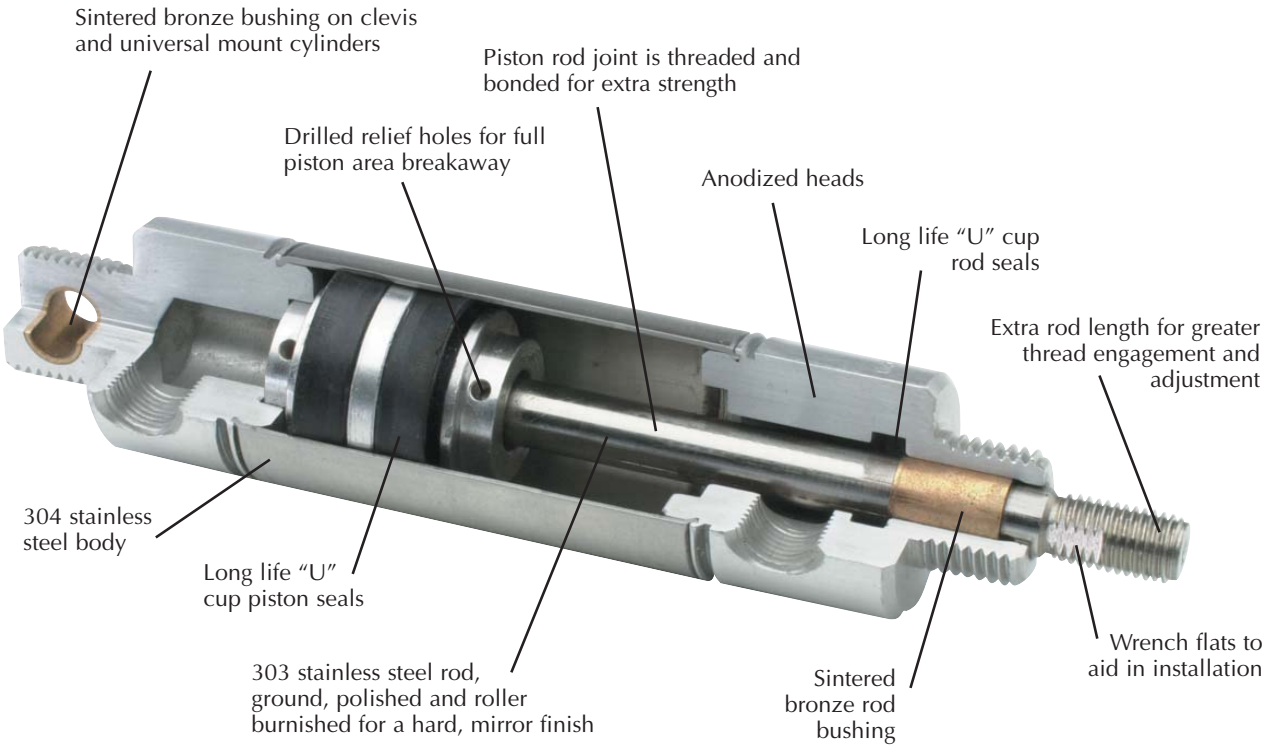
Stainless Steel Cylinder Construction

In the early 1950's, Clippard introduced miniature pneumatic cylinders and valves to industry. No other manufacturer can boast of the same experience or knowledge of miniature components.

Air cylinders have always been an integral part of the Clippard Minimatic® line. Over the years Clippard has responded to requests from cylinder users to provide additional sizes of air cylinders and auxiliary support products. While competitively priced, these products maintain the Clippard standard for quality and reliability that has been the industry standard for many years.



Features

- Polished I.D. 304 stainless steel tubes for low breakaway
- Precision rolled construction for a solid, leakproof cylinder at a reasonable price
- Machined aluminum heads are clear anodized for extra protection against corrosion
- Cylinder heads are machined from one side for better concentricity
- Sintered bronze rod bushing
- Sintered bronze clevis bushing on all clevis and universal mount cylinders
- Rods are threaded and bonded to pistons
- Repairable rod seal on 28 through 48 series
- Ground, polished and roller burnished 303 stainless rods provide a smoother rod finish that protects rod seals, giving longer life
- Full piston area breakaway to assure full power from the beginning of each stroke
- Buna-N "U"-cup piston seals for full power, low friction and trouble-free performance
- Buna-N "U"-cup rod seals for leakproof operation
- Temperature range: 32 to 230˚F
- Maximum pressure: 250 psig

