

**Applications:**

- Primary standard for defining the pressure scale in a range up to 120 bar (1,600 psi), pneumatic.
- Reference instrument for testing, adjusting and calibrating pressure measuring instruments in factories and calibration laboratories.
- Self-contained, complete system also suitable for on-site measurements/calibrations.

**Special features:**

- Total uncertainty of measurement down to  $\pm 0.008\%$  of reading.
- Inspection certificate 3.1 according to DIN EN 10204 as standard, DAkkS certificate traceable and accredited according to ISO 17025 available as option.
- High long-term stability with a recommended recalibration cycle of 5 years.
- Masses manufactured from stainless steel and aluminium, local gravity adjustment possible at not additional charge.
- Optional a quick-change system for piston-cylinder unit available, enables fast and secure exchange of the piston-cylinder system in order to change the measuring range.


**Description:**
**Proven primary standard**

Pressure balances are the most accurate instruments for the calibration of electronic or mechanical pressure measuring instruments. The direct measurement of pressure ( $P = F/A$ ) and the use of high-quality materials, result in small measurement uncertainties and an excellent long-term stability of five years (Recommendation in accordance with the German Calibration Service DAkkS). For these reasons pressure balances / deadweight testers have already been used in the calibration laboratories of industry, national institutes and research laboratories for many years.

**Self-contained operation**

Due to the integrated pressure generation (for ranges up to 7 bar) and the purely mechanical measuring principle, the LR-Cal LDW-P deadweight tester is ideally suited to on-site use as well as service and maintenance purposes.

**Basic principle**

Pressure is defined as the quotient of force and area. Correspondingly, the core of the LR-Cal LDW-P deadweight tester is a very precisely-manufactured piston-cylinder system, which is loaded with masses in order to generate the individual test points.

The weight applied is proportional to the desired pressure and accomplished by using optimally graduated weights. These weights are manufactured to standard gravity ( $9.80665 \text{ m/s}^2$ ) although, for fixed location usage, they can be adjusted to a customer-specified local gravity.

### Easy operation

Depending on the instrument range the pressure is set via an integrated pump or via an external pressure supply by the use of control valves. For fine adjustment a very precisely adjustable spindle pump with a precision spindle running only within the pump body is mounted.

### Piston-cylinder system

Both the piston and cylinder are manufactured from Tungsten Carbide. Compared to other materials, Tungsten Carbide has very small pressure and thermal expansion coefficients, which results in a very good linearity of the effective cross-sectional area of the piston and high measurement accuracy.

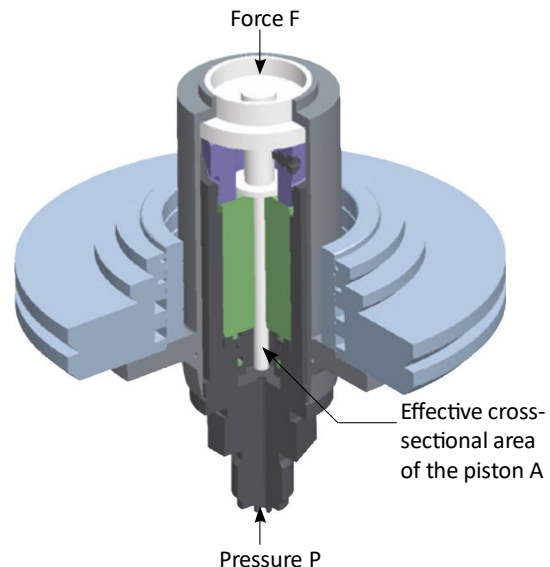
Piston and cylinder are very well protected in a solid stainless steel housing, against contact, impacts or contamination from outside. In addition, overpressure protection is integrated, which prevents the piston from being forced out vertically and avoids damage to the piston cylinder system in the event of weight removal under pressure.

The weight discs are stacked on a bell jar which is fitted to the piston skirt. Due to the construction of the bell jar, the centre of gravity for the stacked weights is very low, which minimises both the side thrust on the piston-cylinder system and the friction. For relatively low starting pressures, a lighter aluminium plate can be used instead of the bell jar.

The overall design of the piston-cylinder unit and the very precise manufacturing of both the piston and the cylinder ensure excellent operating characteristics with a long free-rotation time, low sink rates and a very high long-term stability. Therefore the recommended recalibration interval is 5 years.

The standard connection for the piston-cylinder system is an M30 x 2 male thread. A quick-connect system, for easy measuring range changes without tools, is available as an option.

As soon as the measuring system reaches equilibrium, there is a balance of forces between pressure and mass applied. The excellent quality of the system ensures that this pressure remains stable over several minutes, so that the device under test can be calibrated or time-consuming adjustments can be carried out without any problems.



### High performance instrument base

The instrument base is supplied in two different versions, depending on the measurement range of the deadweight tester:

- Basement for ranges up to 7 bar / 100 psi  
With integrated pressure generation through inlet pressure pump and spindle pump
- Basement for Vacuum and ranges  $\geq 25$  bar up to 120 bar / 1,600 psi  
With connection for external pressure supply or vacuum, incl. inlet vent.

