



Rodless, magnetically coupled pneumatic cylinders

Operating instructions - English P1Z series

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
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1 Introduction to these operating instructions



These operating instructions must be read and observed by everyone who is charged with working on the P1Z, for example:

- Operating, including fitting, troubleshooting during operation, eliminating production shutdowns, maintaining, handling and disposing of hazardous substances (operating fluids).
- Maintenance (servicing, inspection).

In addition to the operating instructions and applicable accident prevention and environmental protection regulations, the acknowledged technical standards for safe and professional work must also be observed.

The operator is responsible for complying with the following:

- EN 89/655 (Minimum safety and health requirements for the use of work equipment ...), and any other national work safety regulations that might apply.
- The regulations contained in these operating instructions.

We reserve the right to make technical modifications.

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2 Safety



The operational safety of the P1Z is only guaranteed if it is used for the intended purpose. It is only assured if the P1Z is used:

- to move loads,
- to exert force.

The P1Z is operated with compressed air (other media on request). The following must also be taken into consideration:

- all of the conditions specified in the order confirmation, these operating instructions and the P1Z catalog.

All other uses are deemed to be **“Not for the intended purpose”**.

Failure to observe this instruction could result in the risk of injury or property damage. We accept no liability for such damages.

Operating personnel

The operator of the overall system must ensure that only authorized and qualified professional staff handle the P1Z. Authorized professional staff are the trained technicians working for the operator, the manufacturer and the service partner.

Safety-conscious work

The information contained in these operating instructions must be observed.

Not permitted: are unauthorized modifications to the P1Z, and work procedures that impair the safety of the P1Z.

Notes on “Magnets”

The P1Z cylinders contain strong magnets: do not use them in the vicinity of substances that are magnetizable or contain magnetic particles (such as steel swarf) that might attach themselves to the cylinders. This would cause the carriage to malfunction.

Keep any objects and appliances away from the cylinder if they are liable to suffer damage or malfunction as a result of the magnetic field.



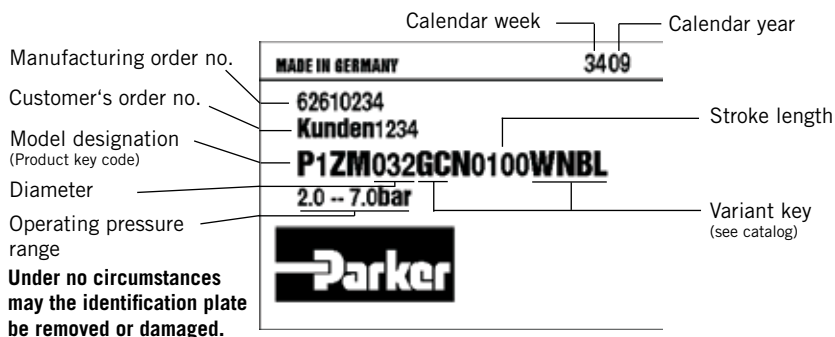
Explanation of symbols and notes

Notes that are marked with this symbol help to avert the risk of injury to life and limb. Make sure all users are aware of these notes.

| Symbol | Explanation |
|--------|---|
| | Caution: Safety-relevant sections of these operating instructions are marked with this symbol. |
| | Caution: Risk of crushing! |
| | Caution: Risk from strong magnetic field |
| | Information: Symbol for tips and notes for facilitating the use of the machine and for helping to avoid damages. |

The identification plate

You will find this identification plate on the carriage of the P1Z:



3 Description of the P1Z (basic model / with parallel rod guidance)

3.1 Technical data

| Piston diameter Ø [mm] | 16 | 20 | 25 | 32 | 40 | |
|--|--|----------------|-------|-------|------|------|
| Max. stroke length [mm] Basic | 1000 | 1500 | 2000 | 2000 | 2000 | |
| with parallel rod guidance | 750 | 1000 | 1500 | 1500 | 1500 | |
| Stroke tolerance [mm] up to 1000 mm | 0/+1.5 | | | | | |
| Stroke tolerance [mm] > 1000 mm | 0/+2 | | | | | |
| Temperature range [°C] | 0 up to 60 | | | | | |
| Operating medium | Filtered, dry compressed air, with or without oil (other media on request) | | | | | |
| Air port | M5 | G1/8 | G1/8 | G1/8 | G1/4 | |
| Magnetic pull-off force [N] | 157 | 236 | 383 | 703 | 942 | |
| Speed range [m/s] | Basic | 0.1 up to 1.3 | | | | |
| | Parallel rod guidance | 0.05 up to 0.4 | | | | |
| Min. operating pressure [bar] | Basic | 1.8 | | | | |
| | Parallel rod guidance | 2.3 | 2.0 | | | |
| Max. operating pressure [bar] | 6.5 | 7 | | | | |
| Damping length [mm] (basic model only) | 9 | 15 | 15 | 12 | 19 | |
| Weight [kg] | at 0 mm stroke Basic | 0.28 | 0.46 | 0.83 | 1.35 | 2.01 |
| | with parallel rod guidance | 0.9 | 1.52 | 1.7 | 3.63 | 5.44 |
| | per 100 mm stroke length Basic | 0.043 | 0.082 | 0.088 | 0.14 | 0.16 |
| | with parallel rod guidance | 0.2 | 0.33 | 0.42 | 0.53 | 0.86 |

Any other detailed information about

- Dimensions, space requirements, connecting dimensions,
- Forces, loads, speed and damping energy,
- and any additional details can be found in the **P1Z catalog**.

3.2 Function

- Alternating ventilation of the compressed air ports moves the piston back and forth in the barrel.
- Magnetic coupling transmits the force of the piston to the carriage.
- Loads are attached directly to the carriage /guide carriage.
- The cylinder is equipped with permanent grease lubrication.

Basic model only:

- The end cushioning is adjustable on both sides and is activated pneumatically.

Model with parallel rod guidance:

- The end position is limited by elastomer dampers / optional hydraulic shock absorbers.



IMPORTANT:

In the case of oil mist lubrication, the cylinder must be supplied with oil at all times during operation.

3.3 Application

The P1Z is intended for use in transporting weights (e.g. components).

3.4 Transport and storage

Appropriate packaging must be used for transportation and storage to protect against dirt, moisture and external forces.



Risk of injury.

Please bear the weight of the cylinder in mind when handling it.

4 Installation in a machine or system

All assembly and commissioning works must be performed by trained personnel!



Warning

Damages to the cylinder barrel will cause malfunctions.

4.1 Preparations

Prior to installation, please ensure that the use of the P1Z will not result in permissible limits for forces, moments and deviations (projecting edges) being exceeded.

The contact surfaces of the fixing points must be parallel and on an even plane.

During assembly, make sure that

- applicable regulations (e.g., DIN EN 983) are observed,
- the P1Z is not distorted during installation,
- all ports and operating components are within reach,
- the identification plate on the cylinder is legible.



The operator is responsible for eliminating any potential sources of risk between this cylinder and any original accessories supplied with it, and the customer's own equipment.

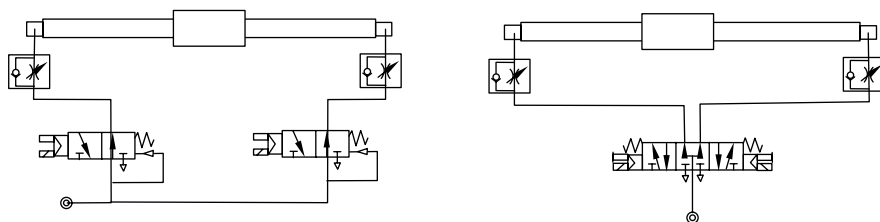
4.2 Installation (Basic model and model with parallel rod guidance)

4.2.1 Mechanical

- Make sure the payload is **only** fastened to the provided fixing points.
- Position the payload in such a way that the forces and tilting moments on the piston are below the limits specified in the **P1Z catalog**.
- Use appropriate coupling and connecting procedures to prevent any constraining forces from external linear loads.
- Observe the permissible weight and speed as specified in the damping diagram in the **P1Z catalog**. Compliance with these specifications is mandatory.

4.2.2 Pneumatic

Switching examples



- Use two 3/2 or one 5/3 directional control valve to control the cylinder. The normal setting is open.
- Avoid any uncontrolled movements when commissioning or unintentionally stopping the machine.
- Use filling units, soft-start valves, etc., from the range offered in our catalog.
- Use the control mechanism to ensure that the piston cannot move against a completely vented cylinder barrel.
- Use throttle check valves from the range in our catalog to set the speed. These valves are bolted directly into the cylinder.
- Make sure the compressed air ports are sufficiently large.
- Do not position magnetic switches close to ferritic parts or moving loads.

