

P3000 Series

Hydraulic Deadweight Testers

Models P3100 and P3200

Technical Data

Features

- Pressure ranges to 20,000 psi (1,400 bar)
- Accuracy better than 0.015% of reading (Increased accuracy option of 0.008%)
- Mineral oil and distilled water models
- Dual piston models allow calibration over a wide range
- Psi, bar, kgf/cm², kPa and MPa ranges available
- Dual piston models for calibration over a wide pressure range
- Built-in lever style hand pump now standard on all hydraulic models
- Mounted spirit level and adjustable feet
- High quality screw press for fine pressure control
- Test station design with O-rings eliminates the need for PTFE tape or wrenches
- Acrylic reservoir provides visibility of fluid level and quality
- Improved case with spring-loaded latches for hood
- Built-in drain plug to remove old fluid
- Sturdy weight box with hinged lid and side handles for easy transport



The P3000 Series is the culmination of over 50 years experience in the production and design of primary pressure standards. With features designed to improve accuracy and performance, increase reliability and simplify operation these deadweight testers can be used to calibrate virtually any pressure sensing device, including transducers, transmitters, gauges or pressure switches.

Each instrument is supplied with a detachable lid which makes it neat, compact and easily portable. The weight masses are stored in a

high-quality case with a self locking mechanism to protect them during transit.

All units are provided with an accredited calibration report, weight mass details, M14 x 1.5, M20 X 1.5, 1/8 inch, 1/4 inch, 3/8 inch and 1/2 inch NPT and BSP female adaptors, operating fluid (where applicable) and spare seals.

The piston/cylinder assemblies are manufactured to the very highest standards and are provided standard with ISO/IEC 17025 accredited calibration reports.

Operating principle

Deadweight testers are the primary standard for pressure measurement. Utilizing the well proven piston-gauge system consisting of a vertically mounted, precision lapped piston and cylinder assembly, accurately calibrated weight masses (Force) are loaded on the piston (Area), which rises freely within its cylinder. These weights balance the upward force created by the pressure within the system.

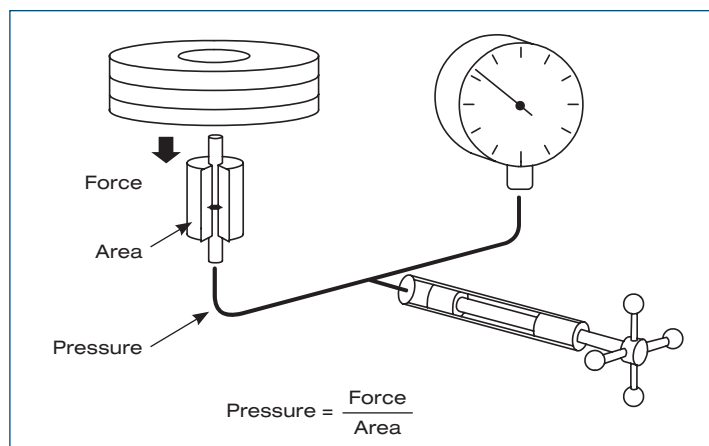
The pressure is measured when placed on a correctly spinning and floating piston. The total pressure measured is the summation of the weights plus the piston weight carrier assembly.

Instrument base

There are three basic variations in the hydraulic offering; single low pressure, single high pressure and dual piston models. Pressure is generated and controlled by means of a high quality screw press located on the front of the tester. A built-in hand pump is included as standard for all hydraulic models to prime the system and accommodate large volume requirements.

Piston/cylinder assemblies

The piston/cylinder assembly is the heart of each deadweight tester. They are manufactured from materials that provide stability, durability, and low thermal coefficients and distortion. Our experience and knowledge of piston/cylinder production and calibration ensure the precision and performance required for today's demanding calibration requirements.