### Gratis - Free of charge:

Download-Link for a MS-Excel sheet for calculation of corrections (e.g. air density, piston temperature) and masses/pressure calculation:

<https://www.druck-temperatur.de/images/software/dwt-corrections.zip>

### Set of masses for the LR-Cal LDW-P:

The mass set is supplied in rigid carrying cases with foams. Here included are the masses shown in below tables, manufactured in stainless steel (non-magnetic).

The weight discs are optimally graduated.



For smaller graduation an incremental weight set is recommended, see accessories.

### Tables of masses

The following tables show the number of weights per measuring range, within a weight set, with their nominal mass values and the resulting nominal pressures. Should you not operate the device under reference conditions (ambient temperature 20°C, air pressure 1013 mbar, relative humidity 40%), corrections must be considered, if necessary.

These weights are manufactured to standard gravity ( $9.80665 \text{ m/s}^2$ ) although, for fixed location usage, they can be adjusted to a customer-specified local gravity (no extra charge, order-code [LDW-P-GRAV](#)).

| Measuring range<br>[bar]                                                      | 0.015...1 |                                      | 0.015...2 |                                      | 0.1...7  |                                     | 0.2...25 |                                     | 1...70     |                                     | 1...120    |                                     |
|-------------------------------------------------------------------------------|-----------|--------------------------------------|-----------|--------------------------------------|----------|-------------------------------------|----------|-------------------------------------|------------|-------------------------------------|------------|-------------------------------------|
|                                                                               | Quantity  | Nominal pressure per piece<br>[mbar] | Quantity  | Nominal pressure per piece<br>[mbar] | Quantity | Nominal pressure per piece<br>[bar] | Quantity | Nominal pressure per piece<br>[bar] | Quantity   | Nominal pressure per piece<br>[bar] | Quantity   | Nominal pressure per piece<br>[bar] |
| Piston and make-up weight                                                     | 1         | 0.015                                | 1         | 0.015                                | 1        | 0.1                                 | 1        | 0.2                                 | 1          | 1                                   | 1          | 1                                   |
| Standard mass set                                                             | 1         | 0.005                                | 1         | 0.005                                | 1        | 0.4                                 | 1        | 0.3                                 | 2          | 1                                   | 2          | 1                                   |
|                                                                               | 3         | 0.02                                 | 3         | 0.02                                 | 2        | 0.5                                 | 1        | 4.5                                 | 5          | 10                                  | 1          | 18                                  |
|                                                                               | 2         | 0.01                                 | 2         | 0.01                                 | 5        | 1                                   | 3        | 5                                   | 1          | 9                                   | 4          | 20                                  |
|                                                                               | 6         | 0.05                                 | 6         | 0.05                                 | 2        | 0.2                                 | 2        | 2                                   | 2          | 4                                   | 1          | 10                                  |
|                                                                               | 6         | 0.1                                  | 6         | 0.1                                  | 1        | 0.1                                 | 1        | 1                                   | 1          | 2                                   | 2          | 4                                   |
|                                                                               | -         | -                                    | 1         | 1                                    | 1        | 0.05                                | 1        | 0.5                                 | 1          | 0.5                                 | 1          | 2                                   |
|                                                                               | -         | -                                    | -         | -                                    | -        | -                                   | -        | -                                   | -          | -                                   | 1          | 0.5                                 |
| Optional set of fine increment masses<br>order-code <a href="#">LDW-P-FMS</a> | -         | -                                    | -         | -                                    | 2        | 0.02                                | 2        | 0.2                                 | 1          | 0.4                                 | 1          | 0.4                                 |
|                                                                               | -         | -                                    | -         | -                                    | 1        | 0.01                                | 1        | 0.1                                 | 1          | 0.2                                 | 1          | 0.2                                 |
|                                                                               | -         | -                                    | -         | -                                    | 1        | 0.005                               | 1        | 0.05                                | 1          | 0.1                                 | 1          | 0.1                                 |
|                                                                               | -         | -                                    | -         | -                                    | -        | -                                   | 2        | 0.02                                | 2          | 0.04                                | 2          | 0.04                                |
|                                                                               | -         | -                                    | -         | -                                    | -        | -                                   | 1        | 0.01                                | 1          | 0.02                                | 1          | 0.02                                |
| Measuring range<br>[PSI]                                                      | 0.2...15  |                                      | 0.2...30  |                                      | 1...100  |                                     | 3...400  |                                     | 15...1,000 |                                     | 10...1,600 |                                     |
|                                                                               | Quantity  | Nominal pressure per piece<br>[PSI]  | Quantity  | Nominal pressure per piece<br>[PSI]  | Quantity | Nominal pressure per piece<br>[PSI] | Quantity | Nominal pressure per piece<br>[PSI] | Quantity   | Nominal pressure per piece<br>[PSI] | Quantity   | Nominal pressure per piece<br>[PSI] |
| Piston and make-up weight                                                     | 1         | 0.2                                  | 1         | 0.2                                  | 1        | 1                                   | 1        | 3                                   | 1          | 10                                  | 1          | 10                                  |
| Standard mass set                                                             | 1         | 0.05                                 | 1         | 0.05                                 | 1        | 4                                   | 1        | 7                                   | 2          | 10                                  | 2          | 10                                  |
|                                                                               | 1         | 0.1                                  | 1         | 0.1                                  | 2        | 5                                   | 1        | 90                                  | 1          | 180                                 | 1          | 180                                 |
|                                                                               | 2         | 0.2                                  | 2         | 0.2                                  | 8        | 10                                  | 2        | 100                                 | 3          | 200                                 | 6          | 200                                 |
|                                                                               | 1         | 0.5                                  | 1         | 0.5                                  | 2        | 2                                   | 1        | 50                                  | 1          | 100                                 | 1          | 100                                 |
|                                                                               | 1         | 0.8                                  | 1         | 0.8                                  | 1        | 1                                   | 2        | 20                                  | 2          | 40                                  | 2          | 40                                  |
|                                                                               | 1         | 1                                    | 1         | 1                                    | 1        | 0.5                                 | 1        | 10                                  | 1          | 20                                  | 1          | 20                                  |
|                                                                               | 2         | 2                                    | 2         | 2                                    | -        | -                                   | 1        | 5                                   | 1          | 5                                   | 1          | 5                                   |
|                                                                               | 2         | 4                                    | 2         | 4                                    | -        | -                                   | -        | -                                   | -          | -                                   | -          | -                                   |
|                                                                               | -         | -                                    | 1         | 15                                   | -        | -                                   | -        | -                                   | -          | -                                   | -          | -                                   |
| Optional set of fine increment masses<br>order-code <a href="#">LDW-P-FMS</a> | -         | -                                    | -         | -                                    | 2        | 0.2                                 | 2        | 2                                   | 1          | 4                                   | 1          | 4                                   |
|                                                                               | -         | -                                    | -         | -                                    | 1        | 0.1                                 | 1        | 1                                   | 1          | 2                                   | 1          | 2                                   |
|                                                                               | -         | -                                    | -         | -                                    | 1        | 0.05                                | 1        | 0.5                                 | 1          | 1                                   | 1          | 1                                   |
|                                                                               | -         | -                                    | -         | -                                    | -        | -                                   | 2        | 0.2                                 | 2          | 0.4                                 | 2          | 0.4                                 |
|                                                                               | -         | -                                    | -         | -                                    | -        | -                                   | 1        | 0.1                                 | 1          | 0.2                                 | 1          | 0.2                                 |