NUMBERING SYSTEM

❑ ❑ ❑ - ❑ - ❑ - ❑

Mounting Type
S - Stud
U - Universal
C - Clevis
F - Front Block
E - End Stud
T - Trunnion

Cylinder Type
D - Double Acting
S - Single Acting
R - Reverse Acting
F - Front Spring Bias
B - Back Spring Bias

Rod Type
D - Double Ended Rod
R - Rotating Rod
N - Non-Rotating Rod
H - Hollow Rod

Bore
05 - 5/16″
08 - 1/2″
10 - 5/8″
12 - 3/4″
14 - 7/8″
17 - 1 1/16″
20 - 1 1/4″
24 - 1 1/2″
28 - 1 3/4″
32 - 2″
40 - 2 1/2″
48 - 3″

Stroke
In inches & fractions of an inch

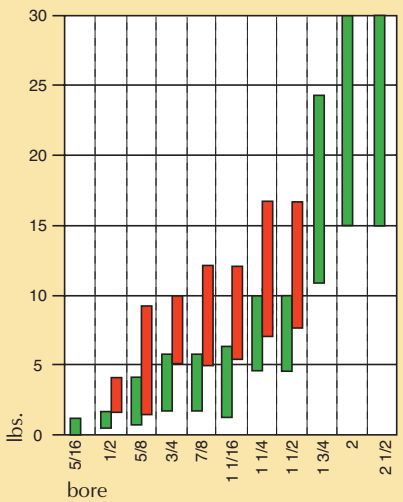
Options
B - Bumpers
V - Fluorocarbon Seals
C - Cushions
M - Magnetic Piston for Position Sensors
F - Cushion Front End
R - Cushion Rear End
W - Rod Wiper
S - Side Ported
H - Heavy Spring
P - Rotated Ports
N - No Threads

Not all combinations are available - consult factory

SPECIFICATIONS

Bore Size	5/16″	1/2″	5/8″	3/4″	7/8″	1-1/16″	1-1/4″	1-1/2″	1-3/4″	2″	2-1/2″	3″
Force Factor - Extend (Area)	0.07	0.19	0.31	0.44	0.60	0.88	1.2	1.7	2.4	3.1	4.9	7.0
Rod Size	1/8″	3/16″	3/16″	1/4″	1/4″	5/16″	3/8″	7/16″	1/2″	5/8″	5/8″	3/4″
Rod Area	0.01	0.03	0.03	0.05	0.05	0.08	0.11	0.15	0.20	0.31	0.31	0.44
Force Factor - Retract (Area)	0.06	0.16	0.28	0.39	0.55	0.80	1.09	1.55	2.20	2.90	4.59	6.56

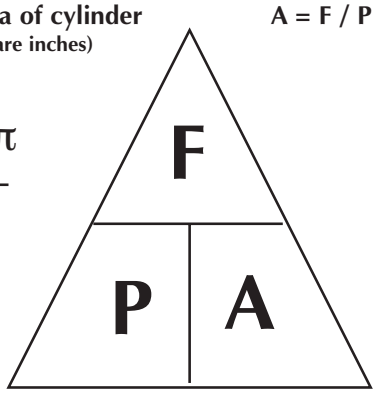
STAINLESS STEEL CYLINDER
STANDARD & HEAVY SPRING FORCES



The force required, operating air pressure and cylinder bore are all factors that must be determined or known when sizing an air cylinder. If two are known the other is easily calculated per the formulas and triangle shown below.

Area is derived using either of the following formulas: **Diameter ^{2} x 0.7854 or Radius ^{2} x π**

F - Force or load in pounds — **F = P x A**
P - Pressure — **P = F / A**
A - Area of cylinder (square inches) — **A = F / P**



Standard Spring Forces (lbs)

Bore	5/16″	1/2″	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	0.9	1.3	3.0	3.0	2.0	4.5	4.5	11.0	15.0	15.0
Compressed	1.0	2.0	4.0	6.0	6.0	7.0	10.0	10.0	24.0	30.0	30.0

Heavy Spring Forces (lbs)

Bore	5/16″	1/2″	5/8″	3/4″	7/8″	1-1/16″	1-1/4″	1-1/2″	1-3/4″	2″	2-1/2″
At Rest	N/A	2.0	3.3	5.0	5.0	5.5	8.5	8.5	N/A	N/A	N/A
Compressed	N/A	4.0	9.0	10.0	10.0	13.0	17.0	17.0	N/A	N/A	N/A

OPTIONS

The following options are available with Clippard stainless steel cylinders. Available options are shown by the abbreviations noted in the information shown with each standard cylinder.

