

# 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/cm<sup>2</sup>, 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 Pressurements 3000 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 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).

## 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.

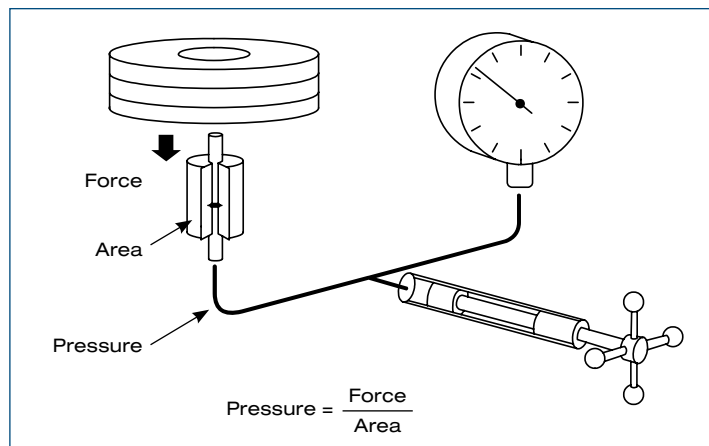
The pressure is measured when placed on a correctly spinning and floating piston. The total pressure measured is the summation of the weights plus the piston weight carrier assembly.

## 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.

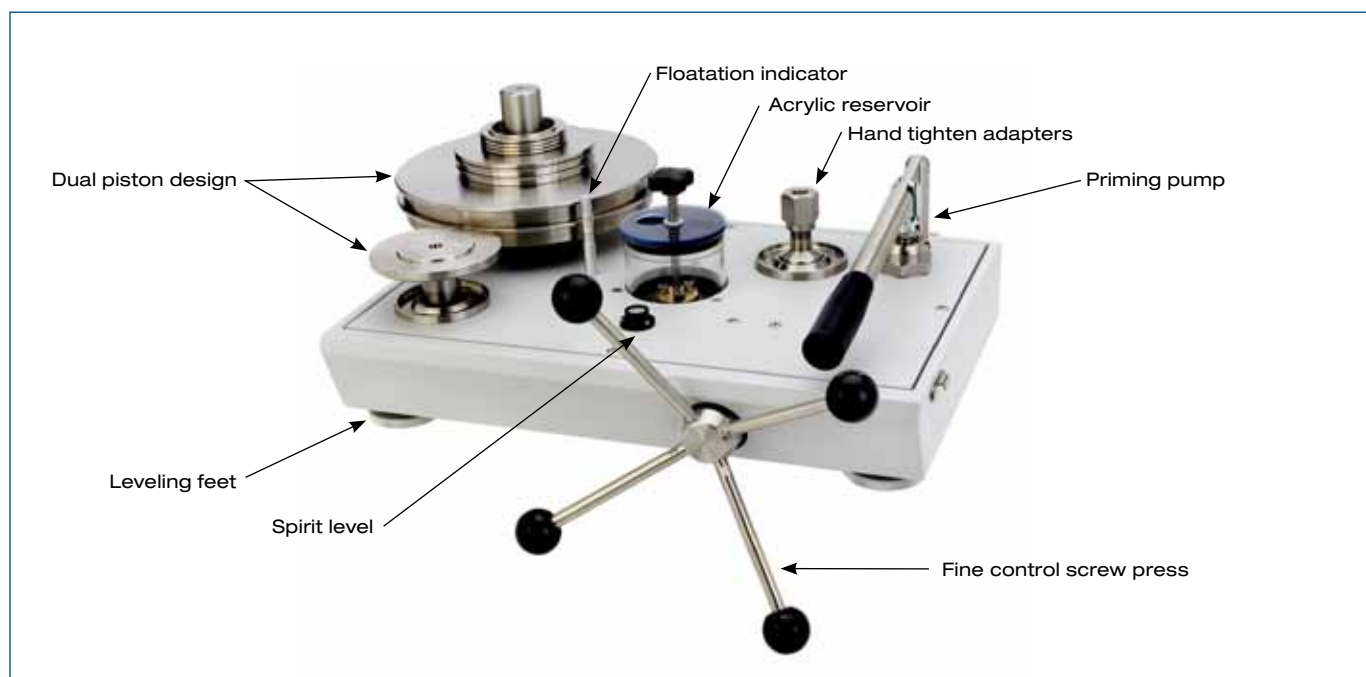


## Weight masses

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 calibrated to local gravity at no extra cost. If unspecified, instruments will be calibrated to Standard Gravity at 980.665 cm/s<sup>2</sup>.



