

Professional Handheld Indicator **LR-Cal/ LHM** for pressure, force/weight and torque

- With internal pressure or force sensor or without internal sensor.
- External sensors for pressure and torque.
- Rigid aluminium housing, portable.
- Up to 4800 measurements per second, programmable.
- Data logger (130,000 measured values).
- USB interface.
- PEAK function, positive and negative.
- „First PEAK“ detection, programmable.
- Programmable filter and average function.
- Chargeable Li-Ion battery, incl. USB charger.
- 15 pressure units, 9 force/weight units, 8 torque units.
- Up to 7 external sensors, also mixed, automatic sensor recognition.
- Possibility of linearisation and calibration of the sensor(s).
- Optional WIRELESS data transmission.



The multipurpose high accurate handheld indicator **LR-Cal/ LHM** is not only suitable for very precise measurement of pressure, force and torque in the field, but also specially as reference instrument for calibration, verification and adjustment of pressure, force or torque reading instruments. The analog-digital converter's resolution of 50,0000 digits works with all **LR-Cal** reference sensors with 2mV/V signal. Via menu it is possible to set zero-point and span as well as linearisation with 5 points.

The measurement rate of up to 4,800 measurements per second make this handheld instrument ideal for detection of max. or min. values (PEAKs).



LR-Cal/ LHM
Very precise
and accurate
measurement of
pressure, force
and torque.



LR-Cal/ LHM with internal pressure sensor, from 100 mbar, accuracy up to 0.05% FS in transit case, with pressure test pump **LR-Cal/ LPP 08** as kit for calibration, verification and adjustments, for small pressure values, with very high accuracy.

Архангельск (8182)63-90-72
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LHM**Professional handheld indicator LR-Cal LHM
for pressure, force/weight and torque****LR-Cal****Specification:**

| | |
|--|---|
| Supply | Built-in chargeable Li-Ion battery, 3.7 V, 750 mAh, Type 14500 |
| Operating time with fully charged battery: | approx. 24 h (if backlight is switched off and no data logging) |
| Graphic display: | LCD 128 x 64 dots with 3 level of back lightning 180° rotatable on key press |
| Selectable pressure units: | bar, mbar, psi, Mpa, kPa, Pa, mH2O, inH2O, kg/cm ² , mmHg, cmHg, inHg, atm, mHg, mmH2O |
| Selectable force/weight units: | kg, g, t, N, daN, kN, MN, lb, klb |
| Selectable torque units: | Nm, Nmm, kgm, kNm, in/lbf, ft/lbf, gcm, kgmm |
| Selectable displacement units: | mm, inch |
| Internal resolution: | 24 bit |
| Readings per second (programmable): | 5, 10, 20, 50, 100, 300, 600, 1200, 2400 oder 4800 |
| Max. transmission rate (USB): | 50 ms (in continuous mode) |
| Digital filter (moving average): | 1, 2, 4, 8, 16 or 32 points |
| Programmable resolution: | 1, 2, 5, 10, 20, 50 or 100 |
| ZERO function: | 100% FS |
| PEAK function: | Positive and Negative |
| Data logger: | 130,000 values, programmable (1 s to 24 h) oder key press |
| Reference temperature: | +23°C |
| Working temperature: | +10...+50°C |
| Storage temperature: | -10...+60°C |
| Protection degree: | IP 40 |
| Case material: | Aluminium |
| Dimensions: | 176 x 79 x 32 mm |
| Max. number of external sensors: | Up to 7 sensors, automatic recognition |
| Interface: | USB 2.0, or WIRELESS with option " LHM-WF " |

| | |
|---|--|
| Optional internal pressure sensor | gauge, absolute or differential pressure, opt. with vacuum |
| Gauge and differential pressure ranges: | 100 mbar, 500 mbar, 1 bar, 2,5 bar or 5 bar |
| Absolute pressure ranges: | 500 mbar, 1 bar, 2,5 bar oder 5 bar |
| Accuracy: | ±0.10% or optional ≤0.05% with option " LHM-KL005 " |
| Temperature influence (at zero and at FS): | each ≤±0.01% |
| Pressure port: (at differential pressure: 2 ports) | M8 female, suitable for quick fit hose connector " LPP-08-PN-STECK " (for hose 4 x 2 mm, not in standard supply) |