Fluorocarbon Seals -V

This option is used in applications where chemical resistance, compatibility and temperature become an issue. Temperature ranges: -20 up to 400°F.

Cushions -C

(Front Cushion Only) -F
(Rear Cushion Only) -R

Clippard's cushion cylinders offer an adjustable cushion to slow the cylinder near the end of the stroke to reduce impact and prolong cylinder life. Our adjustment needle is held captive to prevent the needle from blowing out. The cushion can be adjusted to have a dead stop 1/2" from end of stroke or adjusted to have virtually no effect on the action of the cylinder. See specific cylinder specifications for availability of this option.

No Rod Threads -N

Rods are provided with no threads when this option is ordered.

Magnetic Piston -M

Clippard stainless steel pneumatic cylinders that are equipped with an internal magnet can be used with the Reed Switch and GMR Sensor. By accurately sensing the magnetic field of the piston when it passes beneath the sensor, the position of the rod piston is determined, and the feedback signal is created. Use of this option may add to the overall length of the cylinder. See specific cylinder listings on the following pages for availability and details of the overall length adder.

Rod Wipers -W

Rod Wipers are added to cylinders in applications where a liquid wash could dry out the rod seals of a double acting cylinder.

Non-Standard Options

Extra Rod Extensions
Thread Modifications
Silk Screening Private Labels

If you can't find a cylinder to suit your needs call your Clippard distributor to inquire about custom cylinders.

Bumpers -B

Internal polyurethane bumpers are supplied for applications where the cylinder is cycled with a light load and/or high speeds. The elastic bumpers reduce noise and shock to the load. Use of this option may add to the overall length of the cylinder. See specific cylinder listings on the following pages for availability and details of the overall length added. Maximum temperature 200˚F.

Side Ported -S

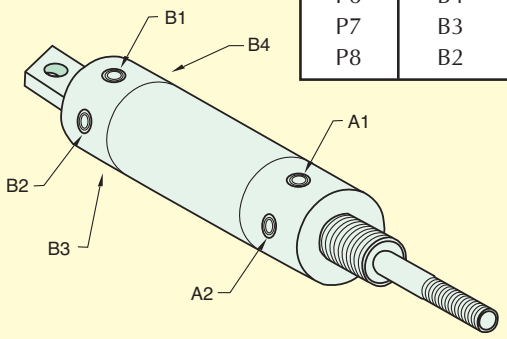
Side ported rear heads are sometimes needed when the standard cylinder has the rear port out the back. This option changes the design of the rear head so the rear port is located on the side of the cylinder. Overall length of cylinder changes with this option.

Heavy Spring -H

In single acting, reverse acting or spring bias cylinders the standard spring force can be changed by ordering the -H option. The spring forces for the heavy springs are shown on page 3.

Rotated Ports

Option #	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



This option is used in applications where ports need to be rotated to accommodate a specific space requirement or port orientation for the fittings and tube attachments. The diagram explains the options and orientation of the ports. See the specific cylinder to find availability of these options.

STROKE LENGTHS

Standard stroke lengths for each bore size and cylinder style are listed in this catalog. Non-standard stroke lengths (not listed in the catalog) up to 24″ for single acting cylinders and 36″ for double acting cylinders are available. Stroke length should be specified in inches and fractions of an inch. Consult the factory for other requirements.

In applications, attention should be given to minimizing the side load on the rod to insure a smooth stroke without binding. Also, in applications where the cylinder rod is subjected to an unsupported column load, the load on the rod should be less than the force shown in the table below to prevent buckling of the rod.

Maximum Load (lbs) to Prevent Buckling of the Rod

Rod dia.	Rod Length								
	1″	5″	10″	15″	20″	25″	30″	35″	40″
1/8″	110	12	3	1.3					
3/16″	262	59	15	6.6	3.7				
1/4″	478	190	47	21	12	7.5			
5/16″	756	451	116	52	29	19	13		
3/8″	1091	786	240	106	60	38	27	20	
7/16″	1490	1184	444	197	111	71	49	36	28
1/2″	1950	1645	757	336	189	120	84	62	47
5/8″	3055	2750	1795	821	462	295	205	150	115
3/4″	4405	4100	3140	1700	950	613	425	312	240

