

Hydraulic Buffer Type LPSA For Inclined Lifts

1 Range Of Application

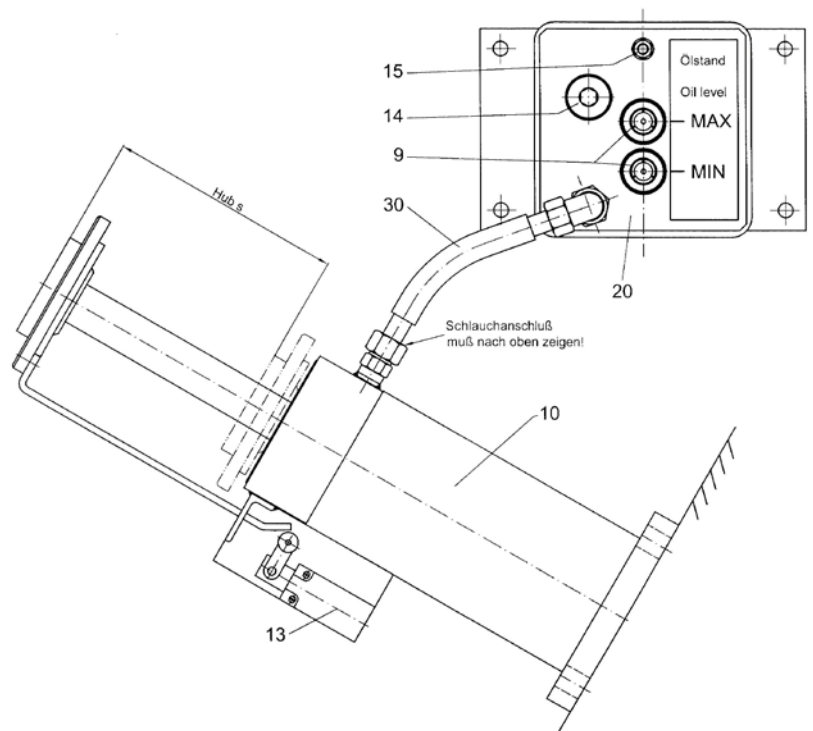
This buffer type LPSA make Henning GmbH is a hydraulic buffer designed particularly for the use in inclined lifts with nominal speeds ranging between **0,5 m/s** and **1,6 m/s**.

Thanks to its separate hydraulic oil reservoir it can be applied for every inclination angle from horizontal to vertical (with plunger pointing upwards) and it facilitates checking the oil level. The high volume of oil available facilitates operation of the buffer and reduces maintenance expenditure.

