Electronic Pressure Controller and Calibrator Model LR-*Cal* LCC 100

- generates and measures pressure and vacuum
- pressure up to 1 mbar, 10 mbar, 100 mbar, 1000 mbar and 2000 mbar (vacuum max. -600 mbar)
- Uncertainty up to ±0.1% FS (±1 digit)
- Great adjustment accuracy (0.01% FS)
- Chargeable Li-Ion battery
- Generates pressure by pressing a key

The **LR-*Cal* LCC 100** measures and generates pressure and vacuum and consequently it is more than a mere measuring instrument - it can also be applied as test and calibration instrument for pressure sensors, pressure switches and pressure gauges. Thanks to internal pressure/vacuum generation no auxiliary tools are required for operation. An internal Li-Ion battery (chargeable) makes mobile operation very easy. Parallel operation of mains and battery supply allows for maximum flexibility.

Typical applications:

- Mobile and stationary pressure standard for low pressure and vacuum
- Mobile and stationary of all kind of pressure reading instruments
- Mobile and stationary pressure and vacuum source for calibration purposes
- Leak test

Technical Data:

Type		LCC 100-1	LCC 100-10	LCC 100-100	LCC 100-1000	LCC 100-2000
Order-Code:		**LCC-100-1**	**LCC-100-10**	**LCC-100-100**	**LCC-100-1000**	**LCC-100-2000**
Pressure range:		1 mbar	10 mbar	100 mbar	1000 mbar	2000 mbar
Overpressure:		5-fold	5-fold	5-fold	2-fold	2-fold
Uncertainty:	±1 digit	±0.3% FS	±0.1% FS	The integrated electr. pump can make max. -600 mbar vacuum. If a larger vacuum is required, an external vacuum source is needed, e.g. calibration handpump model **LR-*Cal* LPP 08**.		
Linearity:	±1 digit	±0.2% FS	±0.1% FS			
Hysteresis:		max. 0,1% v.E.				
Measurement principle:		inductive				
Temperature drift of the internal reference sensor:		Zero point: 0.003% FS / K (0% via zero balance) Span: 0.03% FS / K				
ZERO balance:		• automatic (in settable time spans, possible to switch off), or • manual (by pressing the ZERO button)				
Long-term stability of the internal reference sensor:		0.1% FS per year (typical)				
Temperature range:		Working: +10°C...+40°C; Storage: -10°C...+70°C				
Usable pressure measuring range:		-10...+110%				
Adjustment accuracy:		0.01% FS				
Adjustment time:		depending on volume <5 sec.				
Measurement media:		Air, non-aggressive and corrosion-free dry gases				
Operation modes:		• CTRL controlling pressure • MESS measuring pressure • AUTO individually definable pressure profile • Remote-controlled operation (via USB or RS232 interface)				
Display:		Graphic display (white on blue background)				
Interfaces:		USB and RS232				
Supply:		24 VDC / 1 A, build-in Li-Ion battery (8h typical) and mains charger 90...264 VAC				
Pressure ports:		6,6 x 11 mm (for flexible hose with 6 mm diameter)				
Dimension:		Height 102.6 x Width 257 x Dept 271 mm (without handle)				

Please note: The usable pressure range of the **LR-*Cal* LCC 100** types is -10%...+110% of the pressure range, depending on type. To achieve larger vacuum values, user can change the +/- pressure port connections.

LCC 100

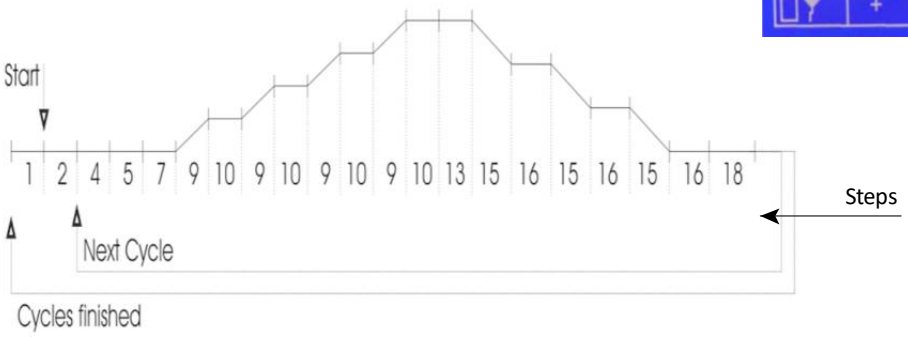
Pressure Controller and -Calibrator for small (pneumatic) pressure

Operation modes of the LR-*Cal* LCC 100

- **Measure:** The measuring mode ("MESS") is used to measure a gauge or differential pressure. In this operation mode the internal pump of the **LR-*Cal* LCC 100** is deactivated. The applied pressure, measured by the internal reference sensor, is shown in the display.

- **Control:** The control mode ("CTRL") is used to calibrate pressure transmitter, pressure switches or pressure gauges. In this operation mode the internal pump of the **LR-*Cal* LCC 100** is activated, the pressure is adjusted to the set point. The pressure value is shown in the display.

- **Auto:** In the "AUTO" mode, a calibration procedure can be defined. This mode allows a comfortable calibration of several test specimen with same specifications. The calibration can be run AUTOmatically in this mode.
Following graphic shows the principle of a calibration procedure:



Steps:
[1] Wait for start command (pressing OK key)
[2] Delay time (adjustable)
[4] Duration of ZERO balancing of the system
[7] Dwell time at ZERO point
[9] Adjustment time to the next step
[10] Dwell time
[13] Delay time at max. pressure step
[15] Adjustment time to the next step
[16] Dwell time at ZERO point
[18] Delay time (adjustable)

- **Leaktest:** In the CTRL mode, connected test specimen can be tested to leakage / tightness by pressing the LEAK key.

Back view of the LR-*Cal* LCC 100

Front panel of the LR-*Cal* LCC 100

Optional Accessories:

Spare part: Mains supply 90...264 VAC (47...63 Hz)
Order-Code: **LCC-100-NT** (1 pc. included in standard supply of instrument)

Certificate of calibration (10 points)
Order-Code: **LCC-100-KAL-10**

Certificate of calibration (20 points)
Order-Code: **LCC-100-KAL-20**

Carrying case with custom foams:
Order-Code: **LCC-100-KOFFER**

Electric calibration pressure test pump LR-*Cal* LAP-P

Generation of test pressure up to +25 bar (363 psi), switchable to generation of vacuum down to -0,9 bar (-26.6 inHg)

The **LR-*Cal* LAP-P** electric calibration test pressure pump is used for simple pressure generation (without manual effort) for checking, adjusting and calibration of mechanical and electronic pressure reading instruments by means of comparative measurements.

When the measuring instrument to be checked and a sufficiently accurate reference instrument are connected to the **LR-*Cal* LAP-P** electric calibration pressure test pump, the same pressure acts on both measuring instruments when the pump is actuated. By comparing the two measured values at any pressure values, the accuracy of the unit under test can be checked or adjusted.

Due to the integrated electric pump, the **LR-*Cal* LAP-P** allows an automatic and exact pressure generation with the possibility to switch to vacuum generation. For precise adjustment of the test pressure the **LR-*Cal* LAP-P** electric calibration pressure test pump is equipped with a fine adjustment valve. Both, the test specimen and the reference instrument are mounted on top of the electric calibration pressure test pump, if necessary using suitable thread adapters (see Accessories / Adapter sets on page 3). No tools are required for connecting the unit under test and reference instrument, hand-tightening of the instruments is sufficient.

Specification:

Generation of pressure:	0 to 25 bar (363 psi), switchable to
Generation of vacuum:	0 to -0,9 bar (-26.6 inHg)
Pressure medium:	Ambient air
Pressure ports:	2 connections with free-running union nut and with dirt separator strainer and sealing ring Pressure port P1 left for test item and P2 right for reference device

Order-Code:	P1 (test item):	P2 (reference):
LAP-P-G14-G12	1/4" BSP F	1/2" BSP F
LAP-P-G14-G14	1/4" BSP F	1/4" BSP F
LAP-P-G12-G14	1/2" BSP F	1/4" BSP F
LAP-P-G12-G12	1/2" BSP F	1/2" BSP F

Material wetted parts:	Stainless steel, nickel-plated brass, brass, FKM
Test pressure setting:	Fine adjustment valve (large volume variator, sensitivity better than ±1 mbar)
Temperatures:	Operation 0...50°C (+32...+122°F); Storage -20...+60°C (-4...+140°F)
Power supply:	110...230 VAC (incl. power supply unit to 24 VDC / 1.5 ADC)
Motor specification:	24 VDC, 220 Ncm, 0.88 A
Dimensions:	approx. 271 x 228 x 116 mm (without power supply unit)
Material housing:	ABS
Weight:	approx. 2.9 kg (without power supply unit)

Standard scope of delivery:

- Electric calibration test pressure pump **LR-*Cal* LAP-P**
- Power supply unit 110...230 VAC

- Operating manual

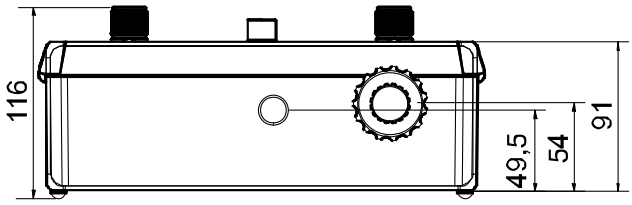
Very easy test pressure generation with the **LR-*Cal* LAP-P** electric calibration test pressure pump

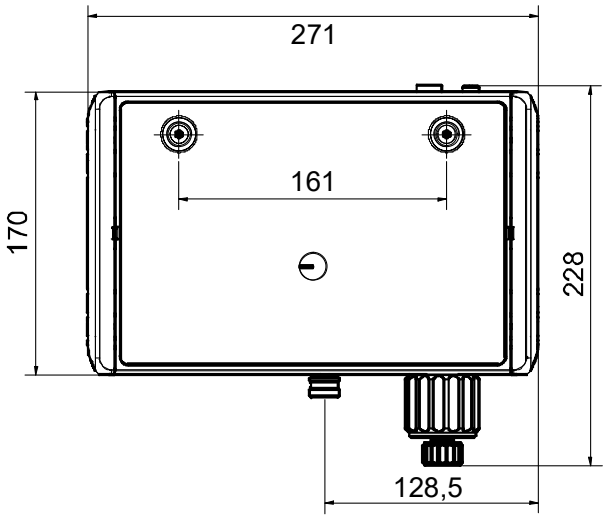
LAP-P

Electric calibration pressure test pump pneumatic, -0,9...+25 bar (bis 363 psi)

