PNEUMATIC CYLINDERS

P1D SERIES - GENERAL SPECIFICATIONS

Specifications

- Bore sizes 32-200mm
- Max stroke 2800mm
- Rod Ends – 2 standard, specials to order
- Single rod end and double rod end styles
- Working pressure Max 10 Bar (145 PSI)
- Working temperature

	min	max
Standard	-4°F	+176°F
High temp version	+14°F	+250°F

  Aluminum piston is required for service above +176°F
- Greased for life (non-lube), does not normally need additional lubrication. If air line lubrication is initiated, it must always be continued.
- Working medium: Dry, filtered compressed air to ISO 8573-1 class 3. 4. 3. or better

P1D Clean Version

Min stroke	25mm
Protection class	Hose-proof in accordance with IP65
Chemical resistance	Tested for normally used industrial detergents, both acid and alkaline

P1D Rod Lock Version

- Fluid Medium: Dry, filtered, compressed air
- Maximum Cylinder Operating Pressure: 145 PSI
- Required Pressure to Unlock[1]: 58 PSI
- Minimum Torque Required for Manual Override Version:
  - 32mm Bore = 8 in-lbs
  - 40mm Bore = 8 in-lbs
  - 50mm Bore = 24 in-lbs
  - 63mm Bore = 24 in-lbs
  - 80mm Bore = 240 in-lbs
  - 100mm Bore = 324 in-lbs
  - 125mm Bore = 540 in-lbs
- Maximum Operating Temperature: +14°F to +167°F
- Maximum Cylinder Operating Speed: 5 feet per second

[1]Signal pressure to port on locking device. Operation at pressures lower than 58 psi may lead to inadvertent engagement of the rod lock device.

Quick Reference

Bore Size	Cylinder Area cm^2	Piston Rod Dia. mm	Piston Rod Area cm^2	Piston Rod Male Thread	Cushioning Length mm	Air Consumption[1] litre	Connection Thread	Theoretical Cylinder Forces at 6 Bar (N)[2] Extend Stroke	Theoretical Cylinder Forces at 6 Bar (N)[2] Retract Stroke
32	8.0	12	1.1	M10x1.25	17	0.105	G1/8	482	414
40	12.6	16	2.0	M12x1.25	19	0.162	G1/4	754	633
50	19.6	20	3.1	M16x1.5	20	0.253	G1/4	1178	989
63	31.2	20	3.1	M16x1.5	23	0.414	G3/8	1870	1681
80	50.3	25	4.9	M20x1.5	23	0.669	G3/8	3016	2721
100	78.5	25	4.9	M20x1.5	27	1.043	G1/2	4712	4417
125	122.7	32	8.0	M27x2	30	1.662	G1/2	7363	6880
160	201.1	40	12.6	M36x2	38	2.724	G3/4	12.064	11,310
200	314.2	40	12.6	M36x2	38	4.256	G3/4	18.850	18,096

Cylinder Bore Size	Total Mass (kg) 0mm Stroke Standard	Tie-Rod	Clean	Supplement per 10mm Stroke Standard	Tie-Rod	Clean	Total Mass (kg) Moving Components at 0mm Stroke All variants	Supplement per 10mm Stroke All variants
32	0.55	0.54	0.60	0.023	0.022	0.047	0.13	0.009
40	0.80	0.79	0.88	0.033	0.030	0.063	0.24	0.016
50	1.20	1.20	1.32	0.048	0.048	0.094	0.42	0.025
63	1.73	1.73	1.86	0.051	0.051	0.101	0.50	0.025
80	2.45	2.47	2.63	0.075	0.079	0.142	0.90	0.039
100	4.00	4.00	4.22	0.084	0.084	0.168	1.10	0.039
125	6.87	6.73	7.01	0.138	0.129	0.248	2.34	0.063
160	—	16.19	—	—	0.160	—	Consult Factory	Consult Factory
200	—	22.23	—	—	0.185	—	Consult Factory	Consult Factory

1) Free air consumption per 10 mm stroke for a double stroke at 6 bar
2) The values for cylinder forces are theoretical and should be reduced to suit working conditions.

