

**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
 

|                   |            |            |
|-------------------|------------|------------|
|                   | <u>min</u> | <u>max</u> |
| 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<sup>1</sup>: 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

<sup>1</sup>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 <sup>2</sup> | Piston Rod |                      |             | Cushioning Length mm | Air Consumption <sup>1</sup> litre | Connection Thread | Theoretical Cylinder Forces at 6 Bar (N) <sup>2</sup> |                |
|-----------|-------------------------------|------------|----------------------|-------------|----------------------|------------------------------------|-------------------|---|----------------|
|           |                               | Dia. mm    | Area cm <sup>2</sup> | Male Thread |                      |                                    |                   | Extend Stroke   | 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) |         |       |                            |         |       | Total Mass (kg) Moving Components |                            |
|--------------------|-----------------|---------|-------|----------------------------|---------|-------|-----------------------------------|----------------------------|
|                    | 0mm Stroke      |         |       | Supplement per 10mm Stroke |         |       | at 0mm Stroke                     | Supplement per 10mm Stroke |
|                    | Standard        | Tie-Rod | Clean | Standard                   | Tie-Rod | Clean | All variants                      | 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

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S

032

M

C

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Continued on next page

| Piston Style    |                        |                       |
|-----------------|------------------------|-----------------------|
| Piston Material |                        |                       |
| Cushions        | Composite <sup>1</sup> | Aluminum <sup>2</sup> |
| None            | M                      | Y                     |
| Cush B/E        | — <sup>3</sup>         | 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 <sup>8</sup> |
| 200       | 200mm <sup>8</sup> |

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

| Cylinder Ports Front & Rear |                                      |
|-----------------------------|--------------------------------------|
| —                           | BSPP Ports (G Threads)               |
| E                           | NPTF Ports*                          |
| Q                           | BSPT Ports (R <sub>c</sub> Threads)* |

- \* Not available on Clean Version.

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

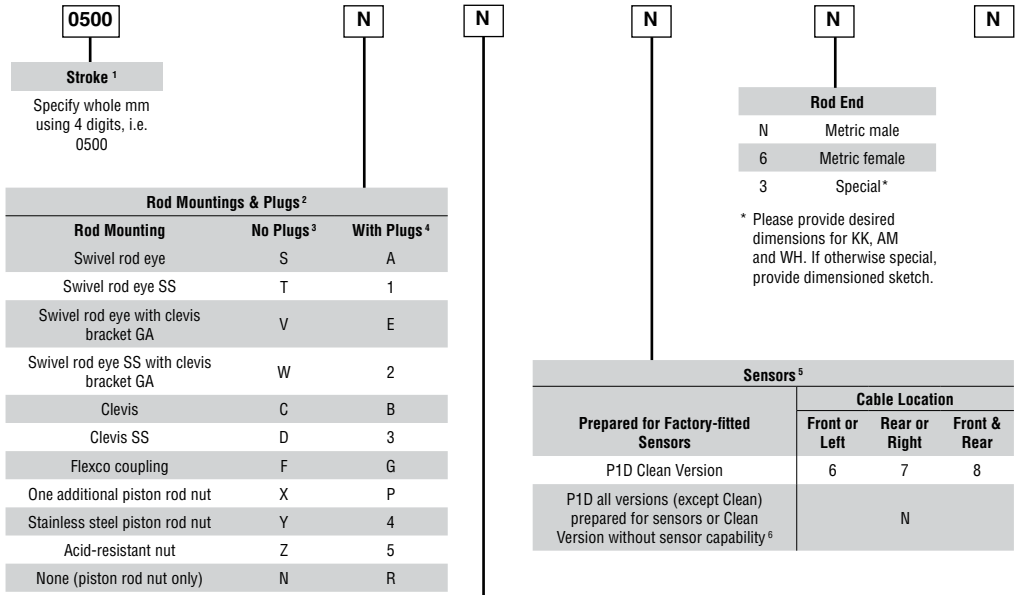
| Fastener Type                                 | Function        |               |            |        |
|---|-----------------|---------------|------------|--------|
|   | Rod Wiper Style | Double Acting | Double Rod | Tandem |
| Standard end cover screws                     | Std scraper     | M 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

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



**Notes:**

- 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).
- Please review Piston Rod Selection Chart in the Engineering Section to check for a rod buckling condition.
- Clean Version comes standard with plugs. Use this column when ordering Clean Version.
- Not available for 160-200mm bores.
- For sensor part numbers and specifications, please refer to Electronic Sensors section.
- 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.

**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 <sup>4</sup>       | H        | P           |
| Trunnion flange in rear end <sup>4</sup>        | J        | 8           |
| None (MX0)                                      | N        | 9           |

**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/m<sup>3</sup>, 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/m <sup>3</sup> ) | Max Pressure Dew Point (°F) | Max. Concentration (mg/m <sup>3</sup> ) |
| 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**

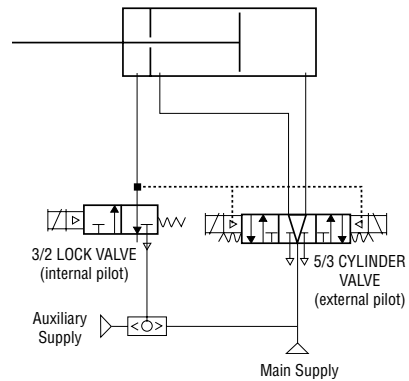
The signal air for the locking device can be obtained directly from a main air supply, or from the air supply serving the valve that controls the cylinder itself. For controlled ON/OFF operation of the locking device, a separate quick-venting valve is used.