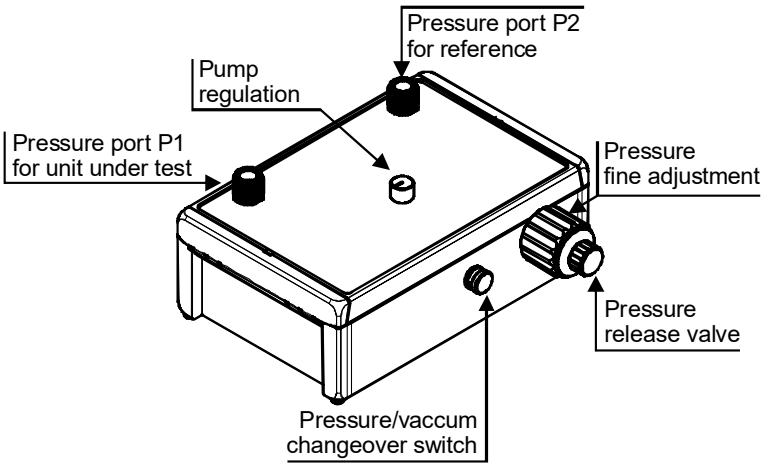
LR-Cal

Dimensions (in mm):





Controls and connections:



Order-Codes:

Electric calibration pressure test pump **LR-Cal LAP-P variants**

Order-Code	Pressure port **P1** for test item	Pressure port **P2** for reference
LAP-P-G14-G12	1/4" BSP F	1/2" BSP F
LAP-P-G14-G14	1/4" BSP F	1/4" BSP F
LAP-P-G12-G14	1/2" BSP F	1/4" BSP F
LAP-P-G12-G12	1/2" BSP F	1/2" BSP F

Spare parts

Order-Code	Description	
LAP-P-NT	Power supply unit (input 110...230 VAC / output 24 VDC - 1.5 A) (spare part, as already included in standard supply of the basic device)	
LPP30-ASS-G12	Pressure connector 1/2" BSP F free running union-nut (assembly) (without dirt separator slieve)	
LPP30-ASS-G14	Pressure connector 1/4" BSP F free running union-nut (assembly) (without dirt separator slieve)	
LAP-P-SIEB-G12	5 pcs. dirt separator slieves for pressure connector 1/2" BSP F	
LAP-P-SIEB-G14	5 pcs. dirt separator slieves for pressure connector 1/4" BSP F	
LPP-VENTIL	Fine adjustment and pressure release valve (assembly)	
LPP-SICH	Glass fuse 5 x 20 mm, medium order, 1 A / 250 V	

Accessories

Order-Code	Content	
LPP-ADAPTER-BSP	BSP thread adapters for pressure port **1/4"** BSP free running union-nut: 1 piece 1/4" BSP male x 1/8" BSP female 1 piece 1/4" BSP male x 3/8" BSP female 1 piece 1/4" BSP male x 1/2" BSP female 1 piece 1/4" BSP male x 1/2" BSP male	
LPP-ADAPTER-NPT	NPT thread adapters for pressure port **1/4**" BSP free running union-nut: 1 piece 1/4" BSP male x 1/8" NPT female 1 piece 1/4" BSP male x 1/4" NPT female 1 piece 1/4" BSP male x 3/8" NPT female 1 piece 1/4" BSP male x 1/2" NPT female	
LPP-ADAPTER-M	Metric thread adapters for pressure port **1/4**" BSP free running union-nut: 1 piece 1/4" BSP male x M12x1.5 female 1 piece 1/4" BSP male x M20x1.5 female 1 piece 1/4" BSP male x Minimess 1620	
LSP-ADAPTER-SET	Thread adapters for pressure port **1/2**" BSP free running union-nut: 1 piece 1/2" BSP male x 1/4" BSP female 1 piece 1/2" BSP male x M20x1.5 female 1 piece 1/2" BSP male x 1/4" NPT female 1 piece 1/2" BSP male x 1/2" NPT female	
VRS-G12	Volume reducer for **LR-Cal TLDMM 2.0** and **LR-Cal LDM 80**	
LPP-VOLUMEN-TOOL	Tool for the fine adjustment valve, to increase the diameter, thus even easier fine adjustment of the test pressure. Material: aluminum. Simply plug it on the pressure fine adjustment valve.	

Please note that the performance of the **LR-Cal LAP-P** electric calibration pressure test pump depends on the volume of the calibration circuit. The smaller the volume, the better the performance. You can keep the volume of the calibration circuit small or minimize it by dispensing with hose lines or pressure hoses and using a reference device with the smallest possible volume in the pressure connection.
For the **LR-Cal TLDMM 2.0** and **LR-Cal LDM 80** reference instruments listed on page 4, for example, we recommend using the optional volume reducer, order-code **VRS-G12**.

Typical performance of the electric pump **LR-Cal LAP-P**:

Pressure: 0 to 20 bar: <85 seconds
(The final value of 25 bar is most easily achieved if you first turn the fine adjustment valve quite far out (anti-clockwise), electrically generate pressure up to approx. 20 bar and then screw the find adjustment valve in clockwise.)
Vacuum: 0 to -0,9 bar: <8 seconds

LAP-P **Electric calibration pressure test pump pneumatic, -0,9...+25 bar (bis 363 psi)**

LR-*Cal* LR

As a reference pressure instrument (pressure calibrator) we recommend:

Documenting process and pressure calibrator
LR-*Cal* **LPC 300**
Accuracy ±0.025% FS

Pressure calibrators
LR-*Cal* **LPC 200-T** and LR-*Cal* **LPC 200**
Accuracy ±0.025% FS

Pressure calibrator
LR-*Cal* **TLDMM 2.0**
Accuracy ±0.05% FS

Precision reference pressure handheld
LR-*Cal* **LHM**
Accuracy ±0.05% FS or ±0.1% FS

Reference digital pressure gauge
LR-*Cal* **LDM 80**
Accuracy ±0.1% FS or ±0.2% FS

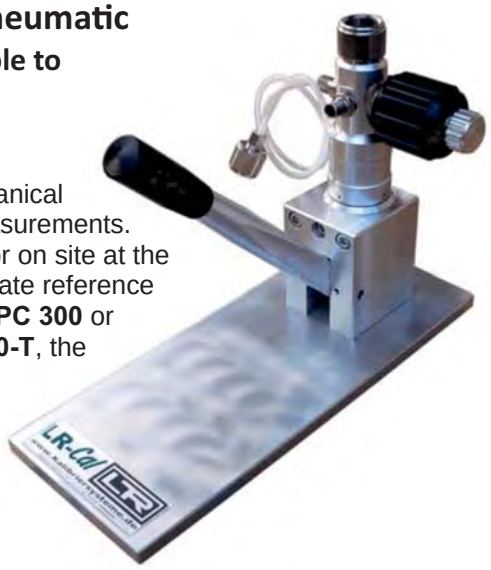
Digital pressure gauge
LR-*Cal* **LDM 70**
Accuracy ±0.125% FS (BFSL) or ±0.25% FS (BFSL)

Digital pressure gauge
DM 80 and **DM 80-UMS**
Accuracy ±0.25% FS (BFSL)

Rel. 20191007

Pressure Comparison Test Pump LR-*Cal* LPP 60-T, pneumatic

Generation of test pressure up to +60 bar (870 psi), switchable to Generation of vacuum to -0.95 bar (-28 inHg)



The Calibration Test Pump **LR-*Cal* LPP 60-T** is used to generate pressures and vacuum for checking, adjusting and calibrating mechanical and electronic pressure measuring instruments by comparative measurements. These pressure tests may be carried out in laboratories, workshop or on site at the measuring point. If the instrument under test and a sufficiently accurate reference measuring instrument (e.g. Electronic Pressure Calibrator **LR-*Cal* LPC 300** or **LR-*Cal* LPC 200**, ±0.025% FS) are connected to the **LR-*Cal* LPP 60-T**, the same pressure / vacuum is applied to the two instruments when the pump is operated.

Despite its compact dimensions, the calibration test pump **LR-*Cal* LPP 60-T** is easy to operate and allows for exact generation of the required test pressures. A change-over switch enables the generation of vacuum as well. The **LR-*Cal* LPP 60-T** is fitted with a fine adjustment valve for the precise adjustment of pressures. The reference instrument is screwed directly on to the top of the pump and the unit under test is connected by means of a connection tube incorporating an adapter 1/4" BSP rotating female (optional 1/4" NPT female) port.

Specification:

Pressure generation:	0...60 bar = 0...870 psi (or equivalent), switchable to
Vacuum generation:	0...- 0,95 bar = 0...-28 inHG (or equivalent)
Pressure ports:	1/2" BSP female rotating (with seal) for reference instrument on the top of the pump (Type LPP-60-T-N14: 1/4" NPT female, type LPP-60-T-G14: 1/4" BSP female rotating) 1/4" BSP female for unit under test (at connection tube) (Type LPP-60-T-N14: 1/4" NPT female)
Volume per stroke:	appr. 11 cm³
Materials:	anodized aluminum, brass (chromium plated)
Fine adjustment:	Fine adjustment valve
Dimension:	appr. 150 x 300 x 215 mm
Weight:	appr. 2.55 kg

Included in standard supply:

- Calibration test pump **LR-*Cal* LPP 60-T**
- Connection tube with female rotating pressure port
- Operating manual

Optional accessories:

- Set of adapters and seals for unit under test
- Carrying case with custom foams
- Tool for a simple operation of the adjustment valve (**LPP-VOLUMEN-TOOL**)

Recommended Reference Instruments:

• Accuracy ±0.025% FS:	Electronic Process Calibrator	**LPC 300**	datasheet “LPC 300"
• Accuracy ±0.025% FS:	Electronic Pressure Calibrator	**LPC 200**	datasheet “LPC 200"
• Accuracy ±0.050% FS:	Electronic Pressure Calibrator	**TLDMM**	datasheet “TLDMM 2.0”
• Accuracy ±0.1% FS:	Digital Test Pressure Gauge	**TLDMM-A01**	datasheet “LDM 80"
• Accuracy ±0.2% FS:	Digital Test Pressure Gauge	**TLDMM-A02**	datasheet “LDM 80"
• Accuracy ±0.125% F	Digital Test Pressure Gauge	**LDM70-E25**	datasheet “LMD 70"
• Accuracy ±0.25% F	Digital Test Pressure Gauge	**LDM70-K50**	datasheet “LDM 70"
• Accuracy ±0.6& FS:	Analogue Pressure Gauge	**LPP-MANO-K06**	see reverse page
• Accuracy ±1.0% FS:	Analogue Pressure Gauge	**LPP-MANO**	see reverse page

LPP 60-T

Pressure Comparison Pump LPP 60-T
Generating pressure -0,95...+60 bar (870 psi)

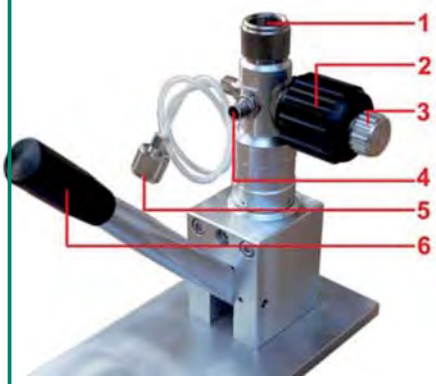
LR-*Cal*

Order-Codes:

Description	Order Code
LR-*Cal* LPP 60-T Calibration Test Pump -0,95...+60 bar (-28 in Hg...+870 psi) NOTE: if you dismount the reference connector, you get 3/8" BSP female port	**LPP-60-T**
ditto, but reference port 1/4" BSP female rotating	**LPP-60-T-G14**
ditto, but reference port and test port 1/4" NPT female	**LPP-60-T-N14**
Set of **BSP adapters** and set of seals 1/8" BSP, 3/8" BSP and 1/2" BSP	**LPP-ADAPTER-BSP**
Set of **metric adapters** and set of seals M12x1,5 M20x1,5 and Minimess®	**LPP-ADAPTER-M**
Set of **NPT adapters** 1/8" NPT, 1/4" NPT, 3/8" NPT, 1/2" NPT	**LPP-ADAPTER-NPT**
Tool to simplify operation of the fine adjustment valve  	**LPP-VOLUMEN-TOOL**
Carrying **case** with foams	**LPP-60-T-KOFFER**
LPP-MANO-K06 analogue reference gauge DS 100 ±0.6% FS, all stainless steel, fine graduation dial. **Incl. certificate** Available ranges: 0...4 bar/PSI; 0...25 bar/PSI; 0...40 bar/PSI; -1...0 bar/inHg; -1...+39 bar/PSI 	**LPP-MANO-....-K06**
LPP-MANO analogue reference gauges DS 63 ±1% FS, fine graduation dial. Available ranges: 0...2 bar/PSI; 0...11 bar/PSI; 0...25 bar/PSI; 0...40 bar/PSI; -1...0 bar/inHg; -1...+39 bar/PSI 	**LPP-MANO-....**
Spare part: Test tube with 1/4" BSP female port	**LPP-SCHLAUCH-S-0050**
Spare part: Fine adjustment valve with relief valve	**LPP-VENTIL**
Service Kit for **LR-*Cal* LPP 60-T** (O-rings, seals, etc.)	**LPP-WARTUNG**

NOTE:

To mount the reference instruments **LR-*Cal* LPC 300, LPC 200, TLDMM 2.0, LDM 80, LDM 70** or **LPP-MANO** you do **not** need any adapter if you use the calibration handpump type **LR-*Cal* LPP 60-T**, order-code **LPP-60-T** .



(**1**) pressure port for mounting reference pressure instrument
(**2**) fine volume adjustment, for generating high pressure appr. 40...60 bar and fine pressure adjustment
(**3**) pressure relief valve
(**4**) Switch pressure generation / vacuum generation
(**5**) pressure port for test item
(**6**) pump to generate pressure up to appr. 40 bar

Rel. 20200825

Pneumatic pressure comparison test pump
Model LR-*Cal* LSP 100-P

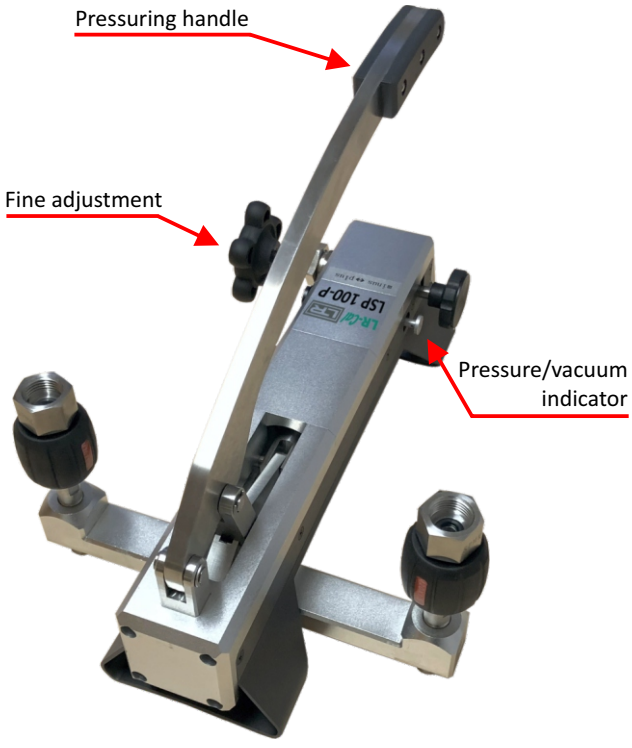
- **Pneumatic pressure and vacuum source for calibration and testing purposes**
- **Manual pneumatic pump using ambient air**
- **Generating pressure up to 100 bar, switchable to vacuum up to -0.95 bar**

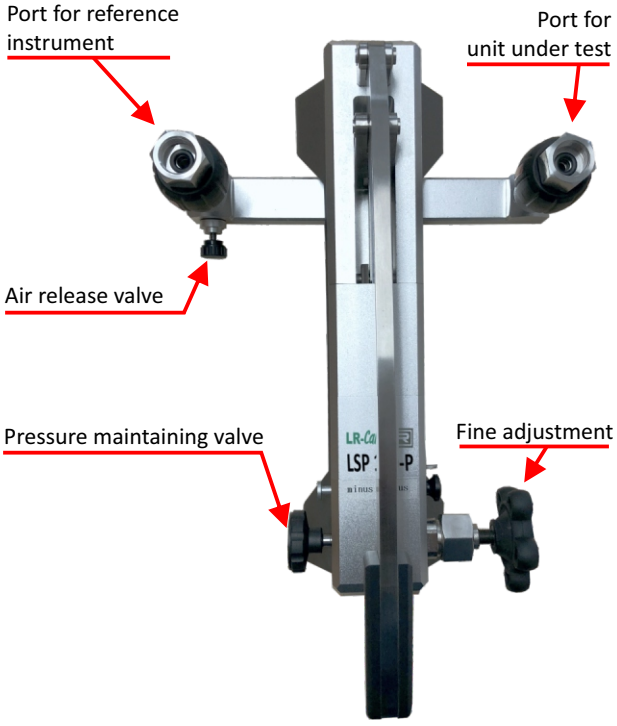
Pressure comparison test pumps are used for generating pressure and vacuum for the testing, adjusting and calibrating of mechanical and electronic pressure measuring instruments by means of comparison measurements. These pressure and vacuum testes can be carried out in laboratories, workshops or on site at the set measuring point.

When the device under test and a reference measuring instrument with an adequate accuracy are connected to the same pressure comparator, the same pressure will act on both measuring instruments after actuating the pump. A calibration or an adjustment can be carried out by comparing the two measure values at any pressure or vacuum value.

In order to enable an accurate generation of the measuring points, the pressure comparison pump LR-*Cal* **LSP 100-P** is provided with a fine adjustment valve.

This manual pressure pump uses ambient air as medium. Easy to use, no external pressure or vacuum source needed.





LSP 100-P

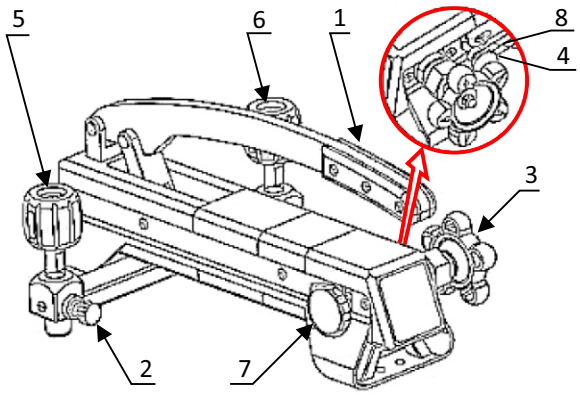
Pneumatic pressure comparison test pump
Generating pressure 100 bar and vacuum -0.95 bar

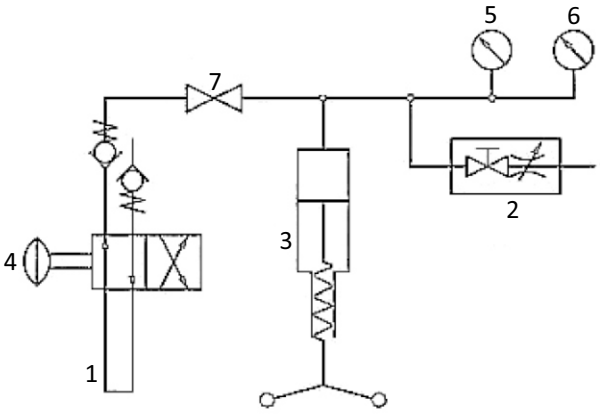
LR-*Cal*

Technical data:

Making pressure:	up to +100 bar, switchable to
Making vacuum:	down to -0.95 bar
Medium:	Ambient air
Pressure ports:	2 ports with 1/2" BSP female rotating swivel nut, incl. o-rings (no tools required for mounting reference instrument and unit under test) Distance of both pressure ports: 220 mm
Fine adjustment:	Fine adjustment valve, sensitivity ±0.1 mbar
Dimensions:	450 x 262 x 170 mm
Net weight:	approx. 5.6 kg

Scope of standard delivery: 1 LR-*Cal* **LSP 100-P** pressure comparison pump
2 threaded adapter M20x1.5 female x 1/2" BSP male with O-rings
Set with spare O-rings, 2 blind plugs M20x1.5 for closing the pressure ports, operating manual.





