

Operating Instructions for Buffers type LPSA for inclined elevators

1 Scope of application

The inclined elevator buffer of type LPSA is a hydraulic buffer which has been specially designed for the application in inclined elevators. A separate equalizing reservoir enables the use for all runway inclinations from horizontal to vertical with upward pointing piston rod and facilitates the oil level check. The big oil supply permits the operational start-up of the buffer and reduces the maintenance expenditure. The design is based on the approved Henning elevator buffers of the production series LP having the design type approval according to EN 81-1/2.

2 Functional description

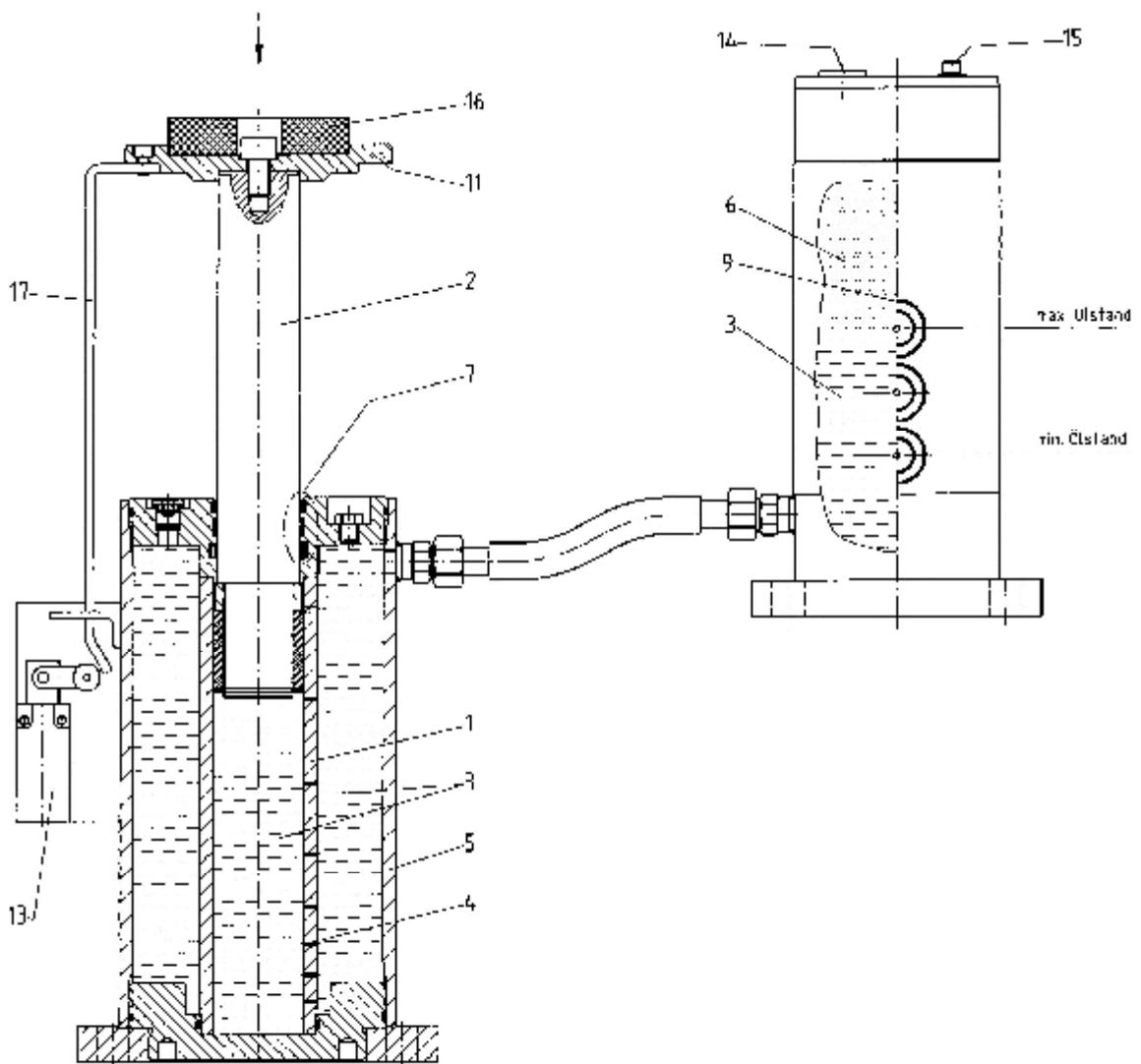


Figure 1: Buffer LPSA with equalizing reservoir

In the case of a buffer stroke the piston rod **2** is forced into the cylinder tube **1** and the hydraulic fluid **3** in the tube is displaced and forced to the outside through small throttling ports **4** in the tube wall. The fluid accumulates within the jacket tube **5** and then overflows through the hose line **30** into the equalizing reservoir **20**. There, the gas volume **6** above the stored hydraulic oil is further compressed. The sealing system **7** maintains a reliable seal between the hard chromium-plated piston rod and the atmosphere.