PNEUMATIC CYLINDERS

P1D SERIES - HOW TO ORDER

P1D – **S** **032** **M** **C** –

Piston Style	Piston Material	
Cushions	Composite [1]	Aluminum [2]
None	M	Y
Cush B/E	–[3]	4
Cush head	J	5
Cush cap	K	6

1 Not available for 160-200mm bores.
2 Not available on Clean Version.
3 Must be placed in model code.

Bore Size	
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm
125	125mm
160	160mm [8]
200	200mm [8]

8 Tie Rod Version E must be specified for these bores.

Continued on next page

Cylinder Ports Front & Rear	
–	BSPP Ports (G Threads)
E	NPTF Ports*
Q	BSPT Ports (R_c Threads)*

* Not available on Clean Version.

Version		Rod Lock		
	Cylinder Body Profile	None	Fitted w/ Std Rod Lock [7]	Fitted w/ Manual Override Rod Lock [7]
Die Cast End Caps	Standard	S	L	N/A
	Tie Rod [4]	T	M	N/A
	Clean	C	D	N/A
Removable Gland [5] (Machined Endcaps)	Standard	G	R	J
	Tie Rod	E	7 [4]	Consult Factory
Special [6]	Any Special	/		

4 Not available for 160-200mm bores.
5 When Removable Gland Version is fitted with rod lock, gland cannot be replaced without disassembling cylinder.
6 If special cylinder is ordered (other than rod end), End Cap Style, Cylinder Body Profile and Rod Lock option must be given in addition to the special request.
7 Cylinders fitted with rod locks must be cushioned on both ends.

Function				
Fastener Type	Rod Wiper Style	Double Acting	Double Rod	Tandem
Standard end cover screws	Std scraper	M	F	C
	Metal scraper	Q	R	J
Stainless steel end cover screws [4]	Std scraper	A	G	N/A
	Metal scraper	S	T	N/A

Piston Rod & Seal Material			
	Seal Material		
Piston Rod Material	Standard	Fluorocarbon [9]	Hydraulic [10]
Chrome plated carbon steel [11]	C	G	J
Chrome plated stainless steel [11]	R	D	Z
Stainless steel [12]	S	N/A	N/A
Acid-resistant stainless steel	M	N [11]	N/A

9 If used for temperature above +176°F, aluminum piston required. Not available for Standard Version. Fluorocarbon seals for Rod Lock Versions are for chemical compatibility applications only, not for high temperature.
10 Hydraulic seal option valid for Removable Gland Version only. Adjustable cushion options and Rod Lock Versions not available.
11 Not available on Clean Version.
12 Only available on Clean Version.

PNEUMATIC CYLINDERS

P1D SERIES - HOW TO ORDER

0500	N	N	N	N	N
Stroke [1]	Rod Mountings & Plugs [2]		Sensors [5]		Rod End

Specify whole mm using 4 digits, i.e. 0500

Rod Mountings & Plugs [2]		
Rod Mounting	**No Plugs [3]**	**With Plugs [4]**
Swivel rod eye	S	A
Swivel rod eye SS	T	1
Swivel rod eye with clevis bracket GA	V	E
Swivel rod eye SS with clevis bracket GA	W	2
Clevis	C	B
Clevis SS	D	3
Flexco coupling	F	G
One additional piston rod nut	X	P
Stainless steel piston rod nut	Y	4
Acid-resistant nut	Z	5
None (piston rod nut only)	N	R

Rod End	
N	Metric male
6	Metric female
3	Special*

* Please provide desired dimensions for KK, AM and WH. If otherwise special, provide dimensioned sketch.