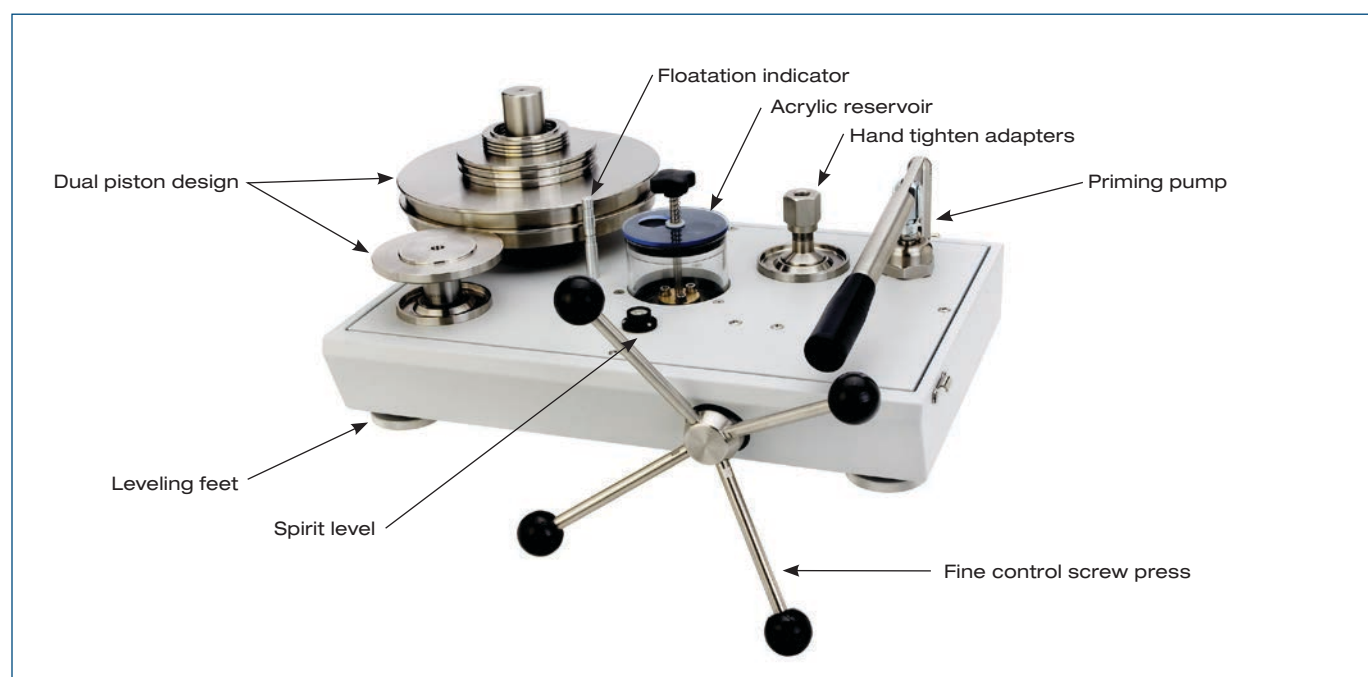


Weight masses

Standard weight masses are series 3 non-magnetic austenitic stainless steel. Each mass is marked with the serial number of the instrument and the nominal pressure value relative to the high or low-pressure piston, when applicable. Optional fractional weights are stainless steel and/or solution heat treated aluminum.

Gravity correction

Gravity varies significantly with geographical location and this variation has a direct effect on the force of the weights and the accuracy of the deadweight tester. Each instrument can be trimmed to local gravity at no extra cost. If unspecified, instruments will be calibrated to Standard Gravity at 980.665 cm/s².



Specifications

Pressure ranges	
Oil operated	Ranges to 20,000 psi (1,400 bar)
Distilled water operated	Ranges to 10,000 psi (700 bar)
Accuracy	± 0.015 % of reading (± 0.008 % optional) Note: Accuracy based on % of reading from 10 % to 100 % of the piston range when used in accordance with the corrections found on the calibration certificate. Below 10 % ± (accuracy class) x 10 % of the piston range.
Materials of construction	
Standard weight material	Series 3 non-magnetic austenitic stainless steel Density: 7.8 g/cm ³
Optional fractional weights	Solution heat treated aluminum Density: 2.7 g/cm ³
Piston material	Tungsten carbide with nickel binder Density: 15.0 g/cm ³
Cylinder material	Hardened martensitic steel Tungsten carbide (water above 500 psi, 35 bar)
Thermal coefficients of expansion	Oil piston/cylinder 16.5 ppm/°C Water (above 500 psi, 35 bar) 11 ppm/°C
General	
Test port adaptors	M14 X 1.5, M20 X 1.5, 1/8 in, 1/4 in, 3/8 in and 1/2 in NPT and BSP
Weight	16 kg (36 lb)
Dimensions (W x D x H)	440 mm x 300 mm x 215 mm (17.5 in x 12 in x 8.5 in)
Mass set weight (typical)	36 kg (80 lb)
Reservoir volume	150 cm ³ (9.2 in ³)
Screw press displacement	5.5 cm ³ (0.34 in ³)
Pump displacement	4.7 cm ³ (0.29 in ³) per stroke
O-ring seal materials	Viton®
Weight increments	
Minimum standard weight increments	
Up to 500 psi (35 bar)	1 psi (0.1 bar)
500 psi to 5 000 psi (35 bar to 350 bar)	10 psi (1 bar)
5 000 psi to 20 000 psi (350 bar to 1 400 bar)	20 psi (2 bar)
Model P3112	1 psi (0.1 bar)
Optional fractional weights	
Up to 500 psi (35 bar)	0.1 psi (0.01 bar)
500 psi to 5 000 psi (35 bar to 350 bar)	1 psi (0.1 bar)
5 000 psi to 20 000 psi (350 bar to 1400 bar)	2 psi (0.2 bar)
Operating fluids	
Mineral oil Shell spindle oil 22, our reference 55-655, viscosity 40 cs@ 20 °C (68 °F)	
Distilled or deionized water	

