

# Hydraulic locking unit HLU LE-X (M)

Size	LE-X (M)
Type DL	Blocking against retraction incl. comfort lock
Stroke	110 mm



## Product characteristics

The hydraulic locking units HLU LE (25/32) as well as HLU LE-X (M/E) are specially developed for amusement rides and flying constructions and can be configured to meet individual customer requirements. They ensure maximum safety in shoulder restraints, lap restraints, and abdominal restraints of passenger restraint systems. A check valve in the hydraulic locking unit blocks the cylinder movement and thus reliably locks the restraint bar.

### Features and advantages

- delivery Plug & Play - simple installation and immediately ready for use
- closed and low-maintenance hydraulic system
- electric unlocking and manual emergency operation
- easier acceptance process through TÜV-Süd component certificate according to current standards
- high passenger comfort through stepless and silent bar adjustment
- comfort locking: restraint bars can be used as an aid for getting in and out (depending on model)
- easier bar opening: energy applied during closing is used to open the bar (depending on model)

### Intended applications

- amusement rides and flying constructions (e. g. roller coasters, VR rides, robot simulations)

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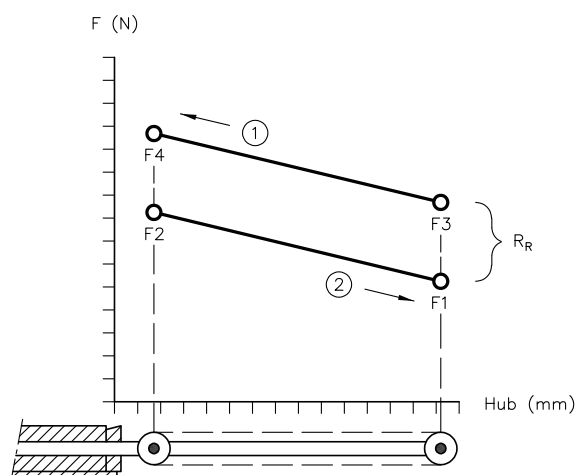
## Technical data

### General

blocking direction	against retraction		
comfort lock	yes		
weight (incl. hydraulic fluid), size	size	weight	RoHs
	860-7007-1 LE-X (M)	5.5 kg	√
material	steel, aluminium, acrylonitrile-butadiene (NBR), polytetrafluorethylene (PTFE), polyurethane		
operating temperature	-10 to + 60 °C		
ambient and storage temperature	-10 to + 60 °C		
outside dimensions cartonage (LxWxH)	630 mm x 250 mm x 200 mm		
mounting position	arbitrary		
behavior in case of power failure	closed/locked		
corrosive category	C2 up to 10 years (M) DIN EN ISO 12944-2		
<p><b>! NOTICE</b></p> <p>The specified corrosion protection classes were tested by means of a salt spray test according to DIN EN ISO 9227 under laboratory conditions. This neutral salt spray test only serves as quality control for the coatings / materials used and does not reflect the behavior in natural environments. An earlier occurrence of corrosion - than assumed according to the corrosion protection class - can therefore not be ruled out.</p>			
dimensions	nominal stroke	piston diameter	rod diameter
	860-7007-1 110 mm	30 mm	18 mm
	installation length when piston rod is retracted (LO)	installation length when piston rod is extended	nominal bore diameter of rod end bearing
	860-7007-1 361 mm	471 mm	17-0.008 mm
rod end angle foot side	0°		
speed at 20 °C	max. extending speed	max. retracting speed	
	860-7007-1 55 mm/s	-	

retraction and extension forces at 20 °C

	F1 (±10 % tolerance)	progression
860-7007-1	85 N	29 %



- 1 Retraction
- 2 Extension

- ▶ F2:  $F_1 + F_1 \times \text{progression (XX \%)}$
- ▶ F3 and F4: Contact between seal and piston rod and the piston on the inside of the pressure tube generates frictional force. The frictional force counteracts the direction of movement of the piston rod. To push the piston rod in, a force increased by the friction must be applied. Additionally, F3 and F4 depend on the insertion speed of the piston rod. The higher the insertion speed, the higher the forces required for insertion.

load cases\*

\*calculation base DIN EN 13814:2019 / ISO 17842-01:2015 / compatible to ASTM F 2291-15

	static load	fatigue load	panic load
860-7007-1	30,000 N	10,500 N	39,000 N

**Primary function:  
lap bar locking**

When the restraint system is closed, the piston rod of the hydraulic cylinder is extended and is locked against retraction. The hydraulic pressure in the accumulator is released and maintains the position of the piston rod hydraulically. The restraint system is locked. The safety lock is active and the piston rod is locked against retraction by the check valve (V2). The restraint system is thus locked and cannot be opened.

**Secondary function:  
lap bar drive**

Due to their design, locking systems of the "DL (RE)" type always generate only very low piston extension forces. If valves V1 and V2 are energized and thus opened, the piston rod of the hydraulic cylinder remains in the extended state and can only be retracted by an additional system. It is not possible to drive the opening movement of the restraint system through the locking system. The low extension forces cause a force that closes the restraint system. An additional system (e.g. gas spring, torsion spring) is therefore required to drive the opening movement and hold the restraint system in the open position.

**Secondary function:  
lap bar fixation**

When the restraint system is open, the lock of valve V1 on both sides prevents the hydraulic cylinder from retracting when a load is applied. Passengers can use the restraint system as a grab handle when getting on and off the vehicle. During travel, the restraint system is prevented from closing too tightly again. Both functions increase passenger comfort.