Sensors [5]			
	Cable Location		
Prepared for Factory-fitted Sensors	**Front or Left**	**Rear or Right**	**Front & Rear**
P1D Clean Version	6	7	8
P1D all versions (except Clean) prepared for sensors or Clean Version without sensor capability [6]	N		

Mounting Style		
	Standard	**Rotated 90°**
Flange MF1/MF2 in front end	1	3
Flange MF1/MF2 in rear end	B	4
Flange MF1/MF2 in both ends	2	K
Foot brackets MS1	F	R
Clevis bracket GA aluminum	C	U
Rear eye MP4 aluminum	E	V
Rear swivel eye MP6 aluminum	S	W
Clevis bracket MP2 aluminum	T	Y
Rear eye + clevis (MP4 + MP2) aluminum	L	Z
Clevis bracket MP2 + pivot hinge aluminum	X	5
Clevis bracket GA aluminum + steel swivel hinge	Q	0
Rear swivel eye + clevis bracket GA aluminum	M	A
Cylinder trunnion MT4 (requires XV dimension)	G	7
Trunnion flange in front end [4]	H	P
Trunnion flange in rear end [4]	J	8
None (MX0)	N	9

Notes:

1 When specifying a stop tube, place a "/" in the version field. Then specify the version, amount of stop tube and amount of net stroke. The stroke used in the model code should be gross stroke (net stroke plus stop tube).

2 Please review Piston Rod Selection Chart in the Engineering Section to check for a rod buckling condition.

3 Clean Version comes standard with plugs. Use this column when ordering Clean Version.

4 Not available for 160-200mm bores.

5 For sensor part numbers and specifications, please refer to Electronic Sensors section.

6 P1D Clean Version ordered without sensors **cannot** be retrofitted with sensor capability.

Double Rod Cylinders

Double rod option is available with Mounting Styles MX0, MS1, MF1, MF2 and MT4.

For double rod cylinders, it is assumed that the rod number and rod end are the same for both piston rods. On a double rod cylinder where the two rod ends are different, use a rod end of '3' and be sure to clearly state which rod end is to be assembled at which end.

PNEUMATIC CYLINDERS

P1D SERIES - MATERIAL SPECIFICATIONS

Standard Version

Body extrusion	Clear anodized aluminium
End covers	Powder coated or black anodized aluminum
End cover inserts	POM
End cover nuts/screws	Zinc plated steel 8.8
Piston rod nut	Zinc plated steel
Piston rod	Chrome-plated steel (standard)
Scraper ring	PUR
Piston rod bearing	POM
Piston	POM
Piston bearing	POM
Magnetic ring	Plastic bound magnetic material
Piston fastener	Zinc plated steel
Piston seal	PUR
O-rings	Nitrile rubber, NBR
End-of-stroke bumpers and end seals	PUR
Cushioning seals	PUR
Cushioning screws	PA

Piston Rod Material Options
(or with equivalent properties):

Standard	Case-hardened, chrome plated carbon steel
Chrome plated stainless steel	17-4 PH, chrome plated stainless steel
Stainless steel	303 stainless steel
Acid-resistant stainless steel	316 stainless steel

Additional/Substitute Specifications

P1D Clean Version

Transparent molding	Silicone
Transparent cover	ABS
Screws, sensor system	Stainless steel
Upper seal, cover	EPDM
Lower seal, cover	rubber
Sealing plugs	PA
Piston rod nut	Stainless steel

P1D Tie-Rod Version

Tie-rods	Blackened steel

P1D Removable Gland Version

End covers	Black anodized aluminum
End cover screws	Zinc plated steel 8.8 (32-125mm bores)
Cylinder Body	Clear anodized aluminum
Rod gland	PTFE filled high strength bronze
Rod seal	Buna Nitrile for sealing action
Rod wiper	Buna Nitrile for wiping action
Piston rod	Case hardened chrome-plated steel
Piston rod nut	Zinc plated steel
Piston	POM (standard) Aluminum (optional)
Piston seals	PUR
Piston bearing	POM or Molyguard wear band for aluminum piston
Magnetic ring	Plastic bound magnetic material
Piston fastener	Zinc plated steel (32-125mm bores)
O-rings	Buna Nitrile
Cushioning seals	PUR
Cushioning screws	Stainless steel (brass for 160 and 200mm bores)