Resolution (internal pressure sensors):

| bar | | mbar | | psi | | MPa | | kPa | | Pa | | mH2O | |
|--------|--------|--------|------|--------|--------|--------|--------|--------|-------|--------|------|--------|--------|
| FS | Res. | FS | Res. | FS | Res. | FS | Res. | FS | Res. | FS | Res. | FS | Res. |
| 0.1000 | 0.0001 | 100.00 | 0.01 | 1.4500 | 0.0001 | 0.0100 | 0.0001 | 10.000 | 0.001 | 10000 | 1 | 1.0000 | 0.0001 |
| 0.5000 | 0.0001 | 500.00 | 0.10 | 7.2000 | 0.0010 | 0.0500 | 0.0001 | 50.000 | 0.005 | 50000 | 5 | 5.0000 | 0.0005 |
| 1.0000 | 0.0001 | 1000.0 | 0.1 | 14.500 | 0.0001 | 0.1000 | 0.0001 | 100.00 | 0.01 | 100000 | 10 | 10.000 | 0.001 |
| 2.5000 | 0.0005 | 2500.0 | 0.5 | 36.200 | 0.005 | 0.2500 | 0.0001 | 250.00 | 0.05 | 250000 | 50 | 25.500 | 0.005 |
| 5.0000 | 0.0005 | 5000.0 | 0.5 | 72.500 | 0.005 | 0.5000 | 0.0001 | 500.00 | 0.05 | 500000 | 50 | 51.000 | 0.05 |

| inH2O | | Kg/cm2 | | mmHg | | cmHg | | inHg | | Atm | |
|---------|-------|--------|--------|--------|------|--------|-------|--------|--------|--------|--------|
| FS | Res. | FS | Res. | FS | Res. | FS | Res. | FS | Res. | FS | Res. |
| 40.000 | 0.005 | 0.1000 | 0.0001 | 75.00 | 0.01 | 7.500 | 0.001 | 3.0000 | 0.0002 | 0.1000 | 0.0001 |
| 200.00 | 0.02 | 0.5000 | 0.0001 | 375.00 | 0.05 | 37.500 | 0.005 | 14.500 | 0.002 | 0.5000 | 0.0001 |
| 400.00 | 0.05 | 1.0000 | 0.0001 | 750.0 | 0.1 | 75.00 | 0.01 | 30.000 | 0.002 | 1.0000 | 0.0001 |
| 1000.00 | 0.10 | 2.5500 | 0.0005 | 1900.0 | 0.2 | 190.00 | 0.02 | 75.00 | 0.01 | 2.5000 | 0.0002 |
| 2000.0 | 0.2 | 5.0000 | 0.0005 | 3750.0 | 0.5 | 375.00 | 0.05 | 145.00 | 0.02 | 5.0000 | 0.0005 |

Instruments with internal pressure sensors are fitted with 1 or 2 (differential pressure versions) pressure ports at the top of the instrument: M8 female. For pressure hose connection we recommend our part number **LPP-08-PN-STECK**: Push&Pull quick fit hose connector for pneumatic hoses 4 x 2 mm.