(1) Pressuring handle
(2) Pressure release valve
(3) Fine adjustment valve
(4) Switch pressure/vacuum
(5) Pressure port for reference instrument
(6) Pressure port for device under test
(7) Pressure maintaining vlave
(8) Switcher safety pin

Optional accessories:

Order-Code **BLINDSTOPFEN-G12-VA**	Blind plug 1/2" BSP in stainless steel, PN 3600 bar
Order-Code **LSP-100-P-WARTUNG**	Maintenance Kit for LR-*Cal* **LSP 100-P** (gaskets etc.)
Order-Code **LSP-ADAPTER-SET**	Set of threaded adapters for pressure port 1/4" NPT, 1/2" NPT, 1/4" BSP and M20x1.5 female

Spare part:

Order-Code **LSP-100-P-UMSCHALTER**	pressure/vacuum switch as a spare part

Reference pressure instruments: LR-*Cal* **LDM 80**, LR-*Cal* **LPC 200**, LR-*Cal* **LPC 300**, LR-*Cal* **TLDMM 2.0**, LR-*Cal* **LDM 70**, LR-*Cal* **LHM**

Rel. 20200930

Hydraulic pressure comparison test pump
Serie LR-*Cal* LSP-H

- **Pressure source for calibration purposes**
- **Spindle pump and priming pump**

Model LR-*Cal* LSP 1000-H: 1000 bar/14500 psi
Model LR-*Cal* LSP 1200-H: 1200 bar/17400 psi
Model LR-*Cal* LSP 1600-H: 1600 bar/23200 psi

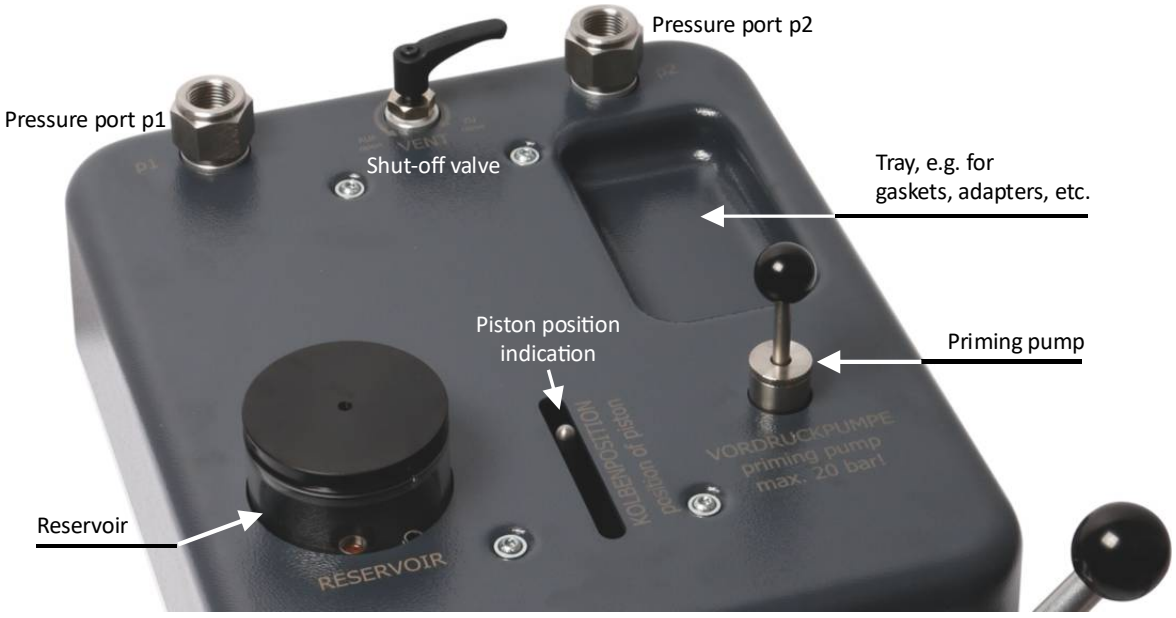
Operating fluid: mineral oil based hydraulic fluid or destilled water

Pressure comparison test pumps are used for generating pressure for the testing, adjusting and calibrating of mechanical and electronic pressure measuring instruments by means of comparison measurements. These pressure tests can be carried out in laboratories, workshops or on site at the set measuring point.
When the device under test and a reference measuring instrument with an adequate accuracy are connected to the pressure comparator, the same pressure will act on both measuring instruments after actuating the pump. A calibration or an adjustment can be carried out by comparing the two measured values at any pressure value.
In order to enable an accurate generation of the measuring points, the pressure comparison test pumps series LR-*Cal* **LSP-H** are provided with a fine adjustable spindle pump.

In addition the series LR-*Cal* **LSP-H** feature a threaded spindle which only runs within the pump body. Thus there is no adverse bending moment acting on an outstanding spindle, and particularly for field use this has the advantage that the dimension of these pressure comparison pumps will not change when the spindle is turned during operation. The series LR-*Cal* **LSP-H** needs only little force to generate also high pressures.

For an easier operating, the LR-*Cal* **LSP-H** series pressure comparators are fitted with a priming pump.

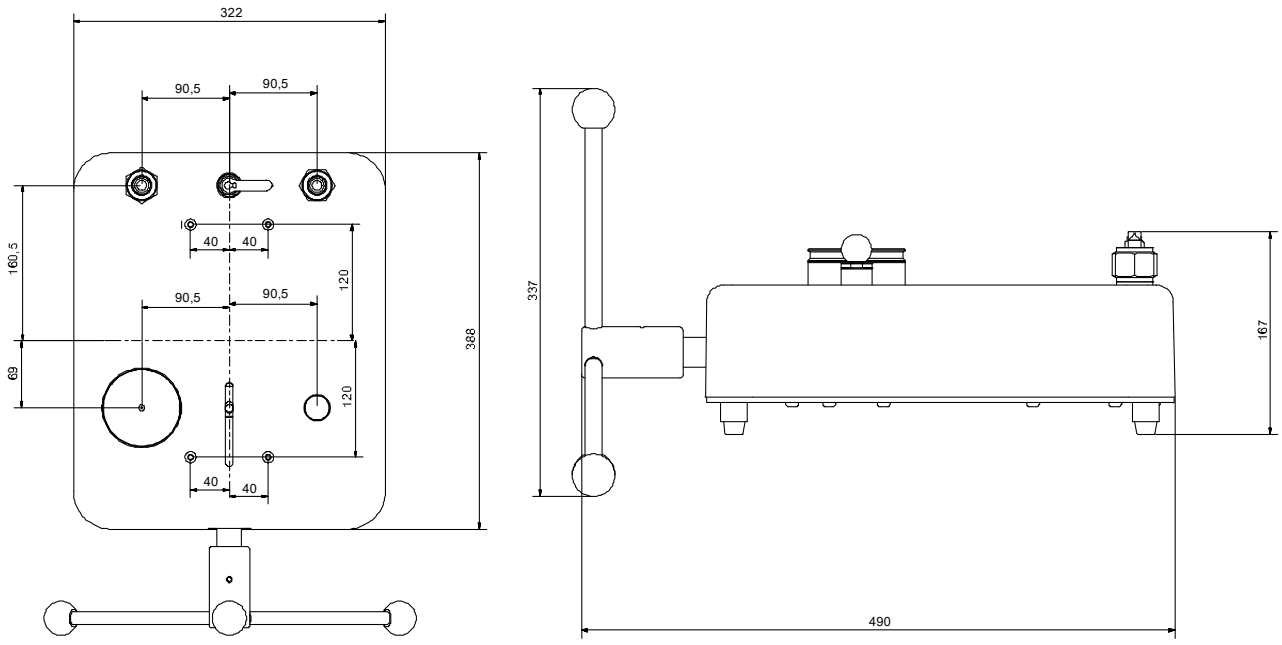
Versions for aggressive media like SKYDROL® or brake fluids available on request (max. 1,000 bar / 1,200 bar).



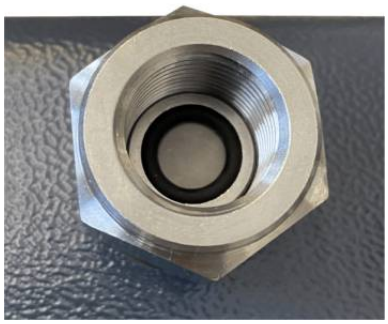
LSP Hydraulic pressure comparison test pump
1000 / 1200 / 1600 bar - 14500 / 17400 / 23200 psi

LR-Cal

Dimension



Protection against material pollution



The pressure comparison test pumps models **LR-Cal LSP-H** are equipped with strainer dirt collectors in the pressure ports as well as in the bottom of the operation fluid reservoir. This reduces considerable the risk of material pollution of the operation fluid.
(Note: if operated with hydraulic oil, the dirt collector in the reservoir has to be removed.)

Recommended pressure reference instruments

Type	Description	Accuracy
LR-Cal LPC 300	Documenting process calibrator	±0.025% FS
LR-Cal LPC 200	Electronic pressure calibrator	±0.025% FS
LR-Cal TLDMM 2.0	Precision digital reference gauge	±0.050% FS
LR-Cal LDM 80+KL01	Digital test pressure gauge	±0.100% FS
LR-Cal LDM 70-E25	Digital test pressure gauge	±0.125% FS
LR-Cal LDM 80	Digital test pressure gauge	±0.200% FS
LR-Cal LDM 70-K50	Digital test pressure gauge	±0.250% FS

LR-Cal

Hydraulic pressure comparison test pump
1000 / 1200 / 1600 bar - 14500 / 17400 / 23200 psi

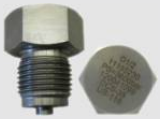
LSP-H

Technical Data

Technical Data		LR-*Cal* LSP 1000-H	LR-Cal LSP 1200-H	LR-*Cal* LSP 1600-H
Pressure range	[bar]	0...1,000	0...1,200	0...1,600
	[psi]	0...14,500	0...17,400	0...23,200
Medium		Mineral Oil or Destilled Water		
Pressure ports		2 x 1/2" BSP female rotating, incl. stainer and gasket		
Fluid reservoir	[cm³]	200		
Piston diameter	[mm]	8		
Spindle stroke	[cm³]	approx. 3.9 (per turnaround: approx. 0.1)		
Needed force	[Nm]	at 250 bar: 2.0 / at 500 bar: 4.0 / at 1,000 bar: 8.0		
Materials		Stainless steel, Aluminium, Viton, NBR, Plastics		
Dimensions				
distance of pressure ports	[mm]	181		
Depth	[mm]	388 without star-handle; 490 incl. star-handle		
Width	[mm]	322		
Height	[mm]	167 without star-handle; 337 incl. star-handle		
Weight	[kg]	10.5		
Design		Base plate with feet and rigid housing		

Version for aggressive media such like SKYDROL® and brake fluids available on request: max. 1,000 bar = Order-Code: LSP-1000-H-S; max. 1,200 bar = Order-Code: LSP-1200-H-S. This versions are not suitable for mineral oil or water.