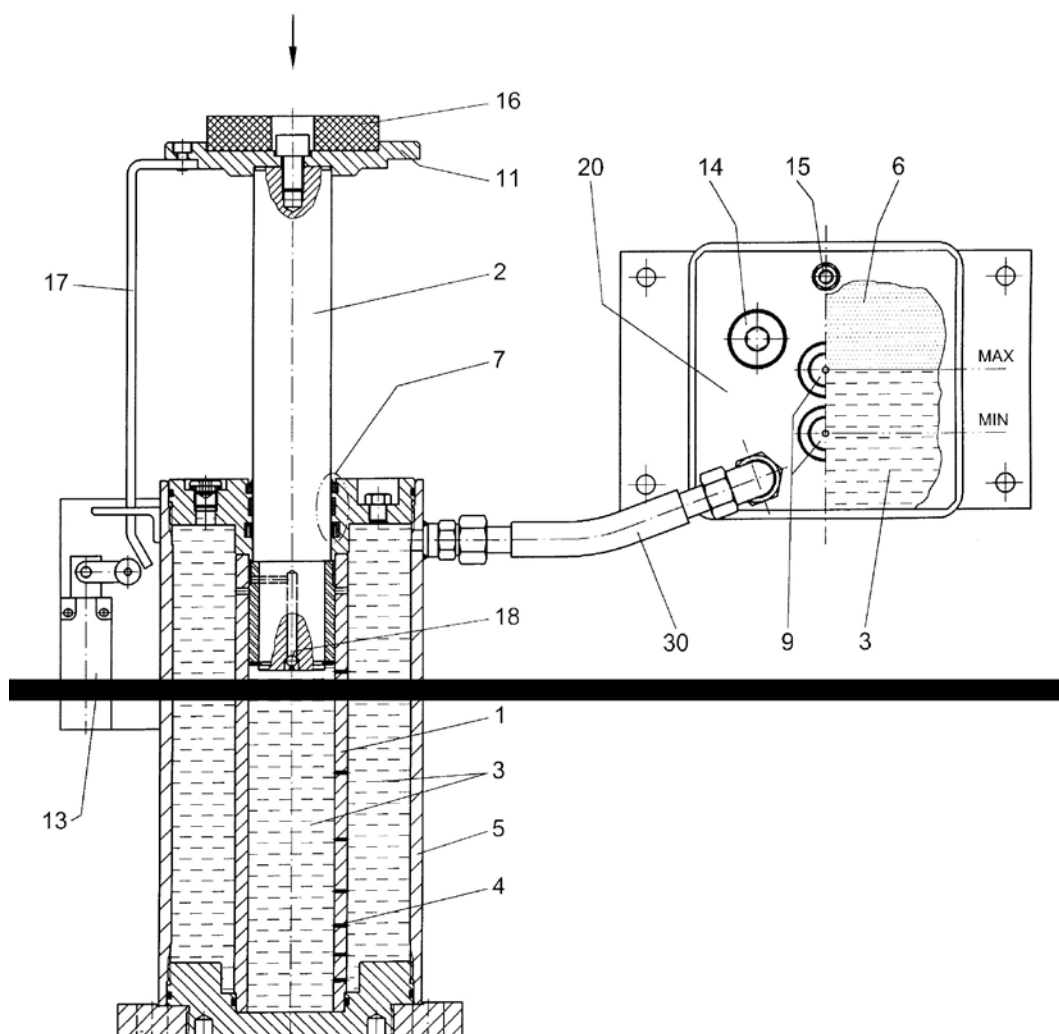
Design of the buffer type LPSA is based on that of the proven and according to EN 81-1/2 type-examined Henning LP-series of lift-buffers, whereas type-examination of the LPSA-buffers has meanwhile been applied for as well.

With their modern design, LPSA buffers offer many advantages for the present-day lift industry:

- The buffer-system is hermetically sealed. That is why the buffers can be delivered filled with oil and transported and stored in every position whatsoever.
- Oil-level can be checked from outside at sightglass 9 of reservoir 20. There is no need to open the buffer (visual inspection). This will reduce maintenance-expenditure to a minimum.
- The mechanical safety limit switch 13 complying with DIN EN 50047 monitors the extended piston rod of the buffer.
- Hydraulic damping enables optimization of the slowdown within a large mass range of inclined lift systems, as well as a substantial absorption of energy.
- Operational safety is high thanks to the leakage-protection by the double sealing of the oil-reservoir.
- The inbuilt gas spring is maintenance-free. It enables low-noise dashing onto the buffer and low resetting forces after a dash.
- A rubber pad absorbs the sounds and impact of dashing.



2 Functional Characteristics



Picture 1: Buffer LPSA With Oil-Reservoir

A dash on the buffer presses the piston rod **2** into the cylinder liner **1** and the hydraulic oil **3** contained therein is exhausted through a small flow-control hole **4** in the liner wall. The exhausted hydraulic oil aggregates in the cylinder's jacket tube **5** and from there flows through the hose **30** into the oil reservoir **20** thus further densifying the gas volume **6** contained there on top of the oil. The sealing system **7** reliably tightens the hardchrome-plated piston rod.