# LDW-P Deadweight Tester / Pressure Balance Pneumatic, Accuracy up to $\pm 0.008\%$ o.r.

LR-Cal



## Order-Codes:

**LR-Cal LDW-P - Pneumatisch, für kleine Drücke, mit integrierter Druckerzeugung.** Inkl. Kolbenzylinder-System, mit Gabelschlüssel auswechselbar. Inkl. Massensatz und Abnahmeprüfzeugnis 3.1 entsprechend DIN EN 10204

**LR-Cal LDW-P - pneumatic, for small pressures, with integrated manual pressure source.** Incl. piston-cylinder system,

changeable with flat spanner. Incl. mass set and inspection certificate 3.1 according to DIN EN 10204

Prüfungsanschluss G 1/2

Pressure port for test item: 1/2" BSPF

|                      |                               | Genauigkeit $\pm 0,015\%$ v.Messwert<br>Uncertainty $\pm 0.015\%$ of measured value | Genauigkeit $\pm 0,008\%$ vom Messw.<br>Uncertainty $\pm 0.008\%$ measured value |
|----------------------|-------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Prüfbereich<br>Range | Druckeinheit<br>Pressure Unit | Artikel-Nummer<br>Order Code                                                        | Artikel-Nummer<br>Order Code                                                     |
| 0,015 ... 1          | bar                           | LDW-P-B-00001-G015                                                                  | LDW-P-B-00001-G008                                                               |
| 0,015 ... 2          | bar                           | LDW-P-B-00002-G015                                                                  | LDW-P-B-00002-G008                                                               |
| 0,1 ... 7            | bar                           | LDW-P-B-00007-G015                                                                  | LDW-P-B-00007-G008                                                               |
| 0,2 ... 15           | PSI                           | LDW-P-P-00015-G015                                                                  | LDW-P-P-00015-G008                                                               |
| 0,2 ... 30           | PSI                           | LDW-P-P-00030-G015                                                                  | LDW-P-P-00030-G008                                                               |
| 1 ... 100            | PSI                           | LDW-P-P-00100-G015                                                                  | LDW-P-P-00100-G008                                                               |