Design Variants for Removable Gland Version

High temperature option includes:

All seals	Fluorocarbon
Piston	Aluminum (without magnetic ring)

Low pressure hydraulic option includes:

Rod seal	Buna Nitrile
Rod wiper	PUR
Piston seals	Buna Nitrile
Piston	Aluminum (non-cushioned)

Metallic Rod Scraper includes:

Rod wiper	Dual high strength bronze wipers with nitrile or fluorocarbon energizer

PNEUMATIC CYLINDERS

P1D SERIES - TECHNICAL DATA

Recommended Air Quality for Cylinders

For best possible service life and trouble-free operation, ISO 8573-1 quality class 3.4.3 should be used. This means 5 µm filter (standard filter) dew point +37°F for indoor operation (a lower dew point should be selected for outdoor operation) and oil concentration 1.0 mg oil/m³, which is what a standard compressor with a standard filter gives.

ISO 8573-1 Quality Classes

Quality Class	Pollution		Water	Oil
	Particle Size (µm)	Max. Concentration (mg/m³)	Max Pressure Dew Point (°F)	Max. Concentration (mg/m³)
1	0.1	0.1	-94	0.01
2	1	1	-40	-0.1
3	5	5	-4	1.0
4	15	8	+37	5.0
5	40	10	+44	25
6	–	–	+50	–

P1D Rod Lock Version – Rod Lock Data

Connection

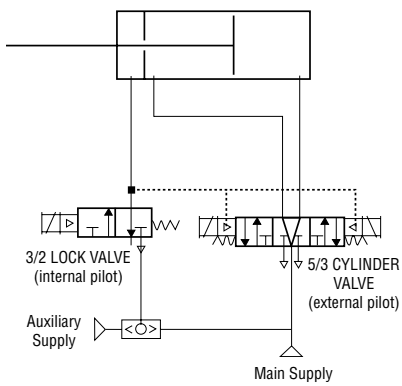
The signal air for the locking device can be obtained directly from a main air supply, or from the air supply serving the valve that controls the cylinder itself. For controlled ON/OFF operation of the locking device, a separate quick-venting valve is used.

The piston rod should not be moving when the locking device is activated. The locking device is not intended to brake a movement in repeated sequences.

Holding Forces

Bore Size	Holding Forces (N)	(lbs)
32mm	550	123
40mm	860	193
50mm	1345	303
63mm	2140	481
80mm	3450	755
100mm	5390	1211
125mm	8425	1894

NOTE: All P1D Rod Lock Versions are not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.



1. Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position.
2. Cylinder valve must be maintained energized during extend or retract. Also keep energized at end of stroke until change of direction is desired.
3. Mid position of 5/3 Cylinder valve may be pressurized outlets if the combination of pressure load on the cylinder and inertia effects of the attached load do not exceed the holding force rating of the rod lock device, including allowance for wear.
4. Do not use cylinder lines for any logic functions — pressure levels vary too much.

PNEUMATIC CYLINDERS

P1D SERIES - TECHNICAL DATA

Guide for Selecting Suitable Tubing

The selection of the correct size of tubing is often based on experience, with no great thought to optimizing energy efficiency and cylinder velocity. This is usually acceptable, but making a rough calculation can result in worthwhile economic gains.

