbs.	1,700 lbs.	950 lbs.	613 lbs.	425 lbs.	312 lbs.	240 lbs.

## SPRING FORCES

STANDARD	5/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1-1/16"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"
At Rest	0.5 lbs.	0.9 lbs.	1.7 lbs.	1.3 lbs.	3.0 lbs.	3.0 lbs.	2.0 lbs.	4.5 lbs.	4.5 lbs.	11.0 lbs.	15.0 lbs.	15.0 lbs.
Compressed	1.0 lbs.	2.0 lbs.	4.0 lbs.	4.0 lbs.	6.0 lbs.	6.0 lbs.	7.0 lbs.	10.0 lbs.	10.0 lbs.	24.0 lbs.	30.0 lbs.	30.0 lbs.
HEAVY												
At Rest	—	2.0 lbs.	—	3.3 lbs.	5.0 lbs.	5.0 lbs.	5.5 lbs.	8.5 lbs.	8.5 lbs.	—	—	—
Compressed	—	4.0 lbs.	—	9.0 lbs.	10.0 lbs.	10.0 lbs.	13.0 lbs.	17.0 lbs.	17.0 lbs.	—	—	—