### Zusätzliche Kolben-/Zylinder-Systeme (PNEUMATISCH) zu o.g. Modellen mit integrierter Druckerzeugung

Additional piston-/cylinder-units for above mentioned PNEUMATIC models with integrated manual pressure source

|             |     |                     |                     |
|-------------|-----|---------------------|---------------------|
| 0,015 ... 1 | bar | LDW-PK-B-00001-G015 | LDW-PK-B-00001-G008 |
| 0,015 ... 2 | bar | LDW-PK-B-00002-G015 | LDW-PK-B-00002-G008 |
| 0,1 ... 7   | bar | LDW-PK-B-00007-G015 | LDW-PK-B-00007-G008 |
| 0,2 ... 15  | PSI | LDW-PK-P-00015-G015 | LDW-PK-P-00015-G008 |
| 0,2 ... 30  | PSI | LDW-PK-P-00030-G015 | LDW-PK-P-00030-G008 |
| 1 ... 100   | PSI | LDW-PK-P-00100-G015 | LDW-PK-P-00100-G008 |

### Massensätze für diese zusätzlichen Kolben-/Zylinder-Systeme

Sets of weights for this additional piston-/cylinder-units

|           |     |                              |                   |
|-----------|-----|------------------------------|-------------------|
| 0,015...1 | bar | inkl. Koffer / case included | LDW-P-MS-0001     |
| 0,015...2 | bar | inkl. Koffer / case included | LDW-P-MS-0002     |
| 0,1...7   | bar | inkl. Koffer / case included | LDW-P-MS-0007     |
| 0,2...15  | PSI | inkl. Koffer / case included | LDW-P-MS-0015-PSI |
| 0,2...30  | PSI | inkl. Koffer / case included | LDW-P-MS-0030-PSI |
| 1...100   | PSI | inkl. Koffer / case included | LDW-P-MS-0100-PSI |

### LR-Cal LDW-P - Pneumatisch, für Vakuum oder größere Drücke, mit Anschluss für ext. Druck- bzw. Vakuum-Versorgung

Inkl. Kolben-/Zylinder-System mit Gabelschlüssel auswechselbar. Inkl. Massensatz und Abnahmeprüfzeugnis 3.1

**LR-Cal LDW-P - pneumatic, for vacuum or higher pressures, with connector for external pressure/vacuum source.**

Incl. piston-cylinder-unit changeable with flat spanner. Incl. mass set and inspection certificate 3.1 according to DIN 10204

Prüfungsanschluss G 1/2

Pressure port for test item: 1/2" BSPF

|               |              | Genauigkeit $\pm 0,015\%$ v.Messwert<br>Uncertainty $\pm 0.015\%$ of measured value | Genauigkeit $\pm 0,008\%$ vom Messw.<br>Uncertainty $\pm 0.008\%$ measured value |
|---------------|--------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| -1 ... -0,015 | bar (Vakuum) | LDW-P-B-00000-G015                                                                  | LDW-P-B-00000-G008                                                               |
| 0,2 ... 25    | bar          | LDW-P-B-00025-G015                                                                  | LDW-P-B-00025-G008                                                               |
| 1 ... 70      | bar          | LDW-P-B-00070-G015                                                                  | LDW-P-B-00070-G008                                                               |
| 1 ... 120     | bar          | LDW-P-B-00120-G015                                                                  | LDW-P-B-00120-G008                                                               |
| -15 ... -0,2  | PSI (Vakuum) | LDW-P-P-00000-G015                                                                  | LDW-P-P-00000-G008                                                               |
| 3 ... 400     | PSI          | LDW-P-P-00400-G015                                                                  | LDW-P-P-00400-G008                                                               |
| 15 ... 1000   | PSI          | LDW-P-P-01000-G015                                                                  | LDW-P-P-01000-G008                                                               |
| 10 ... 1600   | PSI          | LDW-P-P-01600-G015                                                                  | LDW-P-P-01600-G008                                                               |

### Zusätzliche Kolben-/Zylinder-Systeme (PNEUMATISCH) zu o.g. Modellen mit Anschluss für ext. Druck-/Vakuum-Quelle

Additional piston-/cylinder-units for above mentioned PNEUMATIC models with connector for external pressure/vacuum source

|               |              |                     |                     |
|---------------|--------------|---------------------|---------------------|
| -1 ... -0,015 | bar (Vakuum) | LDW-PK-B-00000-G015 | LDW-PK-B-00000-G008 |
| 0,2 ... 25    | bar          | LDW-PK-B-00025-G015 | LDW-PK-B-00025-G008 |
| 1 ... 70      | bar          | LDW-PK-B-00070-G015 | LDW-PK-B-00070-G008 |
| 1 ... 120     | bar          | LDW-PK-B-00120-G015 | LDW-PK-B-00120-G008 |
| -15 ... -0,2  | PSI (Vakuum) | LDW-PK-P-00000-G015 | LDW-PK-P-00000-G008 |
| 3 ... 400     | PSI          | LDW-PK-P-00400-G015 | LDW-PK-P-00400-G008 |
| 15 ... 1000   | PSI          | LDW-PK-P-01000-G015 | LDW-PK-P-01000-G008 |
| 10 ... 1600   | PSI          | LDW-PK-P-01600-G015 | LDW-PK-P-01600-G008 |