4.3 Lubrication

The P1Z is suitable for operation with **oil-free** compressed air.

Once they have been operated with oiled compressed air, the cylinders must continue to be operated with oiled compressed air.

4.4 End position limiting

Basic model:

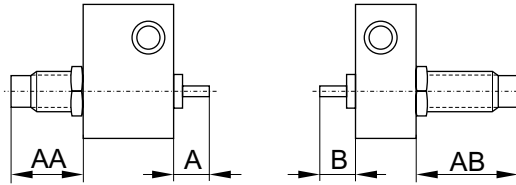
An adjustable damping screw is used to cushion the end position on both sides.

With parallel rod guidance:

The cylinder with parallel rod guidance can be operated either with elastomer dampers or hydraulic shock absorbers.

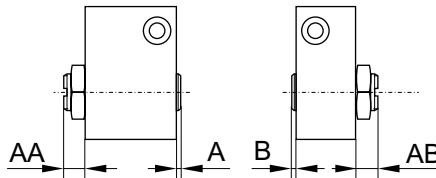
The dampers must be set in accordance with the illustration or table below.

Hydraulic shock absorbers



| | A _{min.} | A _{max.} | AA _{max.} | B _{min.} | B _{max.} | AB _{max.} |
|------|-------------------|-------------------|--------------------|-------------------|-------------------|--------------------|
| Ø 16 | 8.7 | 16 | 18 | 8.7 | 25 | 27 |
| Ø 20 | 15 | 43 | 47 | 15 | 52 | 55 |
| Ø 25 | 15 | 43 | 47 | 15 | 52 | 55 |
| Ø 32 | 23 | 61 | 56 | 23 | 69 | 66 |
| Ø 40 | 22 | 55 | 49 | 22 | 67 | 64 |

Elastomer dampers (rubber buffers)



| | A _{min.} | A _{max.} | AA _{max.} | B _{min.} | B _{max.} | AB _{max.} |
|------|-------------------|-------------------|--------------------|-------------------|-------------------|--------------------|
| Ø 16 | 2 | 10 | 13 | 2 | 10 | 13 |
| Ø 20 | 2 | 5 | 10 | 2 | 14 | 20 |
| Ø 25 | 2 | 5 | 10 | 2 | 14 | 20 |
| Ø 32 | 3.5 | 7 | 12 | 3,5 | 7 | 12 |
| Ø 40 | 2 | 6 | 11 | 2 | 5 | 11 |

5 Commissioning

All assembly and commissioning works must be performed by trained personnel!



Caution! Strong magnetic field!

There can be no guarantee that this field will not influence sensitive equipment in the vicinity, e.g., measuring equipment.

If the holding force between the two magnet stacks on the piston and carriage is exceeded, the two may separate. The cylinder will then no longer function (see Section 9.2 "Connecting the piston and carriage").

The magnetic pull-off forces for the individual diameters are as follows:

| | | | | | |
|--------------------|-----|-----|-----|-----|-----|
| Diameter [mm] | Ø16 | Ø20 | Ø25 | Ø32 | Ø40 |
| Magnetic force [N] | 157 | 236 | 383 | 703 | 942 |

When using the equipment for a specific application, make very sure that these forces are not exceeded.



Risk of crushing.

Linear actuation can produce rapid and forceful linear movements. This can injure or crush limbs, or cause damages as a result of collisions with other parts of the system.



Checks that must be performed prior to commissioning:

- Can covers and/or safety guards effectively prevent anyone from reaching into the moving parts of the cylinder?
- Can the carriage be manually moved over the entire length of travel? Identify and eliminate any possible areas of collision and check the functioning of position detection solenoids.

End cushioning on basic model cylinders

- Move the carriage to the center position and fully tighten both end cushioning screws. Then loosen by about half a turn.

End cushioning on cylinders with parallel rod guidance

See Section 4.4



Warning, automatic movement!

- **Slowly vent** both cylinder barrels.
- Bleed at one end; the piston moves to an end position.
- Start the overall test run.
- Use the throttle check valve to set the speed.
- Use the damping screw to set the end cushioning.
The setting of the end cushioning must ensure that the cylinder operates without jolting or vibrating.

6 Decommissioning



Risks arising after the P1Z and/or the entire system have been shut down

Pressure may still be present in the cylinder, in spite of venting. This can cause uncontrolled movements of the piston.

Consult the operating instructions for the entire system.