After release of the buffer the compressed gas-volume presses the exhausted oil back into the cylinder liner and extends the piston rod again. Simultaneously, valve **18** opens an additional flow-back line in order to expedite reset to the original position.

The hydraulic oil level in being with the piston rod extended can be checked at the sight-glasses **9** of the oil-reservoir at any time. There is no need to open the reservoir.

An elastic pad **16** damps the impact and reduces the sounds of the dash. Limit switch **13** monitors the extended standby position of the buffers. It will be activated by switching bracket **17** when the piston rod is pressed down.

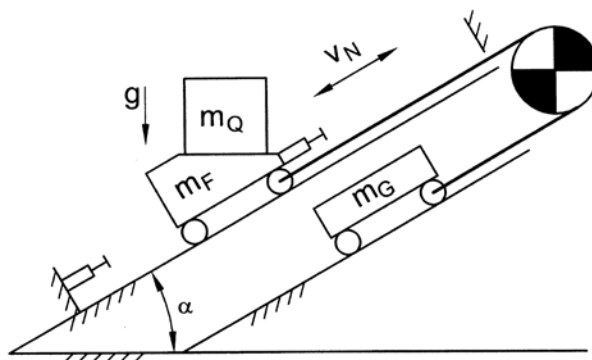
Attention: Make sure that hose line **30** connecting the buffer to the reservoir lays upwards.

3 How To Select And Check The Buffer

The buffer for inclined lifts, type LPSA, can be used in every inclined lift both in the bottom and top end position, and that for any inclination angle of the runway.

To select the appropriate buffer you will need the following information on the characteristics of your inclined lift system:

nominal speed v_N [m/s]
 mass of car m_F [kg]
 nominal load capacity m_Q [kg]
 mass of counterweight m_G [kg]
 inclination angle of runway α [°]



3.1 Selection According To Table

The following table will give you a view of the range of application of buffers type LPSA for inclined lifts for the bottom end position of the runway of inclined lifts. The minimum and maximum admissible mass of the car m_F resp. $m_F + m_Q$ in that case depend on the nominal speed v_N and the inclination angle α of the runway.

LPSA 40 x 175						
Nominal speed	v_N		0,5 m/s		1,0 m/s	
equivalent mass min. / max.	m_e		1.800 kg	25.000 kg	1.900 kg	9.000 kg
min. and max. mass in dependence of inclination angle of runway	α	0 °	1.800 kg	25.000 kg	1.900 kg	9.000 kg
		20 °	395 kg	5.492 kg	1.006 kg	4.767 kg
		25 °	334 kg	4.639 kg	906 kg	4.291 kg
		30 °	291 kg	4.037 kg	827 kg	3.916 kg
		35 °	259 kg	3.594 kg	763 kg	3.616 kg
		45 °	216 kg	2.996 kg	670 kg	3.174 kg
		60 °	180 kg	2.502 kg	585 kg	2.771 kg
90 °	158 kg	2.196 kg	528 kg	2.503 kg		
Absorption of energy max.	Eges			4.133 Nm		5.951 Nm

LPSA 40 x 430						
Nominal speed	v_N		1,2 m/s		1,6 m/s	
equivalent mass min. / max.	m_e		2.000 kg	11.500 kg	2.400 kg	8.600 kg
min. and max. mass in dependence of inclination angle of runway	α	0 °	2.000 kg	11.500 kg	2.400 kg	8.600 kg
		20 °	795 kg	4.572 kg	1.296 kg	4.643 kg
		25 °	696 kg	4.004 kg	1.169 kg	4.189 kg
		30 °	622 kg	3.577 kg	1.069 kg	3.829 kg
		35 °	565 kg	3.248 kg	988 kg	3.540 kg
		45 °	484 kg	2.783 kg	869 kg	3.114 kg
		60 °	414 kg	2.378 kg	760 kg	2.723 kg
90 °	368 kg	2.118 kg	687 kg	2.463 kg		
Absorption of energy max.	Eges			10.950 Nm		14.558 Nm

Attention:

If the masses of the inclined lift in question are higher than those stated in the above-mentioned table, you can install more than one buffer in parallel. In case you install two buffers in parallel, the masses m_F , m_Q and m_G are splitted 50/50 by the two buffers.