After the buffer stroke and return to hydraulic balance the compressed gas volume forces the displaced fluid back into the cylinder and extends the piston rod.

The level of the hydraulic fluid with extended piston rod can be read at any time through the sight glasses **9** of the equalizing reservoirs. For this purpose, the opening of the reservoir is not required.

An elastic impact plate **16** damps the impact and reduces the noise. The limit switch **13** monitors the extended ready position of the buffer. The limit switch is actuated by pressure on the piston rod by the linear slide **17**.

3 General instructions

If people are working in the elevator shaft a suitable refuge must be ensured.

For this purpose the general safety instructions of the elevator manufacturer have to be observed.

	Warning! Buffers are safety devices. Mounting, inspection and maintenance work may only be carried out by expert personnel! Observe the applicable safety instructions!
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4 Preparations

Among the data on the buffer type plate there is included:

- Piston diameter and stroke
- Minimum mass,
- Maximum mass and
- Rated speed of car and
- Inclination angle of the runway

The first check should be to ensure that the operating conditions of the inclined elevator do not exceed the design data of the buffer.

The installation location should be in a clean and dry condition. The ambient temperature should be between 5 °C and 50 °C. In the case of operating conditions outside of this range, please contact Henning GmbH.

Verify the mounting place of the buffer and the bearing capacity of the mounting surface. For the equalizing reservoir a horizontal mounting surface is required.

5 Mounting

The buffer is supplied with oil charge, while the equalization reservoir is not filled in the condition at time of supply.

Fastening material, hoses or connection lines, do not belong to the scope of delivery and should be ordered separately.

!	Safety Instruction: Prior to all mounting and maintenance work, an appropriate measure to prevent automatic switching on or automatic start-up of the drive must be in place!
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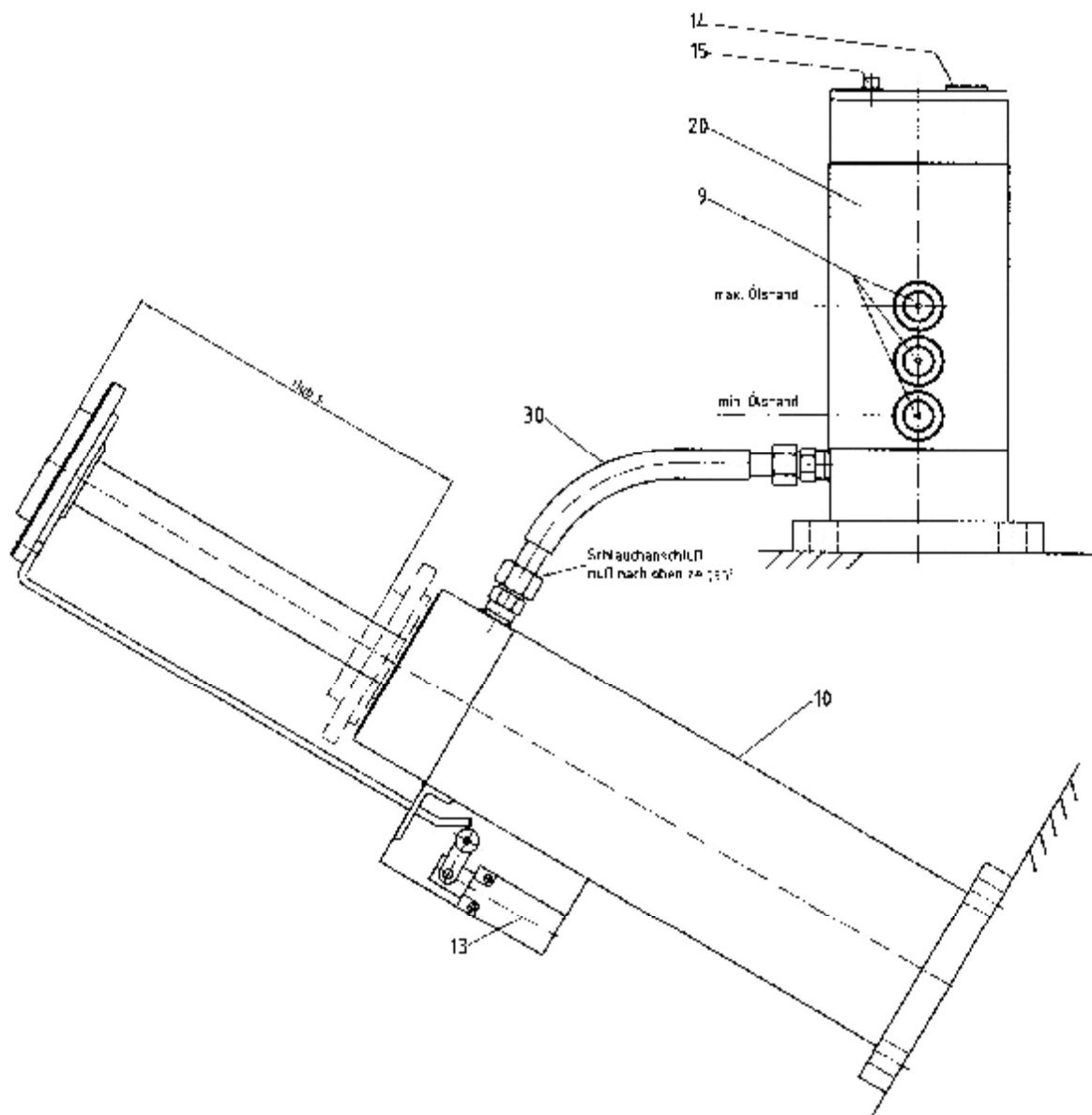