Ordering information

Oil operated - single PCU

Model

P3111-BAR 1 to 35 bar

P3111-KGCM2 1 to 35 kgf/cm²

P3111-PSI 10 to 500 psi

P3111-KPA 100 to 3,500 kPa

P3111-MPA 0.1 to 3.5 MPa

P3112-BAR 4 to 140 bar

P3112-KGCM2 4 to 140 kgf/cm²

P3112-PSI 40 to 2,000 psi

P3112-MPA 0.4 to 14 MPa

P3113-BAR 10 to 350 bar

P3113-KGCM2 10 to 350 kgf/cm²

P3113-PSI 100 to 5,000 psi

P3113-MPA 1 to 35 MPa

P3114-BAR 20 to 700 bar

P3114-KGCM2 20 to 700 kgf/cm²

P3114-PSI 200 to 10,000 psi

P3114-MPA 2 to 70 MPa

P3115-BAR 20 to 1,100 bar

P3115-KGCM2 20 to 1,100 kgf/cm²

P3115-PSI 200 to 16,000 psi

P3115-MPA 2 to 110 MPa

P3116-BAR 20 to 1,400 bar

P3116-KGCM2 20 to 1,400 kgf/cm²

P3116-PSI 200 to 20,000 psi

P3116-MPA 2 to 140 MPa

Water operated - single PCU

Model

P3211-BAR 1 to 35 bar

P3211-KGCM2 1 to 35 kgf/cm²

P3211-PSI 10 to 500 psi

P3211-KPA 100 to 3,500 kPa

P3211-MPA 0.1 to 3.5 MPa

P3213-BAR 10 to 350 bar

P3213-KGCM2 10 to 350 kgf/cm²

P3213-PSI 100 to 5,000 psi

P3213-MPA 1 to 35 MPa

P3214-BAR 20 to 700 bar

P3214-KGCM2 20 to 700 kgf/cm²

P3214-PSI 200 to 10,000 psi

P3214-MPA 2 to 70 MPa

Water operated - dual PCU

Model

P3223-BAR 1 to 350 bar

P3223-KGCM2 1 to 350 kgf/cm²

P3223-PSI 10 to 5,000 psi

P3223-MPA 0.1 to 35 MPa

P3224-BAR 1 to 700 bar

P3224-KGCM2 1 to 700 kgf/cm²

P3224-PSI 10 to 10,000 psi

P3224-MPA 0.1 to 70 MPa

Options

A. Improved Accuracy Option with Software - PressCal

Software is a Windows based software program that allows users to easily apply all necessary corrections, allowing for improved accuracy of 0.008%. PressCal is provided as standard with all 0.008 % instruments.

B. Fine Increment Weights

- Additional small weights that allow for finer pressure increments

- PPA9159-CAL For use with kPa, MPa, bar, or kgf/cm² weight sets
- PPA9608-CAL For use with psi weight sets

C. Conversion Weights - Allows for an instrument to be used in a pressure unit other than the pressure unit the instrument was ordered for.

Oil operated - dual PCU

Model

P3123-BAR 1 to 350 bar

P3123-KGCM2 1 to 350 kgf/cm²

P3123-PSI 10 to 5,000 psi

P3123-MPA 0.1 to 35 MPa

P3124-BAR 1 to 700 bar

P3124-KGCM2 1 to 700 kgf/cm²

P3124-PSI 10 to 10,000 psi

P3124-MPA 0.1 to 70 MPa

P3125-BAR 1 to 1,100 bar

P3125-KGCM2 1 to 1,100 kgf/cm²

P3125-PSI 10 to 16,000 psi

P3125-MPA 0.1 to 110 MPa

P3125XT-BAR 1 to 1,200 bar

P3125XT-KGCM2 1 to 1,200 kgf/cm²

P3125XT-MPA 1 to 120 MPa

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Fluke Calibration

PO Box 9090,
Everett, WA 98206 U.S.A.

Fluke Europe B.V.

PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:

In the U.S.A. (877) 355-3225 or Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or Fax (905) 890-6866
From other countries +1 (425) 446-5500 or Fax +1 (425) 446-5116
Web access: <http://www.flukecal.com>

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Cal Power

Via Acquanagera, 29 22100 COMO
tel. 031.526.566 (r.a.) fax 031.507.984
info@calpower.it www.caltower.it