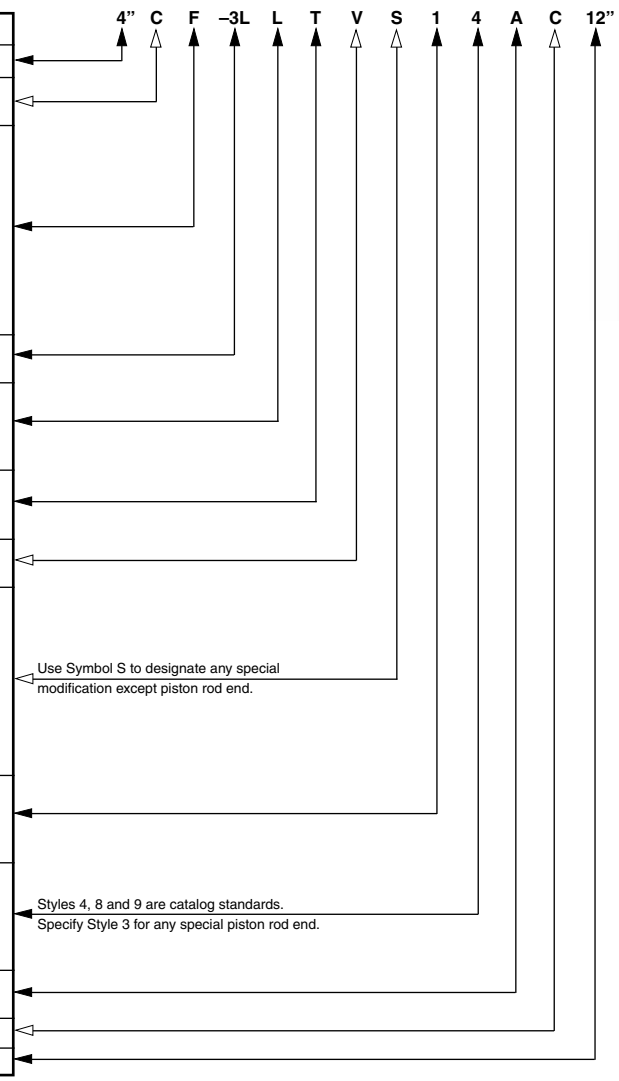
INDUSTRIAL CYLINDERS

HOW TO ORDER

Series 2A/3L Model Numbers – How to Develop Them – How to "Decode" Them

Parker Series 2A/3L cylinders can be completely and accurately described by a model number consisting of coded symbols. To develop a model number, select only those symbols that represent the cylinder required, and place them in the sequence indicated below.

Feature	Description	Symbol
Bore*	Specify in inches	–
Cushion-Head	Used **only** if cushion required	C
Mounting* Style	Head Tie Rods Extended Cap Tie Rods Extended Both End Tie Rods Extended Head Rectangular Flange Cap Rectangular Flange Head Square Flange Side Lugs Side Tapped Head Trunnion Cap Fixed Clevis	TB TC TD J H JB C† F† D BB
Series*	Used in **all** 2A/3L Model Numbers	–2A –3L
Piston	Lipseal® Piston (This code used for 3L Series only. Leave this space blank for 2A Series.)	L
Ports*	SAE Straight Thread O-Ring Port NPTF (Dry Seal Pipe Thread)	T U
Common Modifications	Fluorocarbon Seals (See Operating Fluids/Seals page.)	V
Special Modifications	Used **only** if special modifications are required: Oversize Ports Port Position Change Rod End Bellows Special Seals Stop Tube Stroke Adjuster Tie Rod Supports	S
Piston Rod* Number	For Single Rod Cylinders, select one only. (See Piston Rod - Stroke Selection Chart - for minimum piston rod diameter.)	1 2 3 7
Piston* Rod End	Select: Style 4 Small Male Style 8 Intermediate Male Style 9 Short Female Style 3 Special (specify)	 4 8 9 3
Piston Rod* Threads	UNF Standard	A
Cushion-Cap	Used **only** if cushion required	C
Stroke*	Specify in inches	–



* Required for Basic Cylinder Model Number

† Cylinders with these mounting styles should have a minimum stroke length equal to or greater than their bore size.