Optional Accessories

Order-Code	Description	
HAP-02	Hand suction pump for easy emptying (and filling) of the reservoir. Capacity: 125 ml per stroke. Simultaneous suction and squeezing. 2 hoses, each 500 mm length, suction hose with rotating 3/8" BSP female swivel nut.	
LSP-H-WARTUNG	Maintenance kit, with following content: 10 O-rings for pressure ports (top), 10 O-rings for pressure ports (bottom), 2 sinter filter for reservoir, 4 strainer dirt collectors for pressure ports, 2 O-rings for priming pump (piston).	
BLINDSTOPFEN-G12-VA	Blind plugs for pressure port (1/2" BSP) st.st., PN 3600 bar	
LSP-ADAPTER-SET	Set of stainless steel adapters, PN 1000 bar, 1/4" BSP, M20x1.5, 1/4" NPT, 1/2" NPT, gaskets	
VA-M16X2-G12A	Minimess 1620 coupling to 1/2" BSP male for pressure port	
MMS-M16X2-1-0	Minimess 1620 hose 1.0 m	
MMS-M16X2-2-0	Minimess 1620 hose 2.0 m	
MMS-M16X2-3-2	Minimess 1620 hose 3.2 m	
MMS-M16X2-4-0	Minimess 1620 hose 4.0 m	
MSV-G12-M16X2	Minimess 1620 adapter to 1/2" BSP female	

Rel. 20200930

Hydraulic pressure comparison test pump
Serie LR-*Cal* LSP-H

- **Pressure source for calibration purposes**
- **Spindle pump and priming pump**

Model LR-*Cal* LSP 1000-H: 1000 bar/14500 psi
Model LR-*Cal* LSP 1200-H: 1200 bar/17400 psi
Model LR-*Cal* LSP 1600-H: 1600 bar/23200 psi

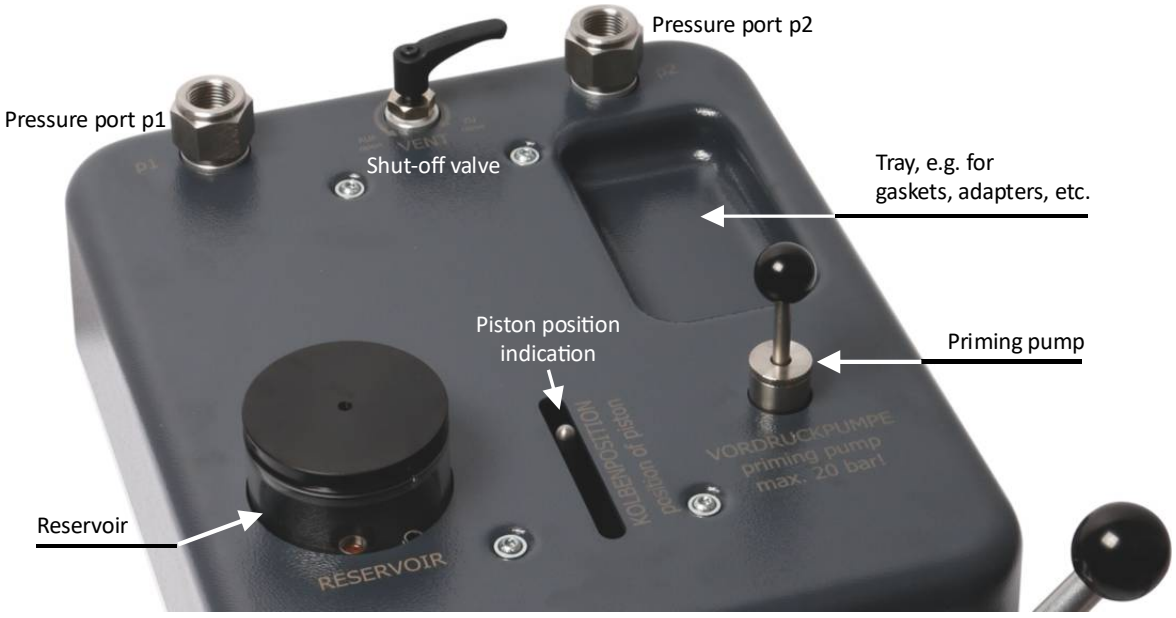
Operating fluid: mineral oil based hydraulic fluid or destilled water

Pressure comparison test pumps are used for generating pressure for the testing, adjusting and calibrating of mechanical and electronic pressure measuring instruments by means of comparison measurements. These pressure tests can be carried out in laboratories, workshops or on site at the set measuring point.
When the device under test and a reference measuring instrument with an adequate accuracy are connected to the pressure comparator, the same pressure will act on both measuring instruments after actuating the pump. A calibration or an adjustment can be carried out by comparing the two measured values at any pressure value.
In order to enable an accurate generation of the measuring points, the pressure comparison test pumps series LR-*Cal* **LSP-H** are provided with a fine adjustable spindle pump.

In addition the series LR-*Cal* **LSP-H** feature a threaded spindle which only runs within the pump body. Thus there is no adverse bending moment acting on an outstanding spindle, and particularly for field use this has the advantage that the dimension of these pressure comparison pumps will not change when the spindle is turned during operation. The series LR-*Cal* **LSP-H** needs only little force to generate also high pressures.

For an easier operating, the LR-*Cal* **LSP-H** series pressure comparators are fitted with a priming pump.

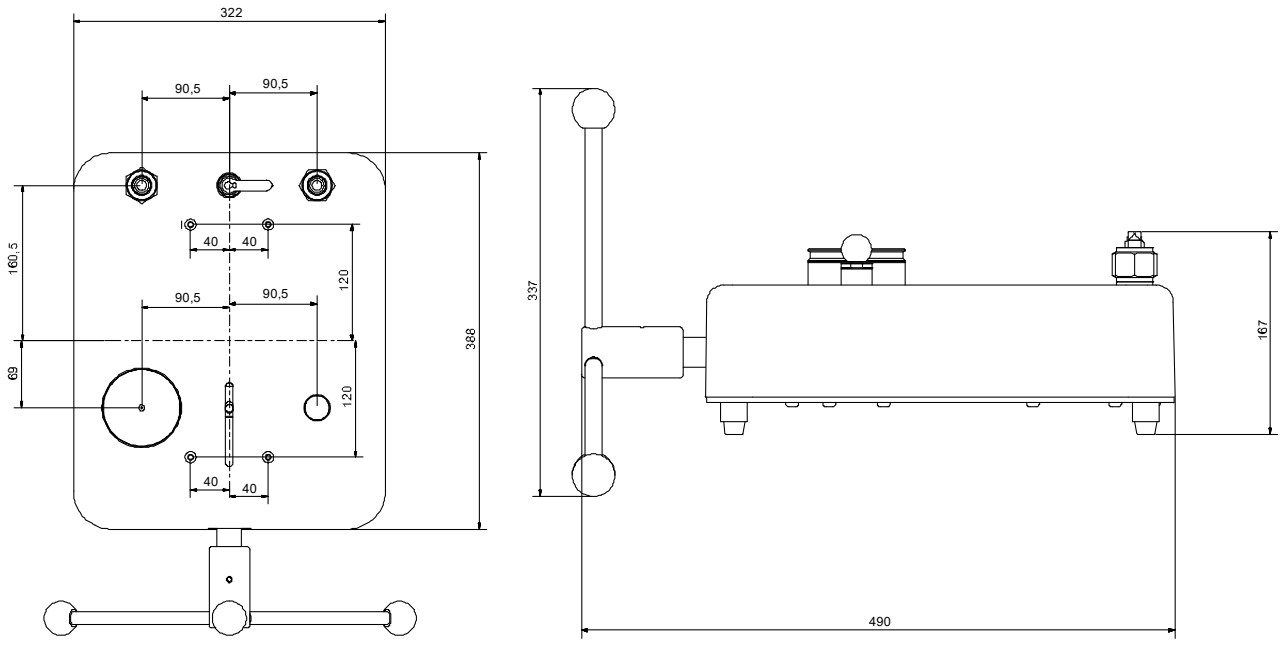
Versions for aggressive media like SKYDROL® or brake fluids available on request (max. 1,000 bar / 1,200 bar).



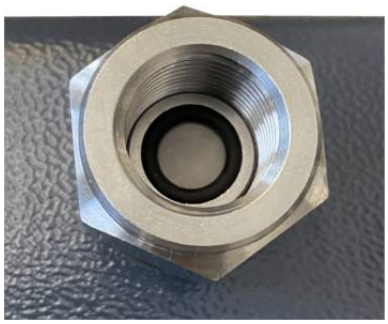
LSP Hydraulic pressure comparison test pump
1000 / 1200 / 1600 bar - 14500 / 17400 / 23200 psi

LR-Cal

Dimension



Protection against material pollution



The pressure comparison test pumps models **LR-Cal LSP-H** are equipped with strainer dirt collectors in the pressure ports as well as in the bottom of the operation fluid reservoir. This reduces considerable the risk of material pollution of the operation fluid.
(Note: if operated with hydraulic oil, the dirt collector in the reservoir has to be removed.)