### Comfort function

- Valve can be loaded with up to 12 kN. At maximum load, a drift of 4.5 mm/s (tolerance:  $\pm 2.5$  mm/s) is possible.
- restraint bar does not yield with short load impulses (e. g. brief holding). With longer holding, drift (yielding) of the restraint bar may occur.
- Due to the high load capacity of the special valve, it can be used, for example, in rides where passengers share a restraint bar.

## Hydraulic parameters

filling gas	nitrogen			
hydraulic medium	hydraulic fluid DIN 51524 - RSL 22			
fill volume (hydraulic medium)	860-7007-1	~0.14 l		
pressure at 20 °C* *The pressures stated are calculated values, i. e. they may deviate in reality.		<b>P0 pneumatic preload pressure</b>	<b>P1 filling pressure (hydraulic fluid) with piston rod extended (piston side)</b>	<b>P2 filling pressure (hydraulic fluid) with piston rod retract- ed (piston side)</b>
	860-7007-1	3.1 bar	3.4 bar	4.5 bar

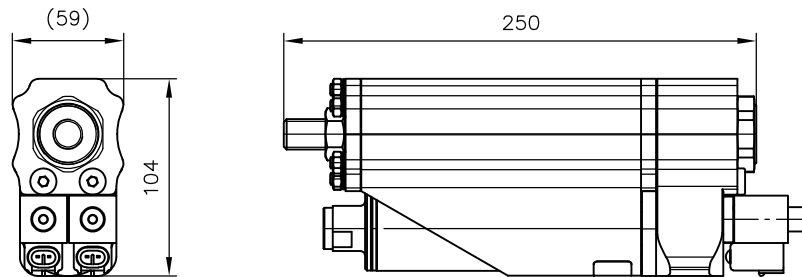
## Electrical parameters

Rated voltage seated valve	24 VDC +/- 10 %
Coil V1 power consumption	22 W
Coil V2 power consumption	22 W
Power supply	Socket AMP-Superseal 1.5 2 poles
Protection class (with appropriate connector)	IP 65 *
Duty cycle	Depending on the environment up to 100 % of duty cycle

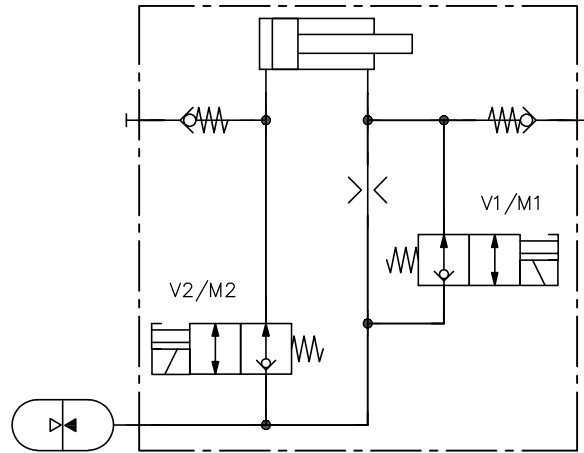
\* Up to IP 67 with optional accessories

## Dimensions and connections

Dimensions are given in mm.



## Circuit diagram



## Order information

order number	lot size "spare parts Fastlane" (delivery time 5 days)	lot size "standard" (delivery time 6 weeks)					
		1-36	37-72	73-108	109-144	145-180	>180
860-7007-1	1-5*						

\*monthly max. 5 spare parts per order number possible

## Accessories, spare & tear parts

Designation	Details	Order number
Packaging set HLU	Standard	063-6003-0 *
Remote unlocking set	<b>Remote unlocking set 1 m</b>	390-6001-0 *
	1 m tension/pressure cable	390-2045-0 *
	Clamping	390-2048-0 *
	Cylinder screw (2x) DIN912-M 2x 10-8.8-A2A	KNS.0230 *
	<b>Remote unlocking set 2 m</b>	390-6002-0 *
	2 m tension/pressure cable	390-2046-0 *
	Clamping	390-2048-0 *
	Cylinder screw (2x) DIN912-M 2x 10-8.8-A2A	KNS.0230 *
	<b>Remote unlocking set 3 m</b>	390-6003-0 *
	3 m tension/pressure cable	390-2047-0 *
	Clamping	390-2048-0 *
	Cylinder screw (2x) DIN912-M 2x 10-8.8-A2A	KNS.0230 *
Plug AMP Superseals & wire 1.5 m without jacket, up to IP 65, UL/CSA-certified	<b>2-way cable</b> ▪ Resistant to hydraulic fluid	325.6001 *
Plug AMP Superseals & wire 2 m with jacket, with protective sleeve, up to IP 67, UL/CSA-certified	<b>Control wire</b> ▪ Cross section 2x0.75 mm <sup>2</sup> ▪ Wire end 2 mm stripped ▪ Black/red	014-3017-1 *
Plug AMP Superseals & wire 5 m with jacket, with protective sleeve, up to IP 67, UL/CSA-certified	<b>Max. bending radius</b> ▪ Once 5x outside diameter ▪ Several times 15 x outside diameter	014-3011-2 *
Coil of 2/2-way valve	24 VDC 22 W	390-2007-0 * (2x)
Coil casing		330-2012-0 * (2x)
Protective cap		390-1000-0 * (2x)
Rod end bore diameter 17-0,008 mm	Rod side	085-1023-0 *
	Foot side	085-1024-0 *
Lock nut M16	On both sides	850-2113-0 *
Memory	Filling adapter (M16x1.5/M28x1.5)	860-1000-0 *
	Filling device HAWE DFM 400	860-6000-0 *

Designation	Details	Order number
	Gas filling screw	007-1021-0 *
	USIT ring	007-1022-0 *

\* HAWE Micro Fluid GmbH



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