Dark arrows indicate Basic Minimum Model Number.

Cylinder serial numbers are factory production record numbers and are assigned to each cylinder, in addition to the model number.

HYDRAULIC AND PNEUMATIC INDUSTRIAL CYLINDERS

CYLINDER PRESSURE RATINGS

Application Data

The proper application of a fluid power cylinder requires consideration of the operating pressure, the fluid medium, the mounting style, the length of stroke, the type of piston rod connection to the load, thrust or tension loading on the rod, mounting attitude, the speed of stroke, and how the load in motion will be stopped. Information given here provides pressure rating data for pneumatic and hydraulic cylinders.

Pneumatic Cylinders

Standard operating fluid — filtered air which is free of moisture. 2A and 2AN series cylinders are recommended for maximum 250 psi heavy duty service.

Pressure Ratings Fluid Medium Air

Bore Size (in.)	Standard Piston Rod Diameters (in.)	Series 2A, 2AN Max. Heavy-Duty Operating Pressure (PSI)
1	1/2	250
1 1/2	5/8	250
2	5/8	250
2 1/2	5/8	250
3 1/4	1	250
4	1	250

Hydraulic Cylinders (Heavy duty)

Standard operating fluid - clean, filtered hydraulic oil. Pressure ratings for heavy duty hydraulic cylinders are shown in the following table:

Pressure Ratings

Series 2H hydraulic cylinders are recommended for pressures to 3000 PSI for heavy-duty service with hydraulic oil. The 4:1 design factor ratings shown are based on tensile strength of material and are for code 1 rod dia. only. The rating is conservative for continuous severe applications. Design factors at other pressures can be calculated from this rating. In addition, mounting styles, stroke, etc., should be considered because of the limiting effect they may have on these ratings.

Maximum Pressure Ratings

Bore Size (in.)	Rod Diameters (in.)	4:1* Design Factor (Tensile) (PSI)	Heavy-Duty Service (PSI)
1 1/2	5/8	2530	3000
2	1	2950	3000
2 1/2	1	2340	3000
3 1/4	1 3/8	2250	3000
4	1 3/4	2130	3000

*Applies to all mountings except J, H and D. See Series 2H.

Hydraulic Cylinders (Medium duty)

Pressure ratings for “Series 3L” hydraulic cylinders vary by bore size and rod size as shown in table below. For pressures higher than those indicated, Series 2H heavy duty cylinders should be used.

Series 3L Hydraulic Cylinders Maximum Pressure Rating

Bore Size (in.)	Rod Number	Rod Diameters (in.)	Pressure Rating At 4:1 Design* Factor (On Tensile)
1 1/2	1	5/8	2000
	2	1	2300
2	1	5/8	1100
	3	1	2000
	2	1 3/8	2000
2 1/2	7	5/8	700
	1	1	1400
	2	1 3/4	1400
3 1/4	1	1	1300
	3	1 3/8	1300
	2	2	1300
4	7	1	900
	1	1 3/8	900
	2	2 1/2	900

*Applies to all mountings except J. See Series 3L

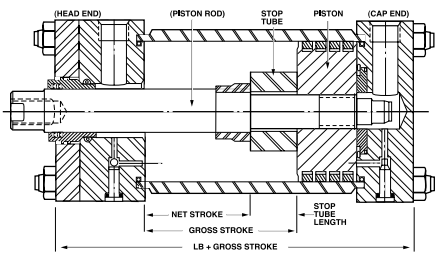
HYDRAULIC AND PNEUMATIC INDUSTRIAL CYLINDERS

STOP TUBING/MOUNTING CLASSES

Stop Tubing

Stop tube is recommended to lengthen the distance between the gland and piston to reduce bearing loads when the cylinder is fully extended. This is especially true of horizontally mounted and long stroke cylinders. Long stroke cylinders achieve additional stability through the use of a stop tube.