Recommended pressure reference instruments

Type	Description	Accuracy
LR-Cal LPC 300	Documenting process calibrator	±0.025% FS
LR-Cal LPC 200	Electronic pressure calibrator	±0.025% FS
LR-Cal TLDMM 2.0	Precision digital reference gauge	±0.050% FS
LR-Cal LDM 80+KL01	Digital test pressure gauge	±0.100% FS
LR-Cal LDM 70-E25	Digital test pressure gauge	±0.125% FS
LR-Cal LDM 80	Digital test pressure gauge	±0.200% FS
LR-Cal LDM 70-K50	Digital test pressure gauge	±0.250% FS

LR-Cal

Hydraulic pressure comparison test pump
1000 / 1200 / 1600 bar - 14500 / 17400 / 23200 psi

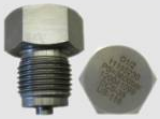
LSP-H

Technical Data

Technical Data		LR-*Cal* LSP 1000-H	LR-Cal LSP 1200-H	LR-*Cal* LSP 1600-H
Pressure range	[bar]	0...1,000	0...1,200	0...1,600
	[psi]	0...14,500	0...17,400	0...23,200
Medium		Mineral Oil or Destilled Water		
Pressure ports		2 x 1/2" BSP female rotating, incl. stainer and gasket		
Fluid reservoir	[cm³]	200		
Piston diameter	[mm]	8		
Spindle stroke	[cm³]	approx. 3.9 (per turnaround: approx. 0.1)		
Needed force	[Nm]	at 250 bar: 2.0 / at 500 bar: 4.0 / at 1,000 bar: 8.0		
Materials		Stainless steel, Aluminium, Viton, NBR, Plastics		
Dimensions				
distance of pressure ports	[mm]	181		
Depth	[mm]	388 without star-handle; 490 incl. star-handle		
Width	[mm]	322		
Height	[mm]	167 without star-handle; 337 incl. star-handle		
Weight	[kg]	10.5		
Design		Base plate with feet and rigid housing		

Version for aggressive media such like SKYDROL® and brake fluids available on request: max. 1,000 bar = Order-Code: LSP-1000-H-S; max. 1,200 bar = Order-Code: LSP-1200-H-S. This versions are not suitable for mineral oil or water.

Optional Accessories

Order-Code	Description	
HAP-02	Hand suction pump for easy emptying (and filling) of the reservoir. Capacity: 125 ml per stroke. Simultaneous suction and squeezing. 2 hoses, each 500 mm length, suction hose with rotating 3/8" BSP female swivel nut.	
LSP-H-WARTUNG	Maintenance kit, with following content: 10 O-rings for pressure ports (top), 10 O-rings for pressure ports (bottom), 2 sinter filter for reservoir, 4 strainer dirt collectors for pressure ports, 2 O-rings for priming pump (piston).	
BLINDSTOPFEN-G12-VA	Blind plugs for pressure port (1/2" BSP) st.st., PN 3600 bar	
LSP-ADAPTER-SET	Set of stainless steel adapters, PN 1000 bar, 1/4" BSP, M20x1.5, 1/4" NPT, 1/2" NPT, gaskets	
VA-M16X2-G12A	Minimess 1620 coupling to 1/2" BSP male for pressure port	
MMS-M16X2-1-0	Minimess 1620 hose 1.0 m	
MMS-M16X2-2-0	Minimess 1620 hose 2.0 m	
MMS-M16X2-3-2	Minimess 1620 hose 3.2 m	
MMS-M16X2-4-0	Minimess 1620 hose 4.0 m	
MSV-G12-M16X2	Minimess 1620 adapter to 1/2" BSP female	

Rel. 20200930

Hydraulic pressure comparison test pump
Serie LR-*Cal* LSP-H

- **Pressure source for calibration purposes**
- **Spindle pump and priming pump**

Model LR-*Cal* LSP 1000-H: 1000 bar/14500 psi
Model LR-*Cal* LSP 1200-H: 1200 bar/17400 psi
Model LR-*Cal* LSP 1600-H: 1600 bar/23200 psi

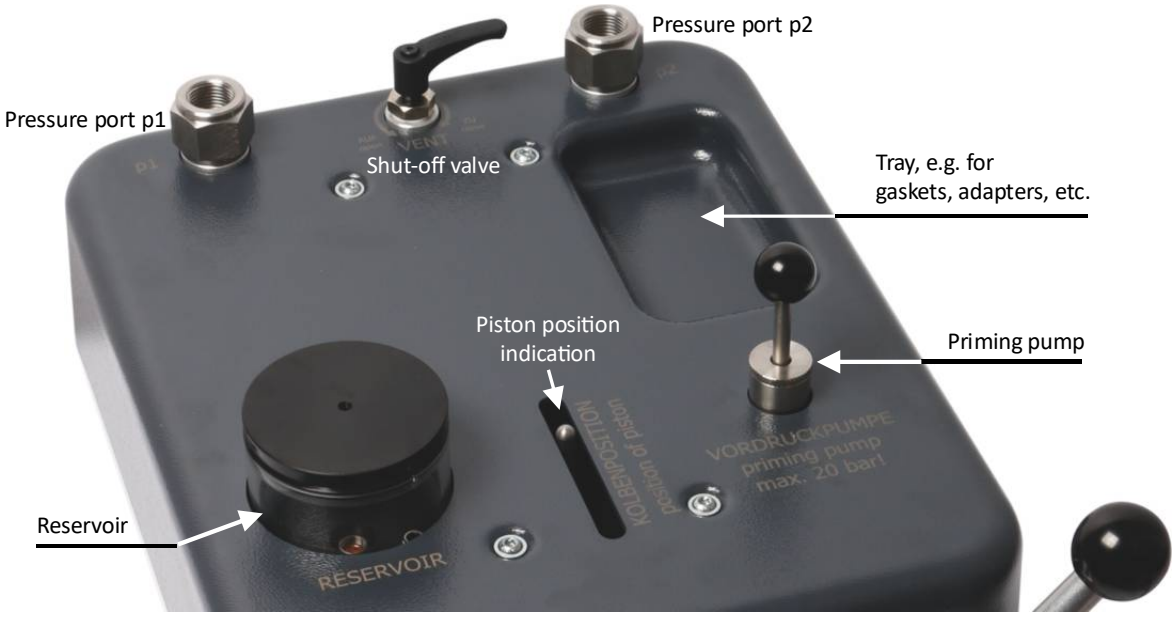
Operating fluid: mineral oil based hydraulic fluid or destilled water

Pressure comparison test pumps are used for generating pressure for the testing, adjusting and calibrating of mechanical and electronic pressure measuring instruments by means of comparison measurements. These pressure tests can be carried out in laboratories, workshops or on site at the set measuring point.
When the device under test and a reference measuring instrument with an adequate accuracy are connected to the pressure comparator, the same pressure will act on both measuring instruments after actuating the pump. A calibration or an adjustment can be carried out by comparing the two measured values at any pressure value.
In order to enable an accurate generation of the measuring points, the pressure comparison test pumps series LR-*Cal* **LSP-H** are provided with a fine adjustable spindle pump.

In addition the series LR-*Cal* **LSP-H** feature a threaded spindle which only runs within the pump body. Thus there is no adverse bending moment acting on an outstanding spindle, and particularly for field use this has the advantage that the dimension of these pressure comparison pumps will not change when the spindle is turned during operation. The series LR-*Cal* **LSP-H** needs only little force to generate also high pressures.

For an easier operating, the LR-*Cal* **LSP-H** series pressure comparators are fitted with a priming pump.

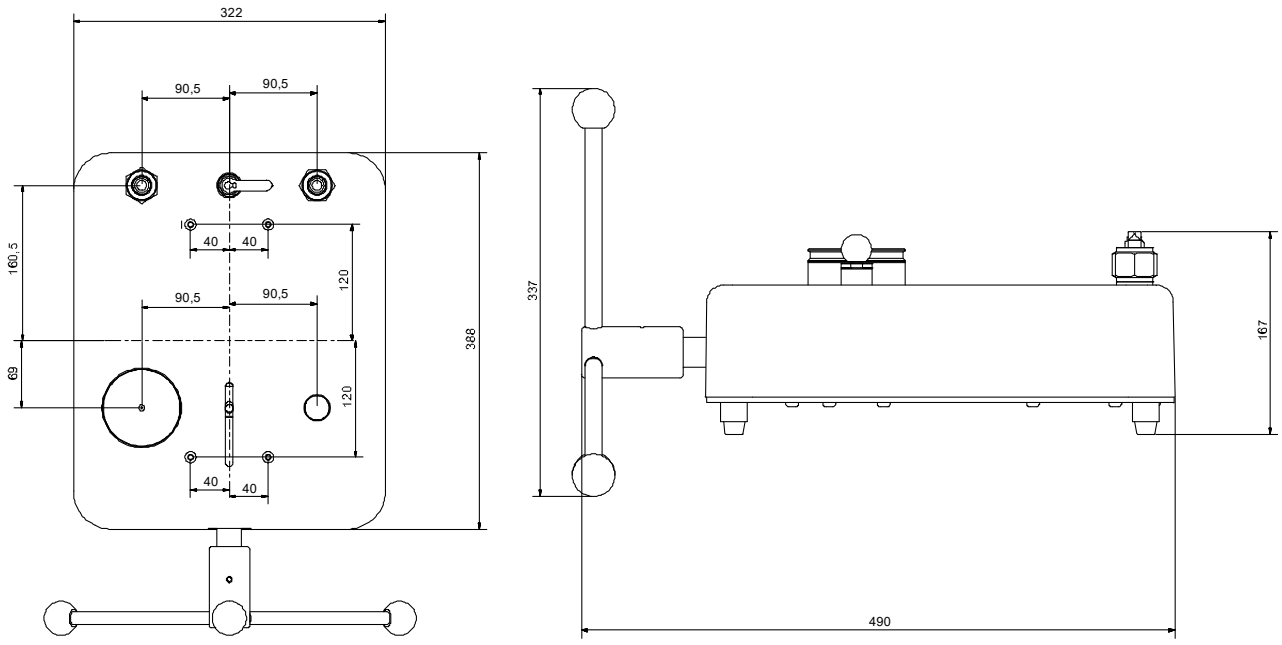
Versions for aggressive media like SKYDROL® or brake fluids available on request (max. 1,000 bar / 1,200 bar).



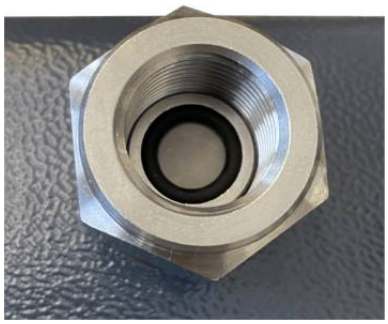
LSP Hydraulic pressure comparison test pump
1000 / 1200 / 1600 bar - 14500 / 17400 / 23200 psi

LR-Cal

Dimension



Protection against material pollution



The pressure comparison test pumps models **LR-Cal LSP-H** are equipped with strainer dirt collectors in the pressure ports as well as in the bottom of the operation fluid reservoir. This reduces considerable the risk of material pollution of the operation fluid.
(Note: if operated with hydraulic oil, the dirt collector in the reservoir has to be removed.)