Figure 2: Mounting arrangement

5.1 Mounting of the buffer

- The buffer should be fixed and aligned, e. g. with the help of consoles, in such a way that the piston rod runs exactly in the direction of travel and parallel to the rails.
- Only those mounting positions are admissible in which the piston rod runs horizontally or points upward (see figure 2).
- The connection for the connection line should be on the upper side of the buffer (see figure 2).
- The use of 4 screws M 16 is recommended.

5.2 Mounting of the equalization reservoir

- The mounting point for the equalization reservoir **20** should be chosen at a height that the connection line from the buffer to the equalization reservoir can be as short as possible and is continuously rising.
- The line length should not exceed 1.25 m.
- The equalizing reservoir should be easily accessible for an oil level check (visual inspection).
- The equalizing reservoir must be fixed on a suitable console using 4 screws M 16.

5.3 Mounting of the connection line

- The connection line **30** from the buffer to the equalizing reservoir can be carried out as a rigid line, a hose pipe or as a combination. Only use the hose pipe supplied by the manufacturer. Furthermore, the following demands have to be met:
 - admissible operating pressure min. 75 bar
 - maximum line length 1.25 m
 - continuously rising routing from the buffer to the reservoir.
- Connect the line to the end fitting of the equalizing reservoir.
- Remove the pipe plug from the line connection of the buffer and attach the connection line at this point.

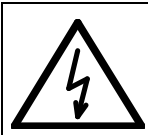
Note:

If the buffer has been delivered with a pre-assembled hose pipe, all hose connections must be tightened after the alignment of the hose.

5.4 Filling of the equalizing reservoir

- Check whether the piston rod of the buffer is completely extended.
- Remove the oil inlet screw **14**.
- Fill-in hydraulic oil type HLP ISO VG 46 DIN 51524, until the oil level reaches the maximum marker (centre of the upper sight glass).
- Press-in the piston rod several times by hand. This permits transport-caused air bubbles to escape from the hydraulic fluid. Subsequently, the piston rod must be completely extended and the oil level correct.
- Close the oil inlet screw **14**.
- Remove the valve cap of the gas filling valve **15**.
- Inflate the equalizing reservoir with compressed air or nitrogen, filling pressure 5 bar. Do not exceed the filling pressure! All commercial filling devices suitable for automobile tire valves VG8 can be used.
- Now the piston rod of the buffer must be completely extended.
- Screw-on the valve cap.
- Under no circumstances fill-in oxygen or combustible gases such as propane or acetylene!
- Finally check the gas filling valve **15** and the oil inlet screw **14** with leak detection spray or soap water for gas tightness.