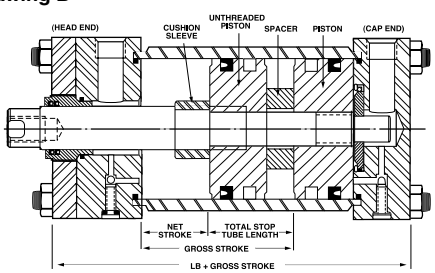
Drawing A



When specifying cylinders with long stroke and stop tube, be sure to call out the net stroke and the length of the stop tube. Machine design can be continued without delay by laying in a cylinder equivalent in length to the NET STROKE PLUS STOP TUBE LENGTH, which is referred to as GROSS STROKE.

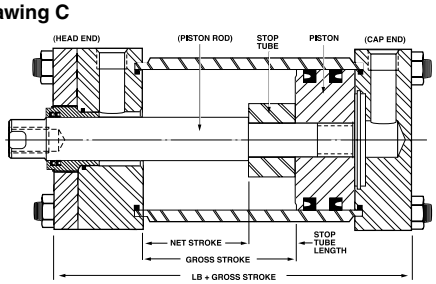
Refer to piston rod/stroke selection chart to determine stop tube length.

Drawing B



Double piston design is supplied on air cylinders with cushion head end or both ends.

Drawing C



This design is supplied on all non cushion cylinders.

Series 2A, 3L, 2H Cylinders Mounting Classes

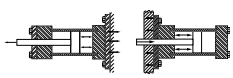
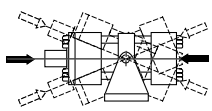
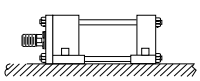
Standard mountings for fluid power cylinders fall into three basic groups. The groups can be summarized as follows:

Group 1 – Straight Line Force Transfer with fixed mounts which absorb force on cylinder centerline.

Group 2 – Pivot Force Transfer. Pivot mountings permit a cylinder to change its alignment in one plane.

Group 3 – Straight Line Force Transfer with fixed mounts which do not absorb force on cylinder centerline.

Because a cylinder's mounting directly affects the maximum pressure at which the cylinder can be used, the chart below should be helpful in selection of the proper mounting combination for your application. Stroke length, piston rod connection to load, extra piston rod length over standard, etc., should be considered for thrust loads. Alloy steel mounting bolts are recommended for all mounting styles, and thrust keys are recommended for Group 3.

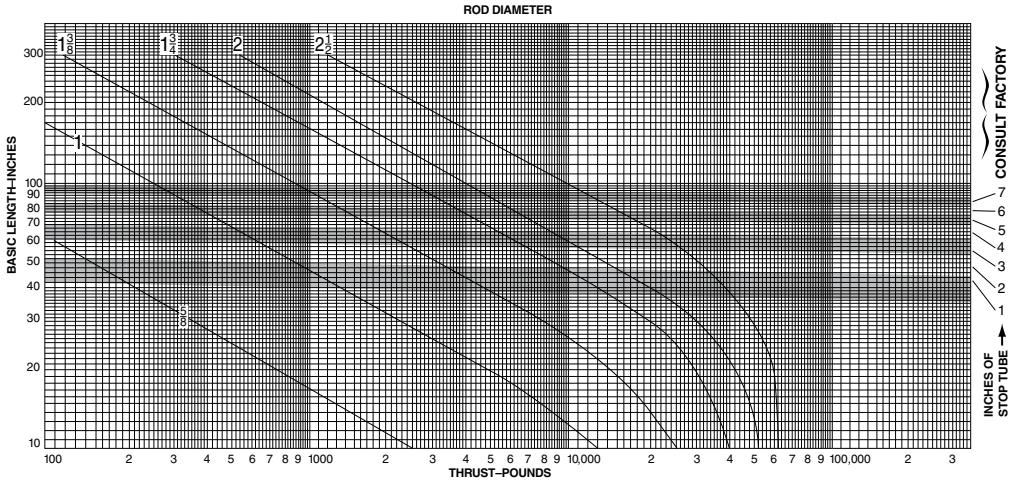
Group 1 FIXED MOUNTS which absorb force on cylinder centerline.	
	
Heavy-Duty Service For Thrust Loads For Tension Loads	 Mtg. Style TC Mtg. Styles JB, JJ, TB
Medium-Duty Service For Thrust Loads For Tension Loads	 Mtg. Styles H Mtg. Styles J, JB
Light-Duty Service For Thrust Loads For Tension Loads	 Mtg. Style H Mtg. Style J
Group 2 PIVOT MOUNTS which absorb force on cylinder centerline.	
	
