

Hydraulic locking unit HLU LE-X (M)

| | |
|---------|----------------------------|
| Size | LE-X (M) |
| Type EX | Blocking against extension |
| Stroke | 90, 110, 140, 150 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 extension | | | |
| comfort lock | no | | | |
| weight (incl. hydraulic fluid), size, RoHs | | size | weight | RoHs |
| | 860-7015-0 | LE-X (M) | 4.9 kg | ✓ |
| | 860-7030-0 | LE-X (M) | 5.3 kg | ✓ |
| | 860-7055-0 | LE-X (M) | 6.1 kg | ✓ |
| | 860-7057-0 | LE-X (M) | 6.1 kg | ✓ |
| | 860-7063-0 | LE-X (M) | 6.1 kg | ✓ |
| | 860-7087-0 | LE-X (M) | 5.3 kg | ✓ |
| | 864-7002-0 | LE-X (M) | 5.9 kg | ✓ |
| | 864-7005-0 | LE-X (M) | 5.7 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>! NOTICE</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> | | | |

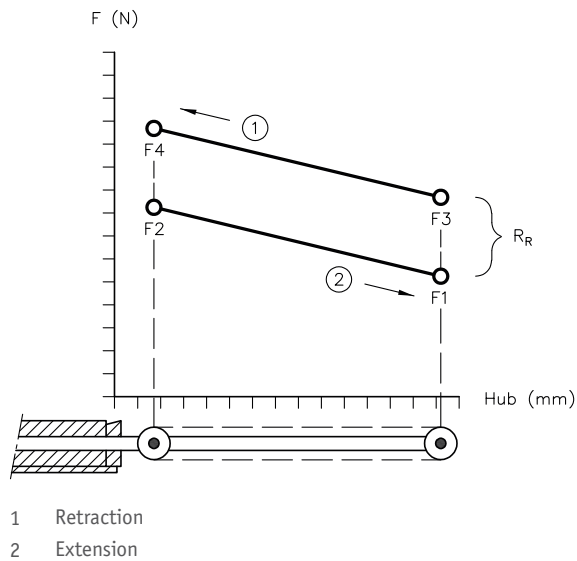
| dimensions | nominal stroke | piston diameter | rod diameter |
|--------------|---|---|--|
| | 860-7015-0 | 90 mm | 30 mm |
| 860-7030-0 | 110 mm | 30 mm | 18 mm |
| 860-7055-0 | 150 mm | 30 mm | 18 mm |
| 860-7057-0 | 150 mm | 30 mm | 18 mm |
| 860-7063-0 | 150 mm | 30 mm | 18 mm |
| 860-7087-0 | 110 mm | 30 mm | 18 mm |
| 864-7002-0 | 140 mm | 30 mm | 18 mm |
| 864-7005-0 | 150 mm | 30 mm | 18 mm |
| | installation length when piston rod is retracted (L0) | installation length when piston rod is extended | nominal bore diameter of rod end bearing |
| 860-7015-0 | 341 mm | 431 mm | 17-0.008 mm |
| 860-7030-0 | 361 mm | 471 mm | 17-0.008 mm |
| 860-7055-0 | 401 mm | 551 mm | 17-0.008 mm |
| 860-7057-0 | 401 mm | 551 mm | 17-0.008 mm |
| 860-7063-0 | 401 mm | 551 mm | 17-0.008 mm |
| 860-7087-0 | 361 mm | 471 mm | 17-0.008 mm |
| 864-7002-0 | 387 mm | 527 mm | 15-0.008 mm |
| 864-7005-0 * | 409 mm | 559 mm | foot side: 17-0,008 mm |

* Installation length with retracted piston rod (L0): measured with rod end installed on rod side.
Bore diameter of rod end bearing: no rod end installed on rod side.