Optional internal force sensor (measurement of compression and tension)

| | |
|--|---|
| Force ranges: | 10N, 25N, 50N, 100N, 250N, 500N, 1kN, 3kN or 5 kN |
| Accuracy: | ≤±0.05% |
| Temperature influence (at zero and at FS): | each ≤±0.01% |
| Process connection: | M6 male thread (Tool-kit „LHM-N-KIT“ recommended) |

Resolution (internal pressure sensors):

| N | | daN | | kN | | kg | | g | | lb | |
|--------|------------|--------|------------|--------|------------|--------|------------|--------|------------|--------|------------|
| FS | Aufl./Res. | FS | Aufl./Res. | FS | Aufl./Res. | FS | Aufl./Res. | FS | Aufl./Res. | FS | Aufl./Res. |
| 10.000 | 0.005 | 1.0000 | 0.0005 | 0.0100 | 0.0005 | 1.0000 | 0.0005 | 1000.0 | 0.5 | 2.2000 | 0.001 |
| 25.000 | 0.005 | 2.5000 | 0.0005 | 0.0250 | 0.0005 | 2.5000 | 0.0005 | 2500.0 | 0.5 | 5.5000 | 0.001 |
| 50.000 | 0.005 | 5.0000 | 0.0005 | 0.0500 | 0.0005 | 5.0000 | 0.0005 | 5000.0 | 0.5 | 11.000 | 0.001 |
| 100.00 | 0.05 | 10.000 | 0.005 | 0.1000 | 0.005 | 10.000 | 0.005 | 10000 | 5 | 22.000 | 0.01 |
| 250.00 | 0.05 | 25.000 | 0.005 | 0.2500 | 0.005 | 25.000 | 0.005 | 25000 | 5 | 55.000 | 0.01 |
| 500.00 | 0.05 | 50.000 | 0.005 | 0.5000 | 0.005 | 50.000 | 0.005 | 50000 | 5 | 110.00 | 0.01 |
| 1000.0 | 0.5 | 100.00 | 0.05 | 1.0000 | 0.0005 | 100.00 | 0.05 | / | / | 220.00 | 0.1 |
| 3000.0 | 0.5 | 300.00 | 0.05 | 3.0000 | 0.0005 | 300.00 | 0.05 | / | / | 660.00 | 0.1 |
| 5000.0 | 0.5 | 500.00 | 0.05 | 5.0000 | 0.0005 | 500.00 | 0.05 | / | / | 1100.0 | 0.1 |

Input for external sensors

| | |
|--|--------------|
| Input signal: | ±2 mV/V |
| Internal resolution: | ±50,000 |
| Accuracy: | ≤ 0.01% |
| Supply: | 5 VDC ±4% |
| Electrical connection: | 4-wire |
| Temperature influence (at zero and at FS): | each ≤±0.01% |

Optional external pressure sensor TP16

| | |
|--|---|
| Pressure ranges: | 10 bar, 20 bar, 50 bar, 100 bar, 250 bar, 350 bar, 500 bar, 700 bar, 1000 bar, 1500 bar, 2000 bar |
| Accuracy: | ±0.1% or optional ±0.05% with option "LHM-P-KL005" |
| Working range: | up to 100% FS (at dynamical pressures up to 75% FS) |
| Overpressure: | 150% FS |
| Burst pressure: | >300% FS |
| Measurement frequency: | from 20 to 100 kHz |
| Temperature influence (at zero and at FS): | each ≤±0,015% |
| Pressure port: | 1/2" BSP male |
| Recommended gasket up to 700 bar: | USIT-ring A 63-18 |
| Recommended sealing ≥1000 bar: | Double sealing cone 60°, Code TLDMM-DK (not in standard delivery) |
| Material: | Stainless steel |
| Connection to LR-Cal LHM: | approx. 4 m connection cable, automatic recognition |



Optional external torque sensor TRS (measurement clockwise and counter-clockwise):

| | |
|---------------------------|--|
| Torque ranges: | 0,5 Nm, 2,5 Nm, 5 Nm, 10 Nm, 25 Nm, 50 Nm, 100 Nm, 250 Nm, 500 Nm or 1000 Nm |
| Accuracy: | ±0.2% or optional ±0.1% with option "LHM-TRS-KL01" |
| Working range: | up to 100% FS (at dynamic torques up to 70% FS) |
| Max. load: | 150% FS |
| Burst load: | >300% FS |
| Reference temperature: | +23°C |
| Working temperature: | -10...+70°C |
| Storage temperature: | -20...+80°C |
| Connection port: | 0,5 - 2,5 - 5 - 10 Nm: □ 1/4" 25 - 50 Nm: □ 3/8" 100 - 250 Nm: □ 1/2" 500 - 1000 Nm: □ 3/4" |
| Material: | Stainless steel |
| Connection to LR-Cal LHM: | approx. 4 m connection cable, automatic recognition |