Given that the characteristics of the inclined lift in question do not at all range within the table, even though more than one buffer are to be used, please contact our engineering service.

It is impossible to compile such tables for buffers at the top end position of the runway, due to the additional influence of the counterweight. By experience we can say that the equivalent mass m_e for buffers at the top end position will for all load situations be in between the minimum and maximum values of the bottom end position. Therefore, you can beforehand suppose that a buffer suitable for the bottom end position will also suit the top end position.

3.2 How To Calculate Equivalent Masses

Equivalent mass m_e is to be regarded at as a characteristic value for the whole system, computed from the kinetic and potential energy of the system in dependence from the nominal speed. Dashing speed onto the buffer is supposed to be 115% of the nominal speed.

The equivalent masses of the empty and of the fully loaded car are to be calculated as follows, both for the buffers in the bottom and the top end position, and that by applying two different formulas:

a) bottom end position

$$m_e = m \cdot \left(1 + 1,51 \cdot \frac{g \cdot s \cdot \sin \alpha}{v_N^2} \right)$$

$$g = 9,81 \text{ m/s}^2$$

$$s = \text{buffer travel [m]}$$

whereas:

empty car

$$m = m_F \text{ [kg]}$$

fully loaded car

$$m = m_F + m_Q \text{ [kg]}$$

b) top end position

$$m_e = m \cdot \left(1 - 1,51 \cdot \frac{g \cdot s \cdot \sin \alpha}{v_N^2} \right) + m_G \cdot \left(1 + 1,51 \cdot \frac{g \cdot s \cdot \sin \alpha}{v_N^2} \right)$$

$$g = 9,81 \text{ m/s}^2$$

$$s = \text{buffer travel [m]}$$

whereas:

empty car

$$m = m_F \text{ [kg]}$$

fully loaded car

$$m = m_F + m_Q \text{ [kg]}$$

3.3 Performance Characteristics

Now match your results with the admissible loads of the following table of performance characteristics.

Type	Travel s [m]	Nominal speed v_N [m/s]	equivalent mass		max. energy absorption E_{max} [kJ]	max. buffer- power $F_P max$ [kN]	Article- Nr.	Weight [kg] *)
			$m_e min$ [kg]	$m_e max$ [kg]				
LPSA 40 x 175	0,175	0,5	1800	25000	4,15	60	240177	29
		1,0	1900	9000	5,95			
LPSA 40 x 430	0,430	1,2	2000	11500	10,95	60	240432	42
		1,6	2400	8600	14,56			

*) including reservoir

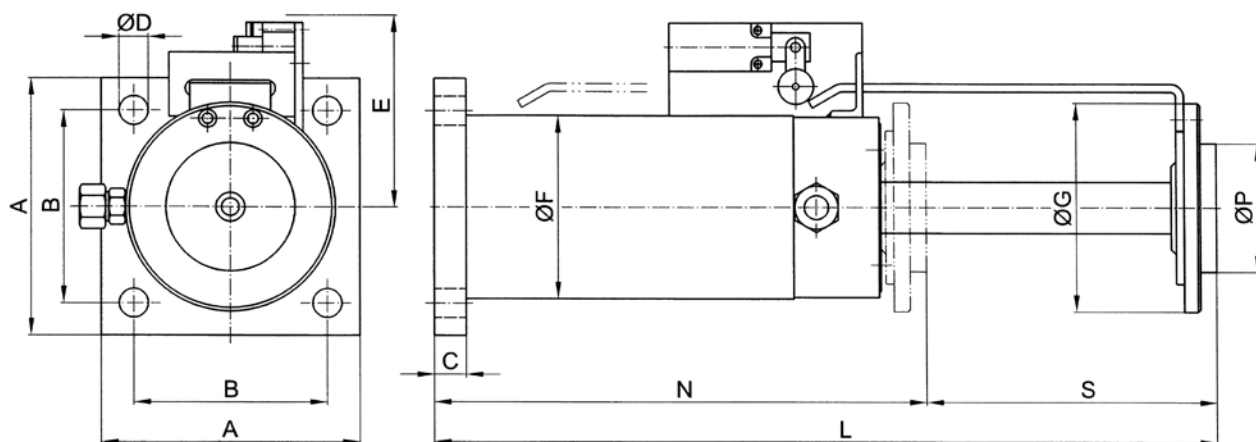
Given that your characteristics of application do not range within the characteristics of this table, even though more than one buffer are to be applied, please contact our engineering service.