| rod end angle foot side | angle |
|-------------------------|-------|
| 860-7015-0 | 0° |
| 860-7030-0 | 0° |
| 860-7055-0 | 0° |
| 860-7057-0 | 0° |
| 860-7063-0 | 0° |
| 860-7087-0 | +90° |
| 864-7002-0 | 0° |
| 864-7005-0 | 0° |

retraction and extension forces at 20 °C

| | F1 (±10 % tolerance) | progression |
|------------|----------------------|-------------|
| 860-7015-0 | 500 N | 22 % |
| 860-7030-0 | 500 N | 29% |
| 860-7055-0 | 250 N | 25% |
| 860-7057-0 | 350 N | 25% |
| 860-7063-0 | 650 N | 25 % |
| 860-7087-0 | 600 N | 29% |
| 864-7002-0 | 380 N | 23 % |
| 864-7005-0 | 600 N | 30 % |



- ▶ F2: $F_1 + F_1 \times \text{progression (XX \%)}$
- ▶ F3 and F4: Contact between the seal and the piston rod and piston on the inside of the pressure pipe produces friction. This friction acts counter to the piston rod's direction of movement. Retracting the piston rod requires additional force equal to the friction. F3 and F4 depend on retraction speed: the greater the retraction speed, the greater the forces required for retraction.

load cases*

*Calculation basis DIN EN 13814:2019 / ISO 17842-01:2015 / in compliance with ASTM F 2291-15

| | static load | fatigue load | panic load |
|------------|-------------|--------------|------------|
| 860-7015-0 | 19,800 N | 10,500 N | 30,800 N |
| 860-7030-0 | 19,800 N | 10,500 N | 30,800 N |
| 860-7055-0 | 19,800 N | 10,500 N | 30,800 N |
| 860-7057-0 | 19,800 N | 10,500 N | 30,800 N |
| 860-7063-0 | 19,800 N | 10,500 N | 30,800 N |
| 860-7087-0 | 19,800 N | 10,500 N | 30,800 N |
| 864-7002-0 | 19,800 N | 10,500 N | 30,800 N |
| 864-7005-0 | 19,800 N | 10,500 N | 30,800 N |

Primary function: bar locking

The piston rod of the hydraulic cylinder retracts when the restraint system is closed. The check valve prevents the cylinder from extending during operation, thereby locking the restraint system.

Secondary function: bar drive

The locking system acts as a lap bar drive. As soon as the valve is opened again, the bar of the restraint system can be opened by way of the piston extension force. The energy stored in the hydraulic system opens the restraint system.

Hydraulic parameters

| | | | | |
|--|------------------------------------|--|---|--|
| filling gas | nitrogen | | | |
| hydraulic medium | hydraulic fluid DIN 51524 - RSL 22 | | | |
| fill volume (hydraulic medium) | 860-7015-0 | ~0.14 l | | |
| | 860-7030-0 | ~0.14 l | | |
| | 860-7055-0 | ~0.21 l | | |
| | 860-7057-0 | ~0.21 l | | |
| | 860-7063-0 | ~0.21 l | | |
| | 860-7087-0 | ~0.14 l | | |
| | 864-7002-0 | ~0.21 l | | |
| | 864-7005-0 | ~0.185 l | | |
| pressure at 20 °C* *The pressures stated are calculated values, i.e. they may deviate in reality. | | P0 pneumatic preload pressure | P1 filling pressure (hydraulic fluid) with piston rod extended (piston side) | P2 filling pressure (hydraulic fluid) with piston rod retracted (piston side) |
| | 860-7015-0 | 17.7 bar | 19.9 bar | 24.6 bar |
| | 860-7030-0 | 17.7 bar | 19.9 bar | 26.0 bar |
| | 860-7055-0 | 8.9 bar | 10.0 bar | 12.7 bar |
| | 860-7057-0 | 12.4 bar | 13.9 bar | 17.7 bar |
| | 860-7063-0 | 23.0 bar | 25.8 bar | 32.9 bar |
| | 860-7087-0 | 21.3 bar | 23.9 bar | 31.2 bar |
| | 864-7002-0 | 9.4 bar | 15.1 bar | 21.2 bar |
| | 864-7005-0 | 21.3 bar | 23.9 bar | 30.4 bar |