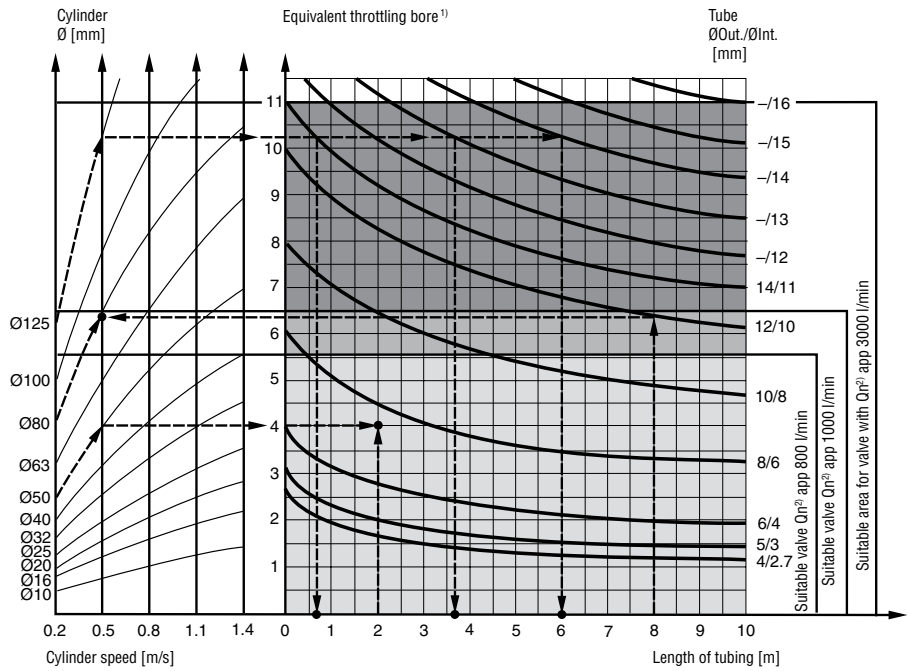
The following is the basic principle:

1. The primary line to the working valve could be over sized (this does not cause any extra air consumption and consequently does not create any extra costs in operation).
2. The tubes between the valve and the cylinder should, however, be optimized according to the principle that an insufficient bore throttles the flow and thus limits the cylinder speed, while an oversized pipe creates a dead volume which increases the air consumption and filling time.

The chart below is intended to help when selecting the correct size of tube to use between the valve and the cylinder.

The following prerequisites apply:
The cylinder load should be about 50% of the theoretical force (= normal load). A lower load gives a higher velocity and vice versa. The tube size is selected as a function of the cylinder bore, the desired cylinder velocity and the tube length between the valve and the cylinder.

If you want to use the capacity of the valve to its maximum, and obtain maximum speed, the tubing should be chosen so that they at least correspond with the equivalent restriction diameter (see description below), so that the tubing does not restrict the total flow. This means that a short tubing must have at least the equivalent restriction diameter. If the tubing is longer, choose it from the table below. Straight fittings should be chosen for highest flow rates. (Elbow and banjo fittings cause restriction.)



1) The "equivalent throttling bore" is a long throttle (for example a tube) or a series of throttles (for example, through a valve) converted to a short throttle which gives a corresponding flow rate. This should not be confused with the "orifice" which is sometimes specified for valves. The value for the orifice does not normally take account of the fact that the valve contains a number of throttles.

2) Qn is a measure of the valve flow capacity, with flow measured in litre per minute (l/min) at 6 bar(e) supply pressure and 1 bar pressure drop across the valve.

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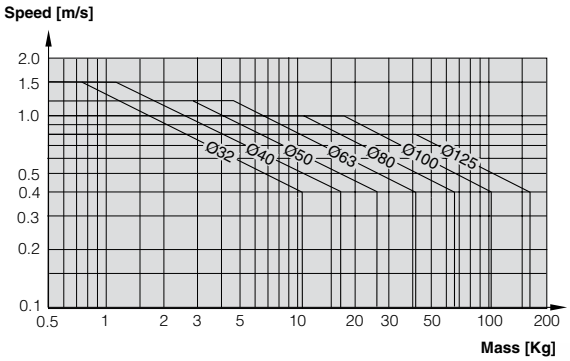
P1D SERIES - TECHNICAL DATA

Use as a Brake

The chart to the right shows the maximum values for speed and braking mass if the cylinder is used as a brake. The cylinder should not be exposed to additional compressive forces as this significantly reduces the external mass that can be braked.

We recommend systems in which the cylinder does not act as a motor during braking. Heat is generated if the brake is used frequently, and this must be taken into account to ensure that the maximum temperature is not exceeded.



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