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:**

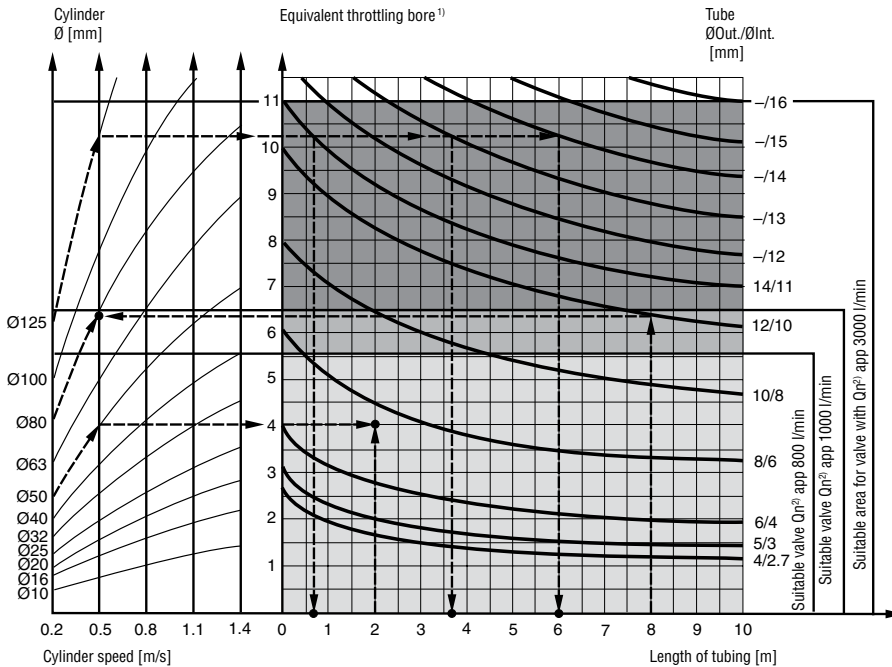
1. The primary line to the working valve could be over sized (this does not cause any extra air consumption and consequently does not create any extra costs in operation).
2. The tubes between the valve and the cylinder should, however, be optimized according to the principle that an insufficient bore 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.

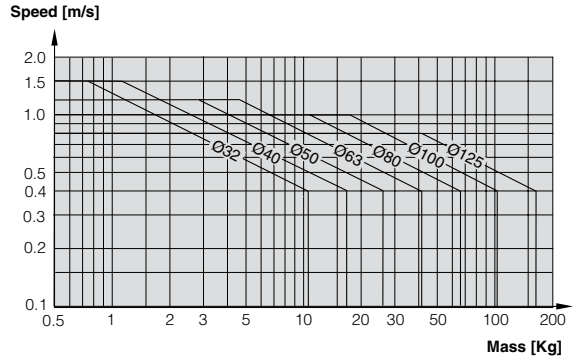
**PNEUMATIC CYLINDERS**

**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.



**ACCESSORIES**

**P1D SERIES - SEALING PLUGS**



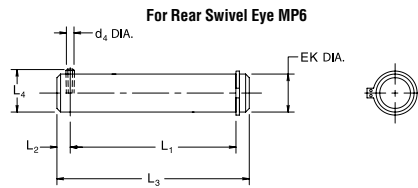
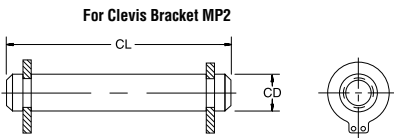
Set of sealing plugs to be fitted in unused end covers.  
 The plugs can be used for all P1D cylinders to avoid collecting dirt and fluids in the end cover screw recesses.

**Material:**  
 Polyamid PA  
 4 pcs per pack

| Part No.   | Bore (mm) |
|------------|-----------|
| 9121742201 | 32        |
| 9121742201 | 40        |
| 9121742202 | 50        |
| 9121742202 | 63        |
| 9121742203 | 80        |
| 9121742203 | 100       |
| 9121742204 | 125       |

**ACCESSORIES**

**P1D SERIES - PIVOT PIN SETS FOR 160-200mm BORE CYLINDER ACCESSORIES**



| Bore    | CD | CL     | Part No.   |
|---------|----|--------|------------|
| 160/200 | 30 | 170.50 | L075500160 |

| Bore    | EK | d4 | L1  | L2 | L3  | L4 | Part No.   |
|---------|----|----|-----|----|-----|----|------------|
| 160/200 | 35 | 6  | 119 | 7  | 131 | 41 | L075520160 |