5.5 Electric connection



Dangerous Voltage!
During connection work the installation must be de-energised!

Carry out the electric connection to the limit switch **13** (Figure 2). During wiring the working

range of the linear slide **17** must be observed.

6 Commissioning



Safety Instruction:
During buffer testing no persons are allowed to stay in the elevator shaft!

1. Verify the extended position of the piston rod and the oil level. Press-in the piston rod 2 – 3 times manually as far as possible in order to pump the air remaining in the connection line into the equalizing reservoir. Once more check the oil level.
 2. Check all connections for leakages.
 3. Carry out a first buffer test with reduced speed and without additional load.
 4. Verify the electrical signal of limit switch **13**.
 5. Wait for approx. 1 - 2 minutes and then relieve the buffer.
 6. Verify the extended position of the piston rod and the oil level. Check the buffer and the impact point for possible damage and oil leaks.
 7. If no defects are found, carry out a second buffer test. This test should be carried out, if possible, with rated speed and maximum load.
 8. Repeat points 5 and 6.
- If no defects are found, the buffer is ready for operation.

7. Regular inspections

During regular inspections of the elevator installation or for trouble shooting the following

verifications are possible for which all the a/m safety instructions must be observed:

7.1 Inspection of the extended piston rod

The completely extended piston rod can be recognized by the following characteristic features:

- The limit switch **13** is not actuated.
- The visible part of the piston rod is as long as its stroke (see indication on the type plate).

7.2 Oil level check

The equalizing reservoir **20** of the inclined elevator buffers type LPSA is equipped with sight glasses for the oil level check. For this purpose, the opening of the buffer or reservoir is not required! The oil must only be checked, if the piston rod is fully extended (see a/m inspection point). The oil level must be visible in the sight glasses **9** and is checked as shown in figure 3:

- in the case of minimum oil level the level is visible in the centre of the lower sight glass,
- in the case of maximum oil level the level is visible in the centre of the upper sight glass.

The oil level is temperature-dependent. For ambient temperatures near the freezing point the oil level can go down near to the minimum level. High ambient temperatures lead to a rising oil level.

If during the oil level check the oil level is found to be too high, air bubbles might be in the oil. In this case first press in the (upright standing) buffer several times as far as possible. If the oil level is not falling although the piston rod is

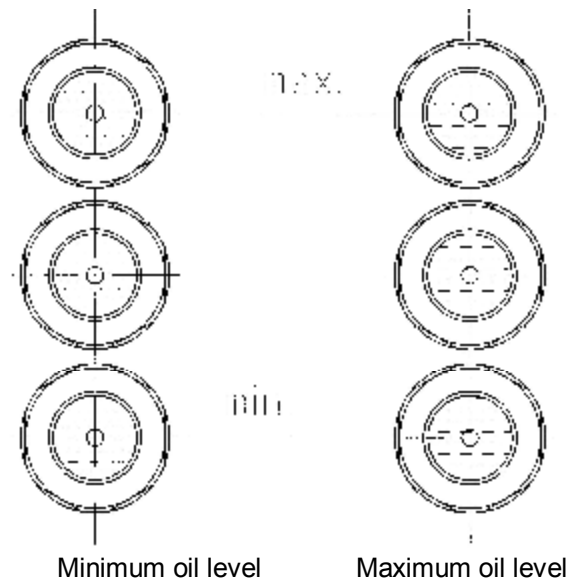


Figure 3: Oil level indication

fully extended, oil must be removed. If the oil level is too low, oil must be added (see point 8.3 "Correction of the oil level"). In this case check the buffer for leakage.

7.3 Gas pressure check

For resetting the piston rod after a buffer stroke the buffer is filled with compressed air or nitrogen. The gas pressure at extended piston rod is 5 bar.

The gas pressure may be checked without using a measuring instrument. For this purpose press

the piston rod by hand for some centimetres. If the piston rod then returns automatically to its initial position, the gas pressure is sufficient. Otherwise proceed as described under point 8.4 "Gas refilling".

7.4 General visual inspection

Pay attention to oil spots on the floor or on the buffer. An oil film on the piston rod **2** is normal and harmless.

Check the piston rod surface for damage and tightly adherent contaminations.

Check the state and function of the limit switch **13**.

If leaks or damage is found, the buffer must be exchanged or repaired by skilled personnel.


8 Maintenance

Under normal operating conditions the elevator buffer LP does not require maintenance. However, if during the a/m checks defects are

detected, these can be removed as described in the following.