LHM

Professional handheld indicator **LR-Cal** LHM for pressure, force/weight and torque

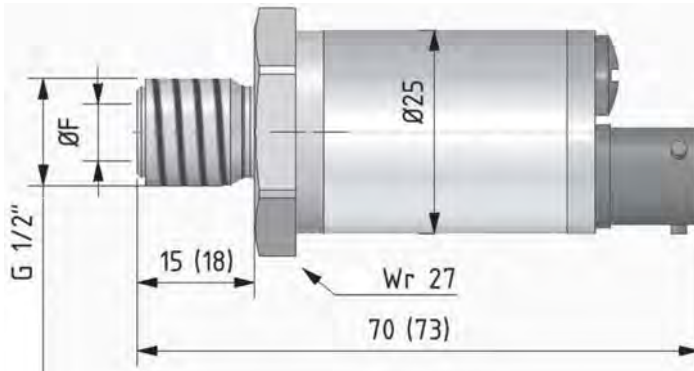
LR-Cal



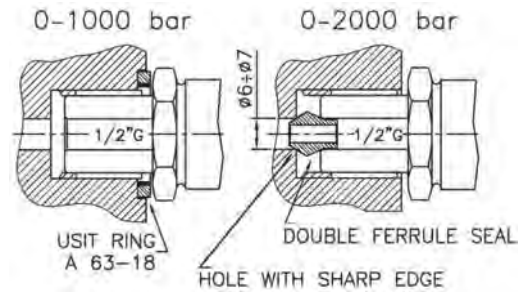
Dimensions [mm] (the images on the left hand side are showing the version with WIRELESS option)



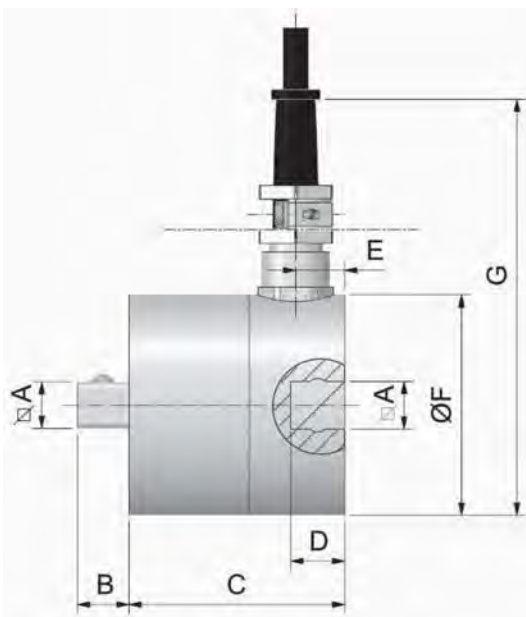
Dimensions [mm] External pressure sensor LHM-TP16:



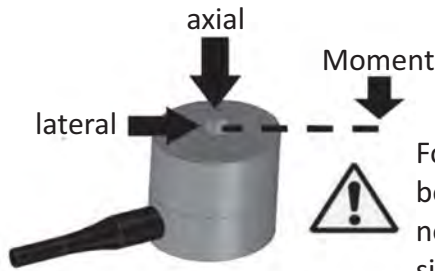
Installation / Sealing LHM-TP16:



Dimensions [mm] Externer torque sensor LHM-TRS:



| Artikel-Nr. Order-Code | Bereich Load | □ A | B | C | D | E | F | G |
|---------------------------|-----------------|------|------|------|----|------|----|----|
| LHM-TRS-8005 | 0,5 Nm | 1/4" | 7,5 | 44 | 8 | 10 | 45 | 85 |
| LHM-TRS-0002 | 2,5 Nm | 1/4" | 7,5 | 44 | 8 | 10 | 45 | 85 |
| LHM-TRS-0005 | 5 Nm | 1/4" | 7,5 | 44 | 8 | 10 | 45 | 85 |
| LHM-TRS-0010 | 10 Nm | 1/4" | 7,5 | 44 | 8 | 10 | 45 | 85 |
| LHM-TRS-0025 | 25 Nm | 3/8" | 10,5 | 44 | 11 | 10 | 45 | 85 |
| LHM-TRS-0050 | 50 Nm | 3/8" | 10,5 | 44 | 11 | 10 | 45 | 85 |
| LHM-TRS-0100 | 100 Nm | 1/2" | 15,0 | 44 | 16 | 10 | 45 | 85 |
| LHM-TRS-0250 | 250 Nm | 1/2" | 15,0 | 44 | 16 | 10 | 45 | 85 |
| LHM-TRS-0500 | 500 Nm | 3/4" | 22,5 | 53,5 | 24 | 17,5 | 51 | 91 |
| LHM-TRS-1000 | 1000 Nm | 3/4" | 22,5 | 53,5 | 24 | 17,5 | 51 | 91 |



For correct measurement both axial and transverse forces and bending moment should be absent. In case of presence, they must not be greater than the values below, to be reduced in simultaneous presence of more solicitations:

| Artikel-Nr. Order-Code | Bereich Range | Max. axiale Belastung Max. axial permissible load | Max. seitliche Belastung Max. lateral permissible load | Max. Abwinklung Bending limit moment |
|---------------------------|------------------|--|---|---|
| LHM-TRS-8005 | 0,5 | 0,38 kN | 15 N | 1 Nm |
| LHM-TRS-0002 | 2,5 | 0,38 kN | 15 N | 1 Nm |
| LHM-TRS-0005 | 5 | 0,5 kN | 15 N | 1,5 Nm |
| LHM-TRS-0010 | 10 | 0,9 kN | 30 N | 3,5 Nm |
| LHM-TRS-0025 | 25 | 2,2 kN | 30 N | 4,5 Nm |
| LHM-TRS-0050 | 50 | 3,5 kN | 80 N | 15 Nm |
| LHM-TRS-0100 | 100 | 6 kN | 150 N | 20 Nm |
| LHM-TRS-0250 | 250 | 9,5 kN | 180 N | 42 Nm |
| LHM-TRS-0500 | 500 | 18 kN | 250 N | 65 Nm |
| LHM-TRS-1000 | 1000 | 28 kN | 400 N | 170 Nm |

Overview Order-Codes for measurement of pressure and force:

LR-Cal LHM with internal pressure sensor:

LHM-0100-GP 0...100 mbar gauge
 LHM-0500-GP 0...500 mbar gauge
 LHM-1000-GP 0...1 bar gauge
 LHM-2500-GP 0...2,5 bar gauge
 LHM-5000-GP 0...5 bar gauge

LHM-0100-VA -100...+100 mbar
 LHM-0500-VA -500...+500 mbar
 LHM-1000-VA -1...+1 bar
 LHM-2500-VA -1...+2,5 bar
 LHM-5000-VA -1...+5 bar

LHM-0500-AP 0...500 mbar absolute
 LHM-1000-AP 0...1 bar absolute
 LHM-2500-AP 0...2,5 bar absolute
 LHM-5000-AP 0...5 bar absolute

LHM-0100-DP 0...100 mbar differential press.
 LHM-0500-DP 0...500 mbar differential press.
 LHM-1000-DP 0...1 bar differential press.
 LHM-2500-DP 0...2,5 bar differential press.
 LHM-5000-DP 0...5 bar differential press.



