

P3100 Hydraulic Deadweight Testers



Highlights

- Pressure ranges to 20,000 psi (1400 bar)
- 0.015% of reading accuracy standard (0.008% optional)
- Single or dual piston formats
- Built-in hand pumps standard
- Mounted spirit level with adjustable feet
- Units can be trimmed to local gravity FOC

The P3100 Models are available in single or dual piston formats for increased operating ranges. Units can be supplied in psi, bar, kgf/cm², and MPa. These robust instruments are highly accurate, quick and easy to use. Units feature a built-in priming pump for large volume applications, piston flotation indicators and a high quality screw press for fine pressure control.

The P3100 Series is the culmination of over 50 years of experience in the production and design of high performance 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 a traceable certificate of accuracy, weight mass details, 1/8 inch, 1/4 inch, 3/8 inch and 1/2 inch NPT or BSP female adaptors, operating fluid (where applicable) and spare seals.

The piston/cylinder assemblies are manufactured to the very highest standards with certified accuracies traceable to international standards laboratories such as the National Institute of Standards and Technology (NIST).

Description

Operating principle

Deadweight testers are the high performance pressure standards 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 nonmagnetic 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 calibrated 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 (1400 bar)
Accuracy	
Accuracy*	±0.015% of reading (±0.008% optional)
*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
Weight density	7.8 g/cm ³
Optional fractional weights	Solution heat treated aluminum
Weight 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	1/8, 1/4, 3/8 and 1/2 NPT or BSP
Instrument weight	36 lbs (16 kg)
Instrument size	17.5 W x 12 D x 8.5 H
Mass set weight (typical)	80 lbs (36 kg)
Reservoir volume	150 cc
Screw press displacement	5.5 cc
Pump displacement	4.7 cc per stroke
O-ring seal materials	Buna N as standard, Viton and EPDM available
Weight Increments	
Minimum Standard Weight Increments	Up to 500 psi (35 bar): 1 psi (0.1 bar) 500 to 5000 psi (35 to 350 bar): 10 psi (1 bar) 5000 to 20,000 psi (350 to 1400 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 to 5000 psi (35 to 350 bar): 1 psi (0.1 bar) 5000 to 20,000 psi (350 to 1400 bar): 2 psi (0.2 bar)
Operating Fluid	
Mineral oil	Shell spindle oil 22, our reference 55-655, viscosity 40 cs@ 20°C

Options

PressCal Software

Windows-based software program that allows users to easily apply all necessary corrections to enhance the deadweight tester performance. Calibration details are then stored and/or used to automatically create a calibration certificate. PressCal is provided as standard with all 0.008% instruments.

Models and Accessories

Accessories common to all models:

Accessory	Description
5540 Metric and 5541 BSP Adapter Sets	<p>P5540 Metric M14 x 1.5, M20 x 1.5, 1/8 and 1/4 BSP</p> <p>P5541 BSP 1/8, 1/4, 3/8 and 1/2 BSP</p> <p>P5542 NPT 1/8, 1/4, 3/8 and 1/2 NPT</p>
P5521 and P5522 Liquid-to-Liquid Separators	<p>These liquid-to-liquid separators connect directly to the test port of a hydraulic deadweight tester or comparison test pump. A flexible diaphragm separates the fluids, protecting the calibrator from contamination, and allows calibration of the device in its specific working fluid.</p>
P5523 Liquid-to-Gas Media Separator	<p>Pressure range 0 to 3,000 psi (210 bar)</p> <p>For high pressure pneumatic calibrations this unit interfaces with hydraulic deadweight testers providing a rateless liquid-to-gas separation. Driven by a pneumatic pressure source (nitrogen bottle) and controlled by needle valves, high pressure gas is balanced against the liquid in a hydraulic deadweight tester through a series of fluid traps.</p> <p>* Note---since fluid mist may be transferred during operation we do not recommend this device for oxygen safe instruments using an oil operated deadweight tester.</p>
P5543 Angle Adapter	<p>To calibrate gauges with the pressure connection on the rear (for example, panel mount gauges) in their correct operating position, an angle adaptor should be used. The angle adapter uses the standard gauge adapters and positions the gauges at 90°. The maximum working pressure of this unit is 10,000 psi (700 bar).</p>
P5544 Two Gauge Stand	<p>This adapter mounts directly to the test port of the calibrator and allows for the calibration of two instruments at the same time, or the connection of a reference test instrument. Maximum working pressure is 10,000 psi (700 bar).</p>
P5551 Pointer Remover/Punch	<p>This tool is designed to quickly remove and consistently refit the pointer of a pressure gauge.</p>
<p>Priority Gold Instrument CarePlan</p>	<p>Fluke Calibration Priority Gold Instrument CarePlans are available for most calibration products. Please contact your local Fluke Calibration sales representative for details or to request a quote. You may also call the Customer Care Center at 877-355-3225 or send email to careplans@flukecal.com.</p>
<p>Silver CarePlan</p>	<p>Fluke Calibration Silver CarePlans are available for most calibration products. Please contact your local Fluke Calibration sales representative for details or to request a quote. You may also call the Customer Care Center at 877-355-3225 or send email to careplans@flukecal.com.</p>



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