Recommended pressure reference instruments

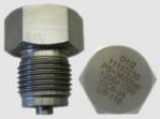
Type	Description	Accuracy
LR-Cal LPC 300	Documenting process calibrator	±0.025% FS
LR-Cal LPC 200	Electronic pressure calibrator	±0.025% FS
LR-Cal TLDMM 2.0	Precision digital reference gauge	±0.050% FS
LR-Cal LDM 80+KL01	Digital test pressure gauge	±0.100% FS
LR-Cal LDM 70-E25	Digital test pressure gauge	±0.125% FS
LR-Cal LDM 80	Digital test pressure gauge	±0.200% FS
LR-Cal LDM 70-K50	Digital test pressure gauge	±0.250% FS

Technical Data

Technical Data		LR-*Cal* LSP 1000-H	LR-Cal LSP 1200-H	LR-*Cal* LSP 1600-H
Pressure range	[bar]	0...1,000	0...1,200	0...1,600
	[psi]	0...14,500	0...17,400	0...23,200
Medium		Mineral Oil or Destilled Water		
Pressure ports		2 x 1/2" BSP female rotating, incl. stainer and gasket		
Fluid reservoir	[cm³]	200		
Piston diameter	[mm]	8		
Spindle stroke	[cm³]	approx. 3.9 (per turnaround: approx. 0.1)		
Needed force	[Nm]	at 250 bar: 2.0 / at 500 bar: 4.0 / at 1,000 bar: 8.0		
Materials		Stainless steel, Aluminium, Viton, NBR, Plastics		
Dimensions				
distance of pressure ports	[mm]	181		
Depth	[mm]	388 without star-handle; 490 incl. star-handle		
Width	[mm]	322		
Height	[mm]	167 without star-handle; 337 incl. star-handle		
Weight	[kg]	10.5		
Design		Base plate with feet and rigid housing		

Version for aggressive media such like SKYDROL® and brake fluids available on request: max. 1,000 bar = Order-Code: LSP-1000-H-S; max. 1,200 bar = Order-Code: LSP-1200-H-S. This versions are not suitable for mineral oil or water.

Optional Accessories

Order-Code	Description	
HAP-02	Hand suction pump for easy emptying (and filling) of the reservoir. Capacity: 125 ml per stroke. Simultaneous suction and squeezing. 2 hoses, each 500 mm length, suction hose with rotating 3/8" BSP female swivel nut.	
LSP-H-WARTUNG	Maintenance kit, with following content: 10 O-rings for pressure ports (top), 10 O-rings for pressure ports (bottom), 2 sinter filter for reservoir, 4 strainer dirt collectors for pressure ports, 2 O-rings for priming pump (piston).	
BLINDSTOPFEN-G12-VA	Blind plugs for pressure port (1/2" BSP) st.st., PN 3600 bar	
LSP-ADAPTER-SET	Set of stainless steel adapters, PN 1000 bar, 1/4" BSP, M20x1.5, 1/4" NPT, 1/2" NPT, gaskets	
VA-M16X2-G12A	Minimess 1620 coupling to 1/2" BSP male for pressure port	
MMS-M16X2-1-0	Minimess 1620 hose 1.0 m	
MMS-M16X2-2-0	Minimess 1620 hose 2.0 m	
MMS-M16X2-3-2	Minimess 1620 hose 3.2 m	
MMS-M16X2-4-0	Minimess 1620 hose 4.0 m	
MSV-G12-M16X2	Minimess 1620 adapter to 1/2" BSP female	

Rel. 20150511

Hydraulic Pressure Comparison Test Pump LR-*Cal* LSP-4000

- **Simple hydraulic test pressure generation on site, in the laboratory or in the workshop**
- **For testing, adjustment and calibration of all types of pressure measuring instruments**
- **Hydraulic pressure generation up to 4,000 bar (58,000 psi)**
- **Precisely adjustable dual-area spindle pump for filling, pressure generation and fine adjustment of pressure**
- **Compact dimensions, low weight**

The **LR-*Cal* LSP-4000** serves as pressure generator for the testing, adjustment and calibration of mechanical and electronic pressure measuring instruments through comparative measurements. The device can be used in the laboratory or workshop, or on site at the measuring point.
By connecting the test item and a sufficiently accurate reference pressure measuring instrument to the test pump, the same pressure will act on both measuring instruments. By comparison of the two measured values at any given pressure value, a check of the accuracy and/or adjustment of the pressure measuring instrument under test can be carried out.

The integrated dual-area spindle pump with switching valve enables rapid filling of the test system and smooth pressure generation.
At the same time, the precisely adjustable spindle pump also serves for fine pressure adjustment. A control schematic for pressure generation on the instrument base facilitates quick and easy operation.
The two test connections are equipped with 1/2" BSP female loose union connections with double ended metal cone. Two threaded adapters mounted on M16 x 1.5 male thread are included in the scope of delivery. Further thread adapters are available for the calibration of instruments with different connection threads.

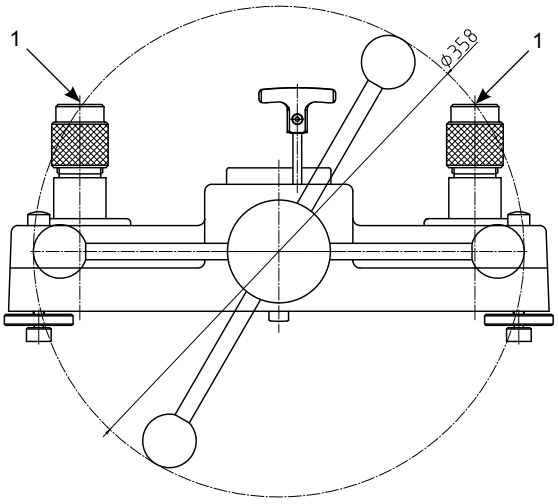
Technical data:

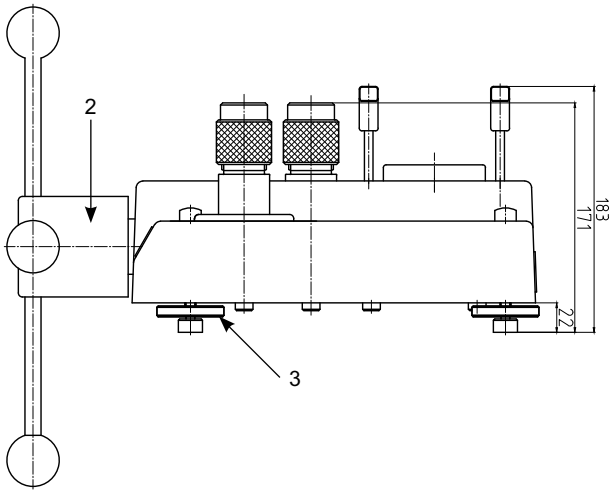
Pressure range:	0…4,000 bar
Pressure transmission medium:	Hydraulic fluid based on VG22 mineral oil (optional: sebacate oil)
Reservoir:	170 cm³
Test connections (2):	2 x 1/2" BSP female thread union nut with metal cone equipped with 2 thread adapters M16 x 1.5 as standard
Distance between test connections:	290 mm
Low-pressure piston diamter:	31.2 mm
High-pressure piston diameter:	6.35 mm
Displacement:	approx. 5 cm³
Wetted parts:	Austenitic stainless steel, high-tensile brass, nitrile rubber
Operating temperature:	0…40°C
Dimensions:	W 401 x D 397 x H 155 mm
Weight:	13.5 kg
Optional storage case:	Wood, W 664 x D 614 x H 380 mm, weight 8.5 kg
CE conformity:	97/23/EC (PS > 1,000 bar; module A, pressure accessory)

Scope of standard delivery:

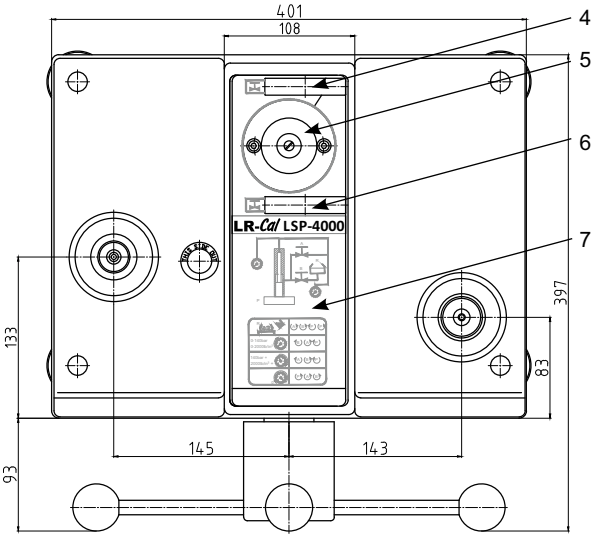
- Pressure comparator **LR-*Cal* LSP-4000** with dual-area spindle pump
- 2 pressure ports with 1/2" BSP female rotating swivel nuts with metal cone
- 2 adapters M16 x 1.5 male thread with sealing cone
- Mineral oil VG22 (0.5 l)
- Tool and maintenance set
- Operating manual (English/German)

Dimensions in mm

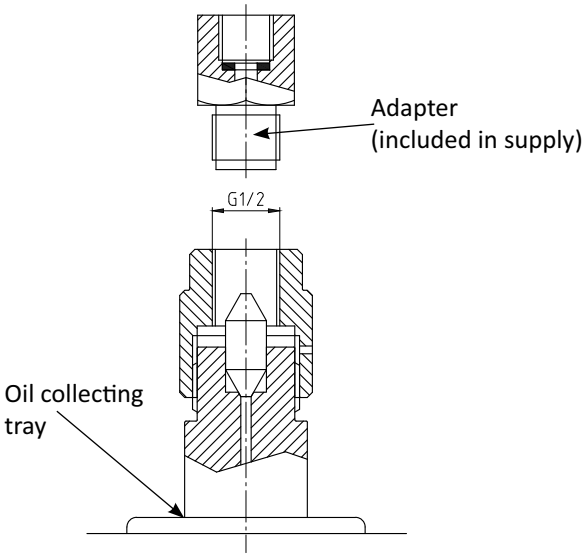




(1) Test connection
(2) Dual-area spindle pump with star handle
(3) Rotatable feet
(4) High-pressure shut-off valve
(5) Reservoir with sealing plug
(6) Low-pressure shut-off valve
(7) Pressure generation control schematic