It is possible to use the buffer with lower nominal speeds. It is however not admissible to use it with higher nominal speeds as otherwise the resulting slowdown could be inadmissibly high.

For nominal speeds in between the values stated in the table, you can determine the according admissible equivalent masses by linear interpolation.

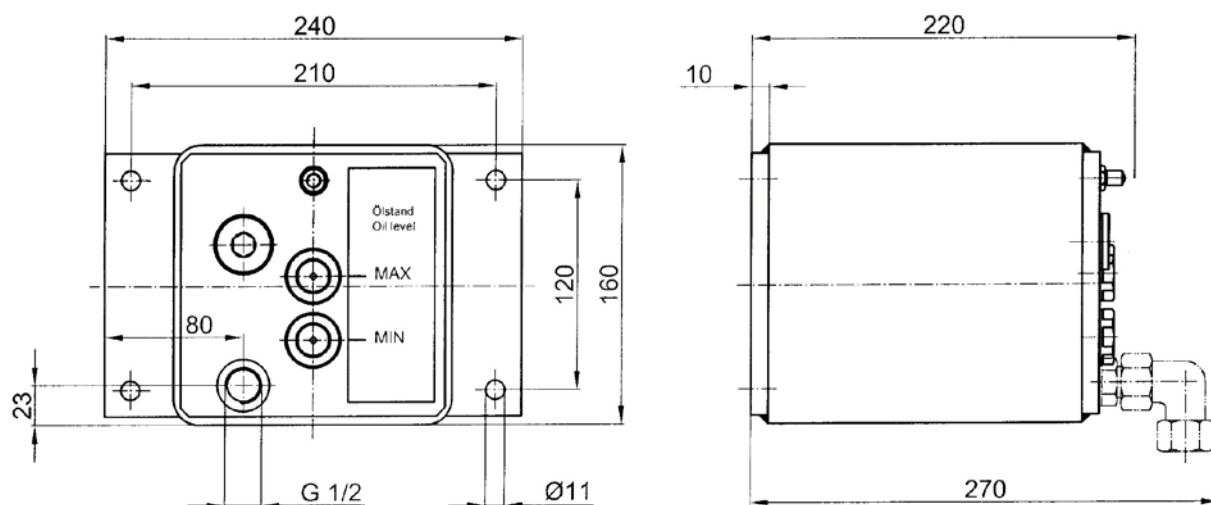
The standard execution is admitted for environmental temperatures between +5 °C and +50 °C. For deviating temperatures please inquire.

4 Dimensions



Type	S	L	N	A	B	C	D	E	F	G	P
LPSA 40 x 175	175	495	320	160	120	20	18	115	115	130	80
LPSA 40 x 430	430	1065	635								

Dimensions in mm.
Subject to
modification without
prior notice!



5 Order Information

Together with your order give the following information please:

- buffer size required
- whether to be used for bottom or top end position
- number of buffers per touch-down position
- number of lifts and number of buffers in total
- nominal speed of inclined lift
- max. and min. mass of car and mass of counterweight
- inclination angle of runway