7 Maintenance / Service



Caution

Maintenance and repair works may only be performed by trained or instructed personnel!



Risk of crushing

Maintenance works may only be performed once the machine has been switched off and the compressed air system has been vented.

Preparation

- Turn off the main switch and make sure it cannot be unintentionally switched on again.
- Dismantle the necessary parts to ensure the free movement of the carriage. If necessary, completely dismantle the cylinder.

7.1 Cleaning and lubrication

Only use gentle agents and non-linting cloths to clean the cylinder.

Do not use high-pressure washers!

Basic model:

- P1Z-S16, 20, 32 cylinder:
Clean and lubricate the entire outside of the cylinder barrel using lithium paste-based grease.
- P1Z-S25, 40 cylinder
Clean the cylinder barrel and grease the lubricating nipples on the carriage until you see fresh grease.
Use lithium paste-based grease.

Cylinder with parallel rod guidance:

- Use the same lubrication procedure as for the basic model cylinder.
The guide rods and friction bushes do not need lubricating.

7.2 Maintenance intervals

Recommended lubrication intervals: **every 500 km.**

Please bear in mind that shorter lubrication intervals are necessary if:

- the temperature loads are higher,
- the cylinder is very soiled,
- the cylinder is positioned close to grease-dissolving liquids or vapors.



Please also consult the operating instructions for the entire system!

8 Disposal



Compliance with the regulations and laws governing the disposal of environmentally harmful substances is absolutely mandatory.

9 Repairs

Please avail yourself of our repair service if your P1Z requires repairs.

9.1 Troubleshooting

| Malfunction | Possible cause | Help |
|---|---|---|
| Uneven movement of the carriage. | Lack of lubrication. | Check lubrication, lubricate. |
| | Incorrect use of the throttle check valve. | Always throttle the outlet air. |
| | Soiled cylinder barrel. | Clean, lubricate, use cover. |
| | Damaged cylinder barrel. | Contact Parker. |
| Carriage does not travel to end position. | End cushioning damping screw tightened to the full. | Loosen the damping screw slightly. |
| | Magnetic coupling interrupted. | Press the carriage firmly against the repulsion force into the end position until the piston and carriage re-engage (see also following section). |

9.2 Connecting pistons and carriages

Aligning the piston and carriage if they separate

If the piston and carriage separate, e.g., because of a load blockage, they can be realigned as follows:

1. Depressurize the cylinder. Lock the entire cylinder.
2. Make sure the cylinder is horizontal, then push the inside piston with the carriage to the end of the piston. (The carriage pushes the piston ahead of it.)
3. Push the carriage back to the other end of the cylinder.



Caution:

When performing the next steps, keep a safe distance away from the cylinder: Risk of injury.

Do not push the carriage manually onto the piston. Risk of injury.

Do not stand in the extended direction of travel of the piston.

Do not damage the outer surface of the cylinder barrel!

4. Apply compressed air to the side at which the piston is located. Use the maximum pressure of 7 bar that is permitted for these cylinders.

The piston is accelerated and pushed into the carriage.

5. Depressurize the cylinder.

6. Test:
Push the cylinder (and – with it – the piston) first to one end position of the cylinder and then to the other. In both cases, the distance from the center of the carriage to the respective end plate must be the same.
If the carriage is **asymmetrical** on the piston, the carriage must be pushed to that end of the cylinder where the distance to the end plate is smaller.
7. Then push the carriage back approx. 5 mm and lock it into position.
(Clamp or use a spacer to the end plate.)
8. Still observing the safe distance, apply pressure once more (see point 4) to the side of the cylinder that is not facing the carriage.
9. Again check for correct alignment, as described in point 6).
If the carriage and piston cannot be aligned using this method, the entire cylinder must be sent in for repair.
10. If the carriage is centered on the piston, the cylinder can be put back into service once it has been carefully checked for damages.

9.3 Dismantling from the system

Risk of crushing

Particular care is needed when dismantling the P1Z. Read Section 2, page 4 “Safety”, and observe local safety regulations.



Potential risks:

Residual pressure in the lines and control elements

- Slowly depressurize the cylinder/system to eliminate any residual pressure in the lines and control elements.

Sharp edges

- Protective gloves must be worn to prevent injuries from sharp edges.

Piston movement

- The cylinder/system must be vented slowly to prevent any uncontrolled movement of the piston.



When installed vertically or at an angle, the piston must be moved to the lower end position prior to venting to avert the risk of it falling.

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