### Massensätze für diese zusätzlichen Kolben-/Zylinder-Systeme

Sets of weights for this additional piston-/cylinder-units

|             |              |                              |                   |
|-------------|--------------|------------------------------|-------------------|
| -1...-0,015 | bar (Vakuum) | inkl. Koffer / case included | LDW-P-MS-0001     |
| 0,2...25    | bar          | inkl. Koffer / case included | LDW-P-MS-0025     |
| 1...70      | bar          | inkl. Koffer / case included | LDW-P-MS-0070     |
| 1...120     | bar          | inkl. Koffer / case included | LDW-P-MS-0120     |
| -15...-0,2  | PSI (Vakuum) | inkl. Koffer / case included | LDW-P-MS-0015-PSI |
| 3...400     | PSI          | inkl. Koffer / case included | LDW-P-MS-0400-PSI |
| 15...1000   | PSI          | inkl. Koffer / case included | LDW-P-MS-1000-PSI |
| 10...1600   | PSI          | inkl. Koffer / case included | LDW-P-MS-1600-PSI |



The above mentioned vacuum ranges -1...-0.015 bar and -15...-0.2 PSI are realised with a vacuum adapter.

This vacuum ranges are possible only with basement version with connector for external pressure/vacuum source and with a suitable vacuum pump.

**Specification LR-Cal LDW-P:**

| Piston-cylinder systems                              |                                               |                   |                                                                                         |                  |                     |                 |
|------------------------------------------------------|-----------------------------------------------|-------------------|-----------------------------------------------------------------------------------------|------------------|---------------------|-----------------|
| Measuring range [bar] 1)                             | 0.015...1                                     | 0.015...2         | 0.1...7                                                                                 | 0.2...25         | 1...70              | 1...120         |
| Required masses                                      | 3.3 kg                                        | 6.54 kg           | 22.5 kg                                                                                 | 21 kg            | 29 kg               | 49.5 kg         |
| Smallest step 2)<br>(Standard mass set)              | 0.005 bar                                     | 0.005 bar         | 0.05 bar                                                                                | 0.3 bar          | 0.5 bar             | 0.5 bar         |
| Smallest step 3)<br>(optional increment masses)      | -                                             | -                 | 0.005 bar                                                                               | 0.01 bar         | 0.02 bar            | 0.02 bar        |
| Nominal effective area<br>of the piston              | 1/2 in²                                       | 1/2 in²           | 1/2 in²                                                                                 | 1/8 in²          | 1/16 in²            | 1/16 in²        |
| Measuring range [PSI] 1)                             | 0.2...15                                      | 0.2...30          | 1...100                                                                                 | 3...400          | 15...1,000          | 10...1,600      |
| Required masses                                      | 3.3 kg                                        | 6.54 kg           | 22.6 kg                                                                                 | 22.4 kg          | 26.9 kg             | 45.5 kg         |
| Smallest step 2)<br>(Standard mass set)              | 0.05 PSI                                      | 0.005 PSI         | 0.5 PSI                                                                                 | 5 PSI            | 5 PSI               | 5 PSI           |
| Smallest step 3)<br>(optional increment masses)      | -                                             | -                 | 0.05 PSI                                                                                | 0.1 PSI          | 0.2 PSI             | 0.2 PSI         |
| Nominal effective area<br>of the piston              | 1/2 in²                                       | 1/2 in²           | 1/2 in²                                                                                 | 1/8 in²          | 1/16 in²            | 1/16 in²        |
| Accuracies                                           |                                               |                   |                                                                                         |                  |                     |                 |
| Standard 4)                                          |                                               |                   | 0.015% of reading                                                                       |                  |                     |                 |
| Premium 5)                                           | 0.008% of reading                             |                   | 0.006% of reading                                                                       |                  | 0.008% of reading   |                 |
| Material                                             |                                               |                   |                                                                                         |                  |                     |                 |
| Piston                                               | High-chromium steel                           |                   |                                                                                         | Tungsten carbide | High-chromium steel |                 |
| Cylinder                                             | High-alloy heat treatable stainless steel     |                   |                                                                                         | Tungsten carbide | Bronze              |                 |
| Mass set                                             | Stainless steel, non-magnetic                 |                   |                                                                                         |                  |                     |                 |
| Weights                                              |                                               |                   |                                                                                         |                  |                     |                 |
| Piston-cylinder system                               | 0.5 kg<br>1.1 lbs                             | 0.5 kg<br>1.1 lbs | 1 kg<br>2.2 lbs                                                                         | 1 kg<br>2.2 lbs  | 2 kg<br>4.4 lbs     | 2 kg<br>4.4 lbs |
| mass set [bar] incl.                                 | 4 kg                                          | 7.6 kg            | 23 kg                                                                                   | 24 kg            | 32 kg               | 53 kg           |
| mass carrier                                         | 8.8 lbs                                       | 16.8 lbs          | 50.8 lbs                                                                                | 53.0 lbs         | 70.7 lbs            | 117 lbs         |
| mass set [PSI] incl.                                 | 4 kg                                          | 7.6 kg            | 23 kg                                                                                   | 24 kg            | 30 kg               | 49 kg           |
| mass carrier                                         | 8.8 lbs                                       | 16.8 lbs          | 50.8 lbs                                                                                | 53.0 lbs         | 66.3 lbs            | 108 lbs         |
| Storage case for mass set<br>(max. 2 pcs., included) | 1 pc.: 5.8 kg<br>1 pc.: 12.8 lbs              |                   | 2 pcs.: 5.8 kg each<br>2 pcs.: 12.8 lbs each                                            |                  |                     |                 |
| Dimensions (W x H x D)                               |                                               |                   |                                                                                         |                  |                     |                 |
| Storage case for mass set                            | 300 x 265 x 205 mm<br>11.8 x 10.4 x 8.1 in 6) |                   | 400 x 310 x 310 mm + 215 x 310 x 310 mm<br>15.8 x 12.2 x 12.2 in + 8.5 x 12.2 x 12.2 in |                  |                     |                 |