Test connection



Order-Codes

- LR-*Cal* **LSP-4000** version for mineral oil:
  Order-Code: LSP-4000-MO
- LR-*Cal* **LSP-4000** version for sebacate oil:
  Order-Code: LSP-4000-SO

Optional accessories

- Adapter for test connectionM20 x 1.5 male,
  with sealing cone, made in hardened st.st.
  Order-Code: LSP-HP-A-M20
- Adapter for test connection 9/16-18 UNF male,
  with sealing cone, made in hardened st.st.
  Order-Code: LSP-HP-A-916
- Adapter for test connection 1/2" BSP female with O-ring
  max. 1,600 bar, in st.st. 1.4571
  Order-Code: LSP-HP-A-G12
- Storage case, wood
  Order-Code: LSP-4000-AB
- Set with spare gaskets and o-rings
  Order-Code: LSP-4000-WARTUNG
- Operating fluid 0.5 l (Mineral oil VG22)
  Order-Code: LSP-HP-FLUID
- Operating fluid 0.5 l for version for sebacate oil
  Order-Code: SEBACATE-05

Rel. 20191113

High Pressure Comparison Test Pump
LR-*Cal* LSP-7000

Pressure Source for calibration purposes
Operating fluid: oil

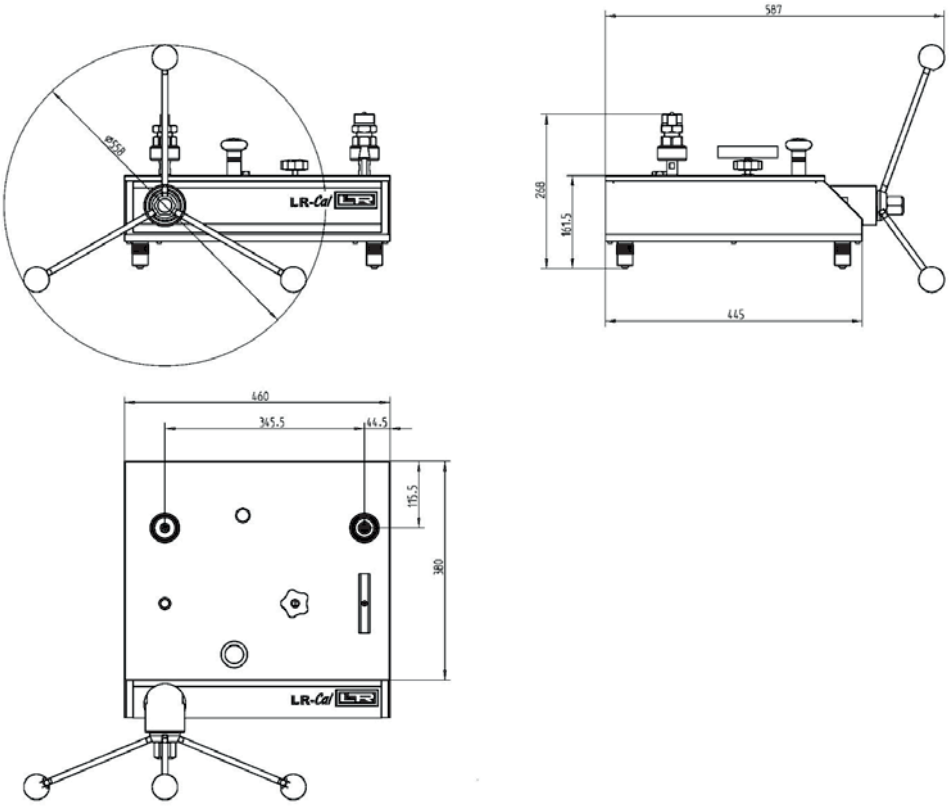
Pressure Comparison Test Pumps are used to generate pressures for checking, adjusting and calibrating mechanical and electronic pressure measuring instruments by comparative measurements. These pressure tests may be carried out in laboratories, workshops or on site at the measuring point.

The comparison test pump **LR-*Cal* LSP-7000** is equipped with two connections for the test specimen and the reference instrument which can be used in any order. If the instrument to be tested and a sufficiently accurate reference measuring instrument are connected to the test pump, the same pressure is applied to the two measuring instruments when the pump is operated. By comparing the two measured values at random pressure values, the accuracy can be verified or the instrument under test can be adjusted. First the pressure is set via an integrated initial (priming) pressure pump. For further pressure generation and for fine adjustment by approaching the measuring points precisely an adjustable volume with precision spindle is available. Another important feature of the test pump **LR-*Cal* LSP-7000** is the rotating spindle that only runs inside the body of the pump. This eliminates the negative effect of a bending torque on a spindle turning outside the body and offers the advantage, especially for use in the field, that the dimensions of these pumps do not change during operation due to the spindle turning.

Technical Data

Order-Code:		LSP-7000-HP
Pressure Range:		0...7000 bar 0...101520 psi
Medium:		oil
Pressure connections:		2 x M16 x 1,5 male thread, rotating, changeable, with sealing cone
Distance of the test connections:		346 mm
Liquid reservoir:		250 cm³
Piston diameter:		7.5 mm
Swept volume per revolution:		approx. 0.08 cm³
Overall swept volume:		approx. 2.5 cm³
Required moment at	250 bar 500 bar 1000 bar 3000 bar 5000 bar 7000 bar	1.5 Nm 3.0 Nm 6.0 Nm 18 Nm 30 Nm 42 Nm
Material	Cylinder Piston Tubing Sealing gaskets	stainless steel hardened steel stainless steel 1.4404, 6 x 2 mm NBR
Dimensions:		W 460 x D 445 x H 265 mm
Weight:		32.5 kg
CE-Conformity:		97/23/EC Pressure equipment directive (Module A)

Dimensions:



Optional Accessories:

Order-Code	Description
LSP-HP-FLUID	Operation liquid, 0.5 l in plastic bottle
LSP-HP-A-M16	Threaded adapter M16 x 1.5 male thread with sealing cone Material: hardened stainless steel
LSP-HP-A-M20	Threaded adapter M20 x 1.5 male thread with sealing cone Material: hardened stainless steel
LSP-HP-A-916	Threaded adapter 9/16-18 UNF male thread with sealing cone Material: hardened stainless steel
LSP-HP-A-G12	Threaded adapter 1/2" BSP female thread with O-ring, max. 1600 bar (max. 23200 psi). Material: stainless steel 1.4571

Recommended Reference Instrument:

Electronic **pressure calibrator LR-*Cal* LPC 300**, together with High-Pressure-Transmitter **LPC-S**. This special pressure transmitter are available e.g. with ranges **0-5000 bar** (0-72520 psi) or **0-6000 bar**. Used with the **LR-*Cal* LPC 300** calibrator, the total accuracy is better than **±0.15%** of full scale value. In this way, the functionality of the **LR-*Cal* LPC 300** calibrator is also available for this very high pressures.
Supply includes a traceable certificate of calibration.
Optional: DAkkS (DKD) certification.

Alternatively: pressure calibrator **LR-*Cal* PC 200**, up to 6000 bar or Temperature and Pressure Calibrator **LR-*Cal* LPC 200-T**.

LR-Cal

Hydraulic Comparison Calibration Pump 400 bar / 5800 psi - for Oxygen use

BT400-OX

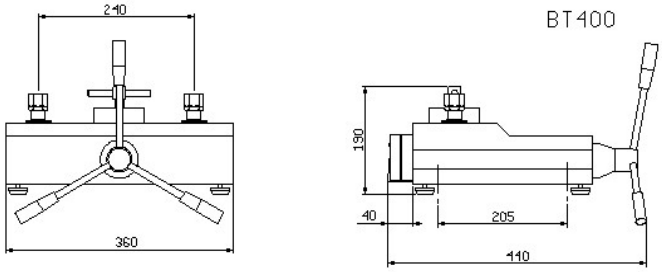
Hydraulic Comparison Calibration Pump
for the comparison calibration of pressure gauges, transmitters, switches...
Type BT 400-OX: up to 400 bar / 5800 psi, for OXYGEN use, free of oil

Features:

- Structure in 2 mm thick metal sheets designet to simplify carrying
- To be fitted onto a work bench by means of 4 adjustable feet or attached to a surface by means of holes on the base
- High pressure unit made in one piece with a brass rod
- Bronze trapezoidal screws and nut screws with st.st. bearing
- Triple-stroke hand-wheel tilted towards operator
- Sockets for 1/2" BSP manometers with rotating screw nut
- St.st. build-in reservoir with hand-wheel operated head valve
- Hydraulic liquid used: destilled water
- Free of oil, suitable for OXYGEN

BT400-OX with Calibrator LPC 300 and test item

Dimensions:



Technical Data:	BT400-OX
Range of Use:	0 - 400 bar / 0 - 5800 psi
Test pressure:	600 bar / 8700 psi
Total capacity:	76 cm³
Displacement / turn:	appr. 2 cm³
Total screw stroke:	appr. 160 mm
Operative stress:	at 50 bar appr. 1 Kgm
Dimensions:	450 x 360 x 300 mm
Weight:	14 kg

Typical operation:

Comparison calibration of pressure gauges, transmitters, pressure switches, transducers with reference instrument (test gauge, precision indicator). The sturdiness and compactness make the BT400-OX easy to use both in the laboratory and on site in the field.

LR-Cal

Hydraulic Comparison Calibration Pump 400 bar / 5800 psi - for Oxygen use

BT400-OX

Standard Accessories:

- Service box wrench Ch 27
- 3/8" BSP rotating connection
- Complete series of spare gaskets
- Case for carrying spare parts
- Operating manual

Optional Accessories:

- Analogue test pressure gauges 17.1, Accuracy ±0.6% f.s. to ±0.1% f.s., free of oil, for oxygen use
- Electronic pressure calibrator LPC 300, Accuracy ±0.025% f.s., free of oil, for oxygen use

Note:
The test pressure gauges shown on the pictures/images are not included in standard supply.