8.1 Preparations

During any maintenance work you should take safety measures against unintentional start-up of the elevator.

	<p>Warning! The buffer and the equalization reservoir are pressurised. Prior to opening the components and for oil refilling the pressure must be released!</p>
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8.2 Relieving gas pressure

- Remove the valve cap from the gas filling valve 15 of the equalizing reservoir.
- Press in the valve cone with a pointed object and let the gas escape.

Note regarding disassembly work:
For this purpose the equalizing reservoir should be in the upright position (valve points upward), in order to avoid oil escape.

8.3 Correction of the oil level

- Remove the oil filling screw **14** from the equalizing reservoir after having relieved the gas pressure.
- Refill hydraulic oil of the type HLP ISO VG 46 DIN 51524 until the oil level is in the centre of the sight glass. If the oil level is too high, oil must be removed.
- The limit values of the oil level shown in figure 3 should absolutely be observed. The correct oil level is only indicated if the piston rod is fully extended. In the case of too high

an oil level there is a danger that the buffer becomes overloaded during buffer stroke. If the oil level is too low, the damping effect of the buffer may be reduced.

- Then replace the oil filling screw **14** making sure a new copper sealing ring A 21x26 x 1.5 DIN 7603 is used.
- Subsequently refill gas.

8.4 Gas refilling

- Pump up the equalizing reservoir with compressed air or nitrogen, filling pressure 5 bar. Do not exceed the filling pressure! All commercial filling devices suitable for automobile tire valves VG8 can be used.
- Now the piston rod of the buffer must be completely extended.
- Screw-on the valve cap.

- Under no circumstances fill-in oxygen or combustible gases such as propane or acetylene!
- Finally check the gas filling valve **15** and the oil inlet screw **14** with leak detection spray or soap water for gas tightness.

9 Measures during operation

9.1 What is to be done after a buffer stroke?

During normal elevator service the buffers for inclined elevators are only started with reduced speed and only partially pressed-in. Therefore, a buffer stroke is regularly the result of an operation failure.

After release of the buffer and the signalling of the piston rod reset (limit switch **13**), as a rule, the elevator is again ready for operation. Nevertheless, we recommend a visual inspection of the buffer and the elevator.

9.2 What is to be done, if oil leakage is detected?

Search for the location of oil leak. If leaking oil is visible and the leak cannot be stopped, the buffer should be exchanged immediately. In the case of small leaks the buffer may remain in use. At first check the oil level of the buffer. If the oil level is below the minimum (Fig. 3), refill oil (see chapter 8). Subsequently, the buffer should be checked at shorter intervals.

In the case of any doubt regarding the state of the buffer, it should be exchanged. For this purpose Henning offers a repair/exchange service for buffers. Leaked oil should be absorbed using oil binder or cleaning rags.

9.3 What is to be done in the case of too low an oil level?

Check the buffer for leakages. If no leaks are found, oil should be refilled (see chapter 8).

If oil is leaking, proceed as described in chapter 9.2.

9.4 What is to be done in the case of too high an oil level?

Too high an oil level can only occur if too large a quantity of oil has been refilled. Follow the instructions under point 7.2 "Oil level check".

Make sure that the piston rod is entirely extended. If oil must be removed, follow chapter 8.

9.5 What is to be done, if the piston rod will no longer fully extend?

Refill compressed air or nitrogen as described under point 8.4. Check the buffer, the equalizing reservoir and the connection line with leak detection spray or

soap water for possible gas leakage. If the problem still exists, the buffer should be exchanged or repaired by skilled personnel.

9.6 What is to be done, if the piston rod is damaged?

Damaged or bent piston rods impair the functional safety of the buffer. Such buffers

should be exchanged or repaired by skilled personnel.

10 Service

For ordering replacement parts, please, contact our Service Department.

Henning GmbH offers elevator buffers as repair/exchange. These buffers can be supplied in a short time, have been overhauled in our works and are supplied with full manufacturer's guaranty.

The following buffer-specific data is always required (see type plate):

- Buffer type
- Serial number
- Maximum and minimum impact mass
- Nominal travel speed
- Inclination angle of the rail system

11 Recycling

At the end of its operational life the buffer can be recycled as follows:

- Relieve the gas pressure as described under point 8.2.
- Completely drain the buffer and the equalizing reservoir. The hydraulic oil should be given into the system of recycling of used oil.

- Dispose of the buffer and equalizing reservoir as scrap iron.