- 1) Theoretical starting value. Corresponds to the pressure value generated by the piston or the piston and its make-up weight (by their own weight). To optimize the operating characteristics more masses should be loaded.
- 2) The smallest pressure range value that can be achieved based on the standard mass set.
- 3) The smallest pressure change value that can be achieved based on the optional set of fine increment masses (order-code LDW-P-FMS). For further reductions, an accessory of class M1 or F1 set of fine increment masses is available (order-code LDW-FMS-F1 or LDW-FMS-M1)
- 4) The accuracy is in reference to the measured value, from 10% of the measuring range to compensate for actual area of piston unit. Standard accuracy without any corrections for the actual area down to 0.02% (0.03% of reading below 10% of range). For the range 0.015...1 bar the accuracy below 10% of the range is 0.04% of reading.
- 5) Available as high-accuracy class deadweight testers for area and mass.
- 6) Piston and mass set can be supplied in a flight box.

**GRATIS - FREE OF CHARGE:**

Download Link für a MS Excel sheet for calculation of corrections (e.g. air density, piston temperature) and masses/pressure calculation:

<https://www.druck-temperatur.de/images/software/dwt-corrections.zip>

## Basement LR-Cal LDW-P:

### Base version

|                                   |                                                                                      |
|-----------------------------------|--------------------------------------------------------------------------------------|
| Pneumatic, low pressure           | up to max. 7 bar (100 psi), with internal pressure generation                        |
| Pneumatic, high pressure + vacuum | up to max. 120 bar (1,600 psi) and vacuum, for external supply (pressure and vacuum) |

### Pressure transmission medium

|           |                                                        |
|-----------|--------------------------------------------------------|
| Pneumatic | Clean, dry, non-corrosive gases (e.g. air or nitrogen) |
|-----------|--------------------------------------------------------|

### Connections

|                                       |                                                                                                                                                    |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Connection for piston-cylinder system | Standard: M20 x 2 female thread<br>Option: Quick release connector (order-code <a href="#">LDW-P-CT</a> together with <a href="#">LDW-PKZ-CT</a> ) |
| Test item connection                  | Quick connector 1/2" BSP female thread, freely rotating, changeable<br>Option: further threaded inserts, see accessories                           |
| External pressure connection          | 6 mm SWAGELOK® threaded pipe connection, max. 100% of assigned measuring range (only basement version for external supply)                         |

### Material

|                |                                                                                                                                         |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Piping in base | low pressure version: plastic tubing from polyurethane, 4 x 0.75 mm<br>high pressure + vacuum version: stainless steel 1.4571, 3 x 1 mm |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|

### Weight

|                                   |                    |
|-----------------------------------|--------------------|
| with standard conn.               | 18.0 kg / 39.8 lbs |
| with optional quick release conn. | 19.0 kg / 42.0 lbs |

### Permissible ambient conditions

|                       |                       |
|-----------------------|-----------------------|
| Operating temperature | 18...28°C / 64...82°F |
|-----------------------|-----------------------|

### Dimensions (W x H x D)

|      |                                            |
|------|--------------------------------------------|
| Base | 401 x 375 x 265 mm / 15.8 x 14.8 x 10.4 in |
|------|--------------------------------------------|

## GRATIS - FREE OF CHARGE:

Download Link für a MS Excel sheet for calculation of corrections (e.g. air density, piston temperature) and masses/pressure calculation:

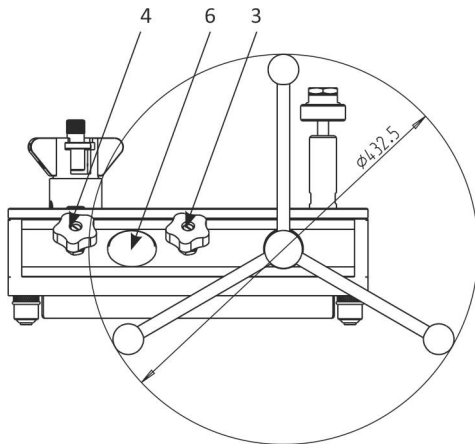
<https://www.druck-temperatur.de/images/software/dwt-corrections.zip>



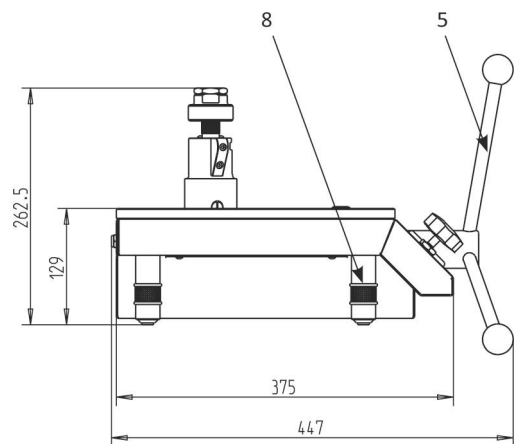
### Dimensions (mm) LR-Cal LDW-P:

The drawing shows a base version LR-Cal LDW-P for external power supply (vacuum range or pressure ranges  $>7$  bar), with optional quick-connect for the piston-cylinder system. The version with integrated pressure generation differs only in the arrangement of the control elements, and not dimensionally.

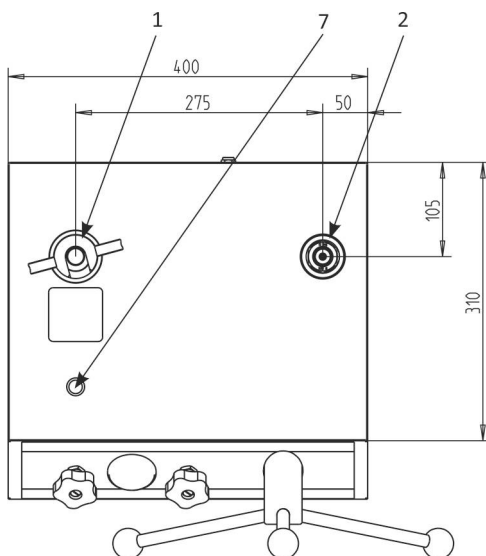
Front view



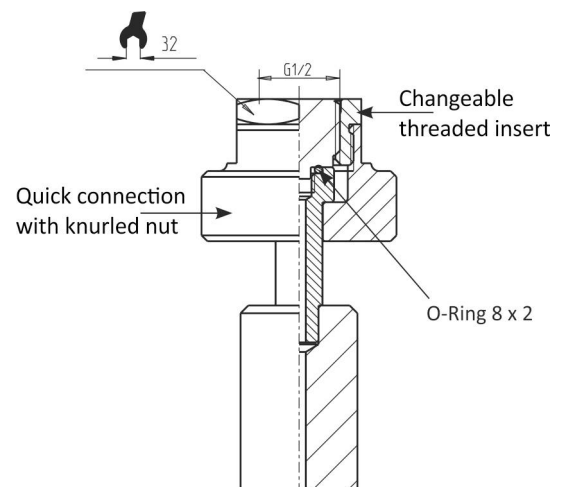
Side view



Plan view

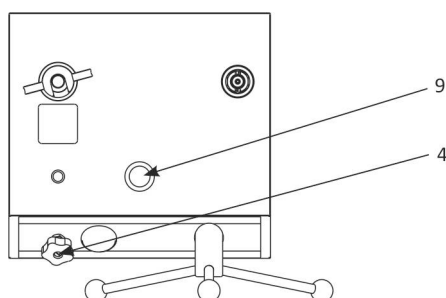


Connection for the test item



### Version (up to 7 bar) with integrated pressure source (pump)

Plan view



- (1) Adapter piston-cylinder system
- (2) Adapter test item
- (3) Inlet-valve (only version for external power supply)
- (4) Outlet-valve
- (5) Spindle pump with star handle, removable
- (6) Analogue pressure gauge (for visual control purposes)
- (7) Water level (for adjusting the basement)
- (8) Rotating feet (for adjusting the basement)
- (9) Priming pump (only version with integr. pressure gener.)

## Scope of supply:

- Instrument base with adjustable feet
- Priming pump (only versions max. 7 bar)
- Pressure input for external pressure source (only versions > 7 bar and vacuum)
- Spindle pump for pressure generation / fine adjustment
- Piston adapter with M30 x 2 female thread
- Piston-cylinder system with bell jar
- Basic mass set in rigid carrying cases
- Mass set manufactured to standard gravity ( $9.80665 \text{ m/s}^2$ )
- Operating manual in German and English
- Inspection certificate 3.1 according to DIN EN 10204

## Accessories:

### Trim-mass sets M1 and F1

The weights included in the LR-Cal LDW-P standard mass set or fine increment weights are ideally suited for everyday use. If smaller intermediate values need to be generated, we recommend using a set of class M1 or F1 trim masses, with the following weights.