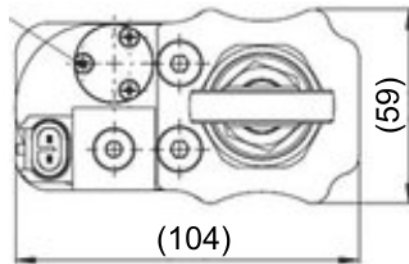
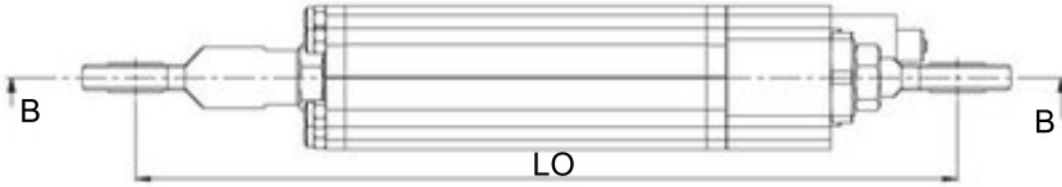
Electrical parameters

| | |
|--|--|
| rated voltage seated valve | 24 VDC +/- 10 % |
| coil V1 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 |

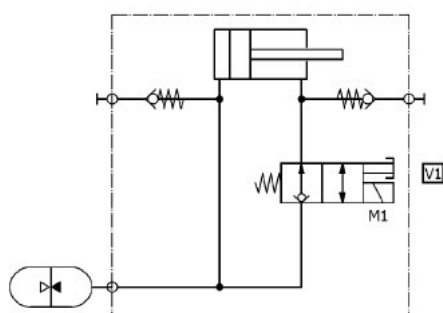
*with optional accessories up to IP 67

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) | | | | | |
|--------------|--|---|-------|--------|---------|---------|------|
| 860-7015-0 | 1-5* | | | | | | |
| 860-7030-0 | | | | | | | |
| 860-7055-0 | | | | | | | |
| 860-7057-0 | | | | | | | |
| 860-7063-0 | | 1-36 | 37-72 | 73-108 | 109-144 | 145-180 | >180 |
| 860-7087-0 | | | | | | | |
| 864-7002-0 | | | | | | | |
| 864-7005-0 | | | | | | | |

*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 | Remote unlocking set 1 m | 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 * |
| | Remote unlocking set 2 m | 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 * |
| | Remote unlocking set 3 m | 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 | 2-way cable ▪ resistant to hydraulic fluid | 325.6001 * |
| plug AMP Superseals & wire 2 m with jacket, with protective sleeve, up to IP 67, UL/CSA-certified | control wire ▪ cross section 2x0.75 mm ² ▪ 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 | max. bending radius ▪ 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 * |

| designation | details | order number |
|---|-----------------------------|--------------|
| coil casing | | 330-2012-0 * |
| protective cap | | 390-1000-0 * |
| rod end bore diameter 15-0,008 mm (864-7002-0) | rod side | 085-1018-0 * |
| | foot side | 085-1016-0 * |
| rod end bore diameter 17-0,008 mm (860-7015-0, 860-7030-0, 860-7055-0, 860-7057-0, 860-7063-0, 860-7087-0) | rod side | 085-1023-0 * |
| | foot side | 085-1024-0 * |
| rod end bore diameter 17-0,008 mm (864-7005-0) | foot side | 085-1024-0 * |
| lock nut M16 | both sides | 850-2113-0 * |
| auxiliary tool for manual operation | type A/E | 850-7046-0 * |
| | filling adapter | 860-1000-0 * |
| | HAWE DFM 400 filling device | 860-6000-0 * |
| accumulator | gas filling screw | 007-1021-0 * |
| | USIT ring | 007-1022-0 * |

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