External pressure sensors LHM-TP16:

LHM-P-0010 0...10 bar
 LHM-P-0020 0...20 bar
 LHM-P-0050 0...50 bar
 LHM-P-0100 0...100 bar
 LHM-P-0250 0...250 bar
 LHM-P-0350 0...350 bar
 LHM-P-0700 0...700 bar
 LHM-P-1000 0...1000 bar
 LHM-P-1500 0...1500 bar
 LHM-P-2000 0...2000 bar

LR-Cal LHM with internal force sensor:

LHM-0010-N 0...10 N
 LHM-0025-N 0...25 N
 LHM-0050-N 0...50 N
 LHM-0100-N 0...100 N
 LHM-0250-N 0...250 N
 LHM-0500-N 0...500 N
 LHM-1000-N 0...1000 N
 LHM-3000-N 0...3000 N
 LHM-5000-N 0...5000 N



Accuracy of pressure measurement: $\pm 0.1\%$ FS, optional $\pm 0.05\%$ FS.

Accuracy of force measurement: $\pm 0.05\%$.

Included in scope of delivery:

- Handheld **LR-Cal** LHM without internal sensor, or
Handheld **LR-Cal** LHM with internal gauge pressure, absolute pressure or differential pressure sensor, or
Handheld **LR-Cal** LHM with internal force sensor
- Built-in chargeable Li-Ion battery 3.7 V (size 14500)
- USB charger 110...230 VAC, 5 V, 750 mA
- USB 2.0 cable
- Certificate(s) of calibration, as follows:
 - **LR-Cal** LHM without internal sensor: none
 - **LR-Cal** LHM with internal pressure sensor: Factory certificate of calibration
 - **LR-Cal** LHM with internal force sensor: ACCREDIA (DAkKS) certificate for tension
 - External pressure sensors LHM-TP16: Factory certificate of calibration
 - Externe torque sensors LHM-TRS: ACCREDIA (DAkKS) certificate *) for clockwise direction
- Transit case with suitable foams
- Operating manual (German/English)

Options for all instrument versions:

- **LHM-WF** WIRELESS option
- **LHM-GK** Rubber cup, yellow
- **LHM-Cal** Windows-Software (english) for PC/Laptop
- **PC-WIRELESS** WIRELESS Receiver 433 Mhz. for PC/Laptop with USB port

Options for instruments with internal pressure sensor:

- **LHM-KL005** Accuracy $\pm 0.05\%$ FS (standard: 0.1% FS)
- **LHM-AZERT** ACCREDIA (DAkKS) certificate (standard: factory certificate)
- **LPP-08-PN-STECK** Push&Pull quick fit hose connectors for pneumatic hose 4 x 2 mm (for version with differential pressure sensor you need 2 pcs.)

Options for instruments with internal force sensor:

- **LHM-N-A-D** ACCREDIA (DAkKS) certificate for compression
- **LHM-N-KIT** Tool-Kit with parts for mesuring compression and tension

Options for external pressure sensor LHM-TP16:

- **LHM-P-KL005** Accuracy $\pm 0.05\%$ FS (standard: 0.1% FS)
- **LHM-P-AZERT** ACCREDIA (DAkKS) certificate (standard: factory certificate)
- **TLDMM-DK** Double sealing cone 60° for pressure port ranges 1500 and 2000 bar

Options for external torque sensor LHM-TRS:

- **LHM-TRS-KL01** Accuracy $\pm 0.1\%$ FS (standard: 0.2% FS)
- **LHM-TRS-AZERT-0500** ACCREDIA (DAkKS) certificate, counter-clockwise direction, ranges 5 Nm to 500 Nm
- **LHM-TRS-AZERT-1000** ACCREDIA (DAkKS) certificate, counter-clockwise direction, ranges 1000 Nm and above



with WIRELESS antenna



Im Lieferumfang enthaltener Koffer



Artikel-Nr. **LHM-N-KIT**



Artikel-Nr. **PC-WIRELESS**

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