Heavy-Duty Service For Thrust Loads For Tension Loads	 Mtg. Style Mtg. Styles BB, D
Medium-Duty Service For Thrust Loads For Tension Loads	 Mtg. Style BB Mtg. Style BB
Light-Duty Service For Thrust Loads For Tension Loads	 ———— ————
Group 3 FIXED MOUNTS which do not absorb force on the centerline.	
	
Heavy-Duty Service For Thrust Loads For Tension Loads	 Mtg. Style C Mtg. Style C
Medium-Duty Service For Thrust Loads For Tension Loads	 Mtg. Style F Mtg. Style F

6

HYDRAULIC AND PNEUMATIC INDUSTRIAL CYLINDERS

CYLINDER STROKE CHART

Piston Rod — Stroke Selection Chart



How to Use the Chart

The selection of a piston rod for thrust (push) conditions requires the following steps:

1. Determine the type of cylinder mounting style and rod end connection to be used. Then consult the chart below and find the "stroke factor" that corresponds to the conditions used.
2. Using this stroke factor, determine the "basic length" from the equation:

Basic Length	=	Actual Stroke	x	Stroke Factor

   The graph is prepared for standard rod extensions beyond the face of the gland retainers. For rod extensions greater than standard, add the increase to the stroke in arriving at the "basic length."
3. Find the load imposed for the thrust application by multiplying the full bore area of the cylinder by the system pressure.
4. Enter the graph along the values of "basic length" and "thrust" as found above and note the point of intersection:

   A) The correct piston rod size is read from the diagonally curved line labeled "Rod Diameter" next *above* the point of intersection.

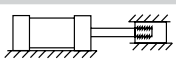
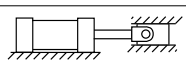
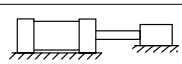
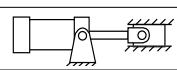
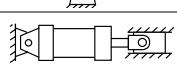
   B) The required length of stop tube is read from the right of the graph by following the shaded band in which the point of intersection lies.

   C) If required length of stop tube is in the region labeled "consult factory," submit the following information for an individual analysis:

   1) Cylinder mounting style.
   2) Rod end connection and method of guiding load.
   3) Bore, required stroke, length of rod extension (Dim. "LA") if greater than standard, and series of cylinder used.
   4) Mounting position of cylinder. (Note: If at an angle or vertical, specify direction of piston rod).
   5) Operating pressure of cylinder if limited to less than standard pressure for cylinder selected.

⚠ Warning

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod end to fail. If these types of additional loads are expected to be imposed on the piston rods, their magnitude should be made known to our Engineering Department so they may be properly addressed. Additionally, cylinder users should always make sure that the piston rod is securely attached to the machine member.

Recommended Mounting Styles for Maximum Stroke and Thrust Loads	Rod End Connection	Case	Stroke Factor
Groups 1 or 3 Long stroke cylinders for thrust loads should be mounted using a heavy-duty mounting style at one end, firmly fixed and aligned to take the principal force. Additional mounting should be specified at the opposite end, which should be used for alignment and support. An intermediate support may also be desirable for long stroke cylinders mounted horizontally. Machine mounting pads can be adjustable for support mountings to achieve proper alignment.	Fixed and Rigidly Guided	I 	.50
	Pivoted and Rigidly Guided	II 	.70
	Supported but not Rigidly Guided	III 	2.00
Group 2 Style D — Trunnion on Head	Pivoted and Rigidly Guided	IV 	1.00
Style BB — Clevis on Cap	Pivoted and Rigidly Guided	VI 	2.00

HYDRAULIC AND PNEUMATIC INDUSTRIAL CYLINDERS

OPERATING FLUIDS/SEALS/PISTONS/WARRANTY

Operating Fluids and Temperature Range

Fluidpower cylinders are designed for use with pressurized air, hydraulic oil.

Standard Seals (class 1)

Class 1 seals are what is normally provided in a cylinder unless otherwise specified. They are intended for use with fluids such as: air, nitrogen, mineral base hydraulic oil or MIL-H-5606 within the temperature range of -10°F (-23°C) to +165°F (+74°C). Generally they are nitrile except for piston rod seals in hydraulic cylinders. However the individual seals may be nitrile (Buna-N) enhanced polyurethane, polymyte, P.T.F.E. or filled P.T.F.E.