1 x 50 g, 2 x 20 g, 1 x 10 g, 1 x 5 g, 2 x 2 g, 1 x 1 g,  
1 x 500 mg, 2 x 200 mg, 1 x 100 mg, 1 x 50 mg,  
2 x 20 mg, 1 x 10 mg, 1 x 5 mg, 2 x 2 mg, 1 x 1 mg



### Connector for test items with back connection

For test items with back connection mounting, a 90° angle connection is available



## Options:

- Systems with increased accuracy to 0.008%
- Piston adapter with quick-connect (change of piston without tools)  
Order-codes **LDW-P-CT** and **LDW-PKZ-CT**
- Storage suit case for piston-cylinder systems
- Mass set manufactured to local gravity (no extra charge, order-code **LDW-P-GRAV**)
- DAkkS certificate, traceable and accredited according to ISO 17025

### Separators

The separators (max. 1,000 bar, without membrane) have been specifically designed for measuring instruments, which should not come into contact with the medium of the deadweight tester or to protect against contamination of the pressure balance from the test items.



### Set of adapters for test item connection

As a standard, the pressure balance is equipped with a quick connector for connecting the test item. For this purpose, various threaded adapters, which can be easily changed, are available. Additionally the sets of adapters include spare-O-rings and a spanner with SW32 flats and SW14 flats, for changing the adapters.



| Order-Code             | Description / Execution                                                                                                                                                         |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LDW-FMS-F1</b>      | Trimm-masses (1 mg up to 50 g), class F1                                                                                                                                        |
| <b>LDW-FMS-M1</b>      | Trimm-masses (1 mg up to 50 g), class M1                                                                                                                                        |
| <b>CPB5000-ADS</b>     | Set of adapters for test item, in a case, with threaded inserts 1/4" BSP, 3/8", BSP, 1/2" NPT 1/4" NPT and M20 x 1.5 for fitting to the knurled nut of the test item connection |
| <b>CPB5000-ADS-NPT</b> | Set of adapters for test item, in a case, with threaded inserts 1/8" NPT, 1/4" NPT, 3/8" NPT and 1/2" NPT for fitting to the knurled nut of the test item connection            |
| <b>CPB5000-WA90</b>    | Angle connection 90°, for test items with back mounting connection                                                                                                              |
| <b>CPB5000-TV-1000</b> | Purifier, max. 1000 bar<br>Only for version with input for external pressure supply                                                                                             |
| <b>CPB5000-R-SET</b>   | Set of o-rings consisting of 5 spare 8 x 2 and 5 spare 4 x 2.2                                                                                                                  |
| <b>CPB5000-PN-RS</b>   | Cleaning set for LR-Cal LDW-P piston-cylinder systems                                                                                                                           |

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**Further LR-Cal Deadweight Tester / Pressure Balances:**
**Model LR-Cal LDW-H**

Hydraulic

Single Piston

 Ranges            from 1...120 to 2...300 bar  
                       from 10...1.600 to 30...4.000 psi

Double Piston

 Ranges            from 1...60 / 10...700 bar to  
                       1...60 / 20...1.400 bar  
                       from 10...800 / 100...10.000 psi to  
                       10...800 / 200...20.000 psi

 Accuracy         $\pm 0.015\%$  or  $\pm 0.006\%$  of measured value

**Model LR-Cal LDW-HK**

Hydraulic (compact design)

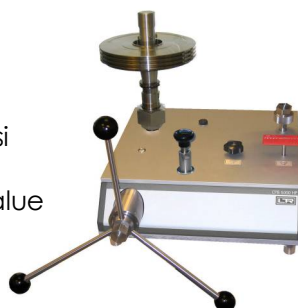
 Ranges            from 1...120 to 10...1,200 bar  
                       from 10...1,600 to 100...16,000 psi

 Accuracy         $\pm 0.05\%$  or  $\pm 0.025\%$  of measured value

**Model LR-Cal CPB5000-HP**

High pressure, hydraulic

 Ranges            from 25...4,000 to 25...5,000 bar  
                       from 365...60,000 to 365...70,000 psi

 Accuracy         $\pm 0.025\%$  or  $\pm 0.02\%$  of measured value

**Modell LR-Cal CPB5600-DP**

Differential pressure, pneumatic

 Ranges            from 0.03...2 to 0.4...100 bar  
                       from 0.435...30 to 5.8...1500 psi

Differential pressure, hydraulic

 Ranges            from 0.2...60 to 2...1,000 bar  
                       from 2.9...1,000 to 29...14,500 psi

 Accuracy         $\pm 0.015\%$  or  $\pm 0.008\%$  of measured value

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<https://www.druck-temperatur.de/images/software/dwt-corrections.zip>