Rod Thread	Bore Size	Series	Rod Size	Rod Flats
#5-40 UNC-2A	5/16″	05	1/8″	none
#10-32 UNF-2A	1/2″	08	3/16″	none
#10-32 UNF-2A	5/8″	10	3/16″	none
1/4-28 UNF-2A	3/4″	12	1/4″	0.218
1/4-28 UNF-2A	7/8″	14	1/4″	0.218
5/16-24 UNF-2A	1 1/16″	17	5/16″	0.250
3/8-24 UNF-2A	1 1/4″	20	3/8″	0.312
7/16-20 UNF-2A	1 1/2″	24	7/16″	0.375
1/2-20 UNF-2A	1 3/4″	28	1/2″	0.437
1/2-20 UNF-2A	2″	32	5/8″	0.500
1/2-20 UNF-2A	2 1/2″	40	5/8″	0.500
5/8-18 UNF-2A	3″	48	3/4″	0.625

CUSTOM CYLINDERS

If your application requires a custom feature that you do not see in our catalog please contact our distributor in your area for assistance. We manufacture a wide variety of special cylinders. Examples of our custom cylinder capabilities would include: stroke and rod modifications, special mounting configurations and ports, seal and lubrication options, integrated valving and adjustable stroke cylinders. We also provide application based special cylinder design for those customers having unique parameters.

FREE CYLINDER SAMPLE PROGRAM

We invite competitive comparisons. If you are an OEM that uses air cylinders, Clippard will provide a free sample for your evaluation. Contact us or your local distributor and ask for the "Free Sample CILinder" request form.

POSITION SENSORS

Clippard stainless steel pneumatic cylinders that are equipped with an internal magnet can be used with the Reed Switch and GMR Sensor. By accurately sensing the magnetic field of the piston when it passes beneath the sensor, the position of the rod piston is determined, and the feedback signal is created. Use of this option may add to the overall length of the cylinder. See specific cylinder listings on the following pages for availability and details of the overall length adder.

GMR (Giant Magneto Resistive) Sensor

Clippard's GMR sensor is a solid-state device that is made up of alternating layers of conductive magnetic and non-magnetic materials. When a magnetic field is applied, there is a large drop in resistance. This decrease produces a signal that can be used to determine the location of the piston.

Some of the benefits of GMR technology include small size, high durability, high sensitivity, high response time, low power consumption and low cost. These benefits make this sensor a clear choice for piston location in pneumatic system control.

A 1/2″ minimum stroke is required when multiple sensors are used.

Reed Switch

Clippard's Reed Switch is a Single Pole, Single Throw (SPST) Normally-Open electronic switch. When the cylinder's magnet-equipped piston moves to a location where the magnet is positioned below the Reed Switch, the Switch sends a feedback signal to indicate the location of the piston.

A 1/2″ minimum stroke is required when multiple switches are used.

ACCESSORIES

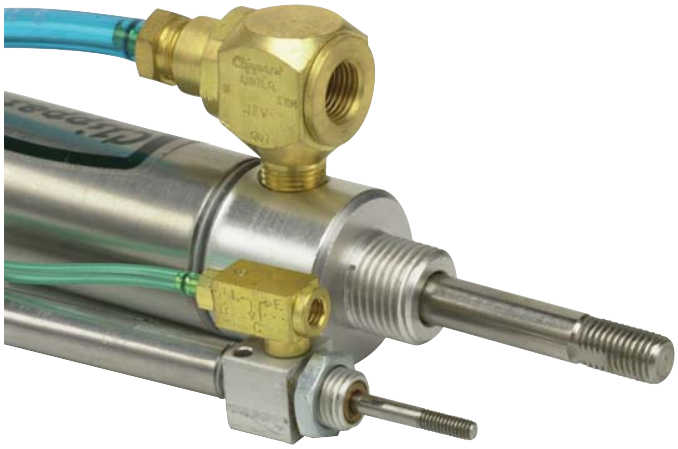
Mounting Hardware

For efficient power and easy mounting, Clippard has designed and manufactured brackets suitable for each cylinder shown in this catalog.

These products are shown on the last page of each corresponding bore size and include clevis mounting brackets, foot mounting brackets, rod clevis assemblies and rod eye assemblies. Extra mounting nuts are available.

Flow Controls

Clippard offers a large variety of flow controls and needle valves for adjusting the speed of the cylinder. Several models are available from fine adjustments to coarse adjustments in a variety of mounting configurations.
See pages 154 through 157.



Quick Exhaust Valves

The primary function of a quick exhaust valve is to increase cylinder speed. This also enables the use of smaller directional valves and longer control lines. Offered with several port configurations from #10-32 models up to 1/4″.
See pages 159 and 160.

Limit Valves

A limit valve is the best way to have a mechanical limit to return air signals to control valves or circuits. Clippard offers limit valves in ports ranging from #3-56 up to 1/8″ NPT, high force and heavy duty limits as well as non-contact sensing valves.
See Control Valves section.