Fluorocarbon Seals (class 5)

Class 5 seals are intended for elevated temperature service or for some Phosphate Ester Fluids such as Houghto-Safe 1010, 1055, 1120; Fyrquel 150, 220, 300, 350; Mobile Pyrogard 42, 43, 53, and 55. Note: In addition, class 5 seals can be used with fluids listed below under standard service. However, they are not compatible with Phosphate Ester Fluids such as Skydrols. Class 5 seals can operate with a temperature range of -10°F (-23°C) to +250°F (+121°C). Class 5 seals may be operated to +400°F (+204°C) with limited service life. For temperatures above +250°F (+120°C) the cylinder must be manufactured with non-studded piston rod and thread and a pinned piston to rod connection. Class 5 Lipseals will have P.T.F.E. back-up washers when required. O-rings will have fluorocarbon back-up when required.

Warning ⚠

The piston rod stud and the piston rod to piston threaded connections are secured with an anaerobic adhesive which is temperature sensitive. Cylinders specified with Class 5 seals are assembled with anaerobic adhesive having a maximum temperature rating of +250°F (+74°C). Cylinders specified with all other seal compounds are assembled with anaerobic adhesive having a maximum operating temperature rating +165°F (+74°C). These temperature limitations are necessary to prevent the possible loosening of the threaded connections. Cylinders originally manufactured with class 1 seals (Nitrile) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service. Contact the factory immediately and arrange for the piston to rod and the stud to piston rod connections to be properly re-assembled to withstand the higher temperature service.

Lipseal Pistons

Under most conditions lipseals provide the best all around service for pneumatic applications. Lipseals with a back-up washer are often used for hydraulic applications when virtually zero static leakage is required. Lipseals will function properly in these applications when used in conjunction with moderate hydraulic pressures. A high load piston option is recommended when operating at high pressures and especially with large bore hydraulic cylinders.

Cast Iron Piston Rings

Cast iron rings are the standard piston seals for 2H and 3L Series cylinders. They offer the widest operating conditions by tolerating high operating pressures, wide temperature range and are compatible with most fluids. The only drawback of cast iron rings is that they allow a small amount of leakage. The leakage for a 4" bore cylinder, operating at 2000 psi, with mineral base hydraulic fluid will be less than 10in^3/min. Leakage will increase as pressure, bore size and viscosity of the operating hydraulic fluid increases. For these reasons cast iron rings are not recommended when using water or (H.W.C.F.) fluids.

Warranty

Parker Hannifin will warrant cylinders modified for water or high water content fluid service to be free of defects in materials or workmanship, but cannot accept responsibility for premature failure due to excessive wear, due to lack of lubricity or where failure is caused by corrosion, electrolysis or mineral deposits within the cylinder.

Pre-Lubricated Air Cylinders

Parker Hannifin air cylinders are factory pre-lubricated with Lube-A-Cyl applied to seals, piston, cylinder bore, piston rod and gland surfaces, provides for normal cylinder operations with lubricated air.

Non-Lubricated Air Cylinders

For heavier duty operation, Series 2AN is recommended for non-lubricated air service. Series 2AN includes an innovative special composite material wick and ring reservoir assembly in each seal groove to retain the extreme pressure lubricant applied at time of assembly. This lubricant coats the cylinder bore and piston rod and mating surfaces.

Class Number	Typical Fluids	Temperature Range
1 (Standard) (Nitrile Polyurethane)	Air, Nitrogen, Hydraulic Oil, Mil-H-5606 Oil	-10°F (-23°C) to +165°F (+74°C)
5 Optional (At extra cost) (Fluorocarbon Seals)	High Temperature Houghto-Safe 1010, 1055, 1120 Fyrquel 150, 220, 300, 550 Mobil Pyrogard 42, 43, 53, 55	See above paragraph on Fluorocarbon seals for recommended temperature range.

Note: Fluorocarbon seals are not suitable for use with Skydrol fluid, but can be used with hydraulic oil if desired