## Specifications

<b>Pressure ranges</b>	
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.
<b>Materials of construction</b>	
Standard weight material	Series 3 non-magnetic austenitic stainless steel Density: 7.8 g/cm <sup>3</sup>
Optional fractional weights	Solution heat treated aluminum Density: 2.7 g/cm <sup>3</sup>
Piston material	Tungsten carbide with nickel binder Density: 15.0 g/cm <sup>3</sup>
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
<b>General</b>	
Test port adaptors	1/8 in, 1/4 in, 3/8 in and 1/2 in NPT or 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 <sup>3</sup> (9.2 in <sup>3</sup> )
Screw press displacement	5.5 cm <sup>3</sup> (0.34 in <sup>3</sup> )
Pump displacement	4.7 cm <sup>3</sup> (0.29 in <sup>3</sup> ) per stroke
O-ring seal materials	Buna N as standard, Viton and EPDM available
<b>Weight increments</b>	
<b>Minimum standard weight increments</b>	
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)
<b>Optional fractional weights</b>	
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)
<b>Operating fluids</b>	
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

**P3111-1** 1 to 35 bar  
**P3111-2** 1 to 35 kgf/cm<sup>2</sup>  
**P3111-3** 10 to 500 psi  
**P3111-4** 100 to 3 500 kPa  
**P3111-5** 0.1 to 3.5 MPa  
  
**P3112-1** 4 to 140 bar  
**P3112-2** 4 to 140 kgf/cm<sup>2</sup>  
**P3112-3** 40 to 2 000 psi  
**P3112-4** 400 to 14 000 kPa  
**P3112-5** 0.4 to 14 MPa  
  
**P3113-1** 10 to 350 bar  
**P3113-2** 10 to 350 kgf/cm<sup>2</sup>  
**P3113-3** 100 to 5 000 psi  
**P3113-4** 1 000 to 35 000 kPa  
**P3113-5** 1 to 35 MPa  
  
**P3114-1** 20 to 700 bar  
**P3114-2** 20 to 700 kgf/cm<sup>2</sup>  
**P3114-3** 200 to 10 000 psi  
**P3114-4** 2 000 to 70 000 kPa  
**P3114-5** 2 to 70 MPa  
  
**P3115-1** 20 to 1 100 bar  
**P3115-2** 20 to 1 100 kgf/cm<sup>2</sup>  
**P3115-3** 200 to 16 000 psi  
**P3115-4** 2 000 to 110 000 kPa  
**P3115-5** 2 to 110 MPa  
  
**P3116-1** 20 to 1 400 bar  
**P3116-2** 20 to 1 400 kgf/cm<sup>2</sup>  
**P3116-3** 200 to 20 000 psi  
**P3116-4** 2 000 to 140 000 kPa  
**P3116-5** 2 to 140 MPa

### Oil operated - dual PCU

#### Model

**P3123-1** 1 to 350 bar  
**P3123-2** 1 to 350 kgf/cm<sup>2</sup>  
**P3123-3** 10 to 5 000 psi  
**P3123-4** 100 to 35 000 kPa  
**P3123-5** 0.1 to 35 MPa  
  
**P3124-1** 1 to 700 bar  
**P3124-2** 1 to 700 kgf/cm<sup>2</sup>  
**P3124-3** 10 to 10 000 psi  
**P3124-4** 100 to 70 000 kPa  
**P3124-5** 0.1 to 70 MPa  
  
**P3125-1** 1 to 1,100 bar  
**P3125-2** 1 to 1 100 kgf/cm<sup>2</sup>  
**P3125-3** 10 to 16 000 psi  
**P3125-4** 100 to 110 000 kPa  
**P3125-5** 0.1 to 110 MPa

### Water operated - single PCU

#### Model

**P3211-1** 1 to 35 bar  
**P3211-2** 1 to 35 kgf/cm<sup>2</sup>  
**P3211-3** 10 to 500 psi  
**P3211-4** 100 to 3,500 kPa  
**P3211-5** 0.1 to 3.5 MPa  
  
**P3213-1** 10 to 350 bar  
**P3213-2** 10 to 350 kgf/cm<sup>2</sup>  
**P3213-3** 100 to 5 000 psi  
**P3213-4** 1 000 to 35 000 kPa  
**P3213-5** 1 to 35 MPa  
  
**P3214-1** 20 to 700 bar  
**P3214-2** 20 to 700 kgf/cm<sup>2</sup>  
**P3214-3** 200 to 10 000 psi  
**P3214-4** 2 000 to 70 000 kPa  
**P3214-5** 2 to 70 MPa

### Water operated - dual PCU

#### Model

**P3223-1** 1 to 350 bar  
**P3223-2** 1 to 350 kgf/cm<sup>2</sup>  
**P3223-3** 10 to 5 000 psi  
**P3223-4** 100 to 35 000 kPa  
**P3223-5** 0.1 to 35 MPa  
  
**P3224-1** 1 to 700 bar  
**P3224-2** 1 to 700 kgf/cm<sup>2</sup>  
**P3224-3** 10 to 10 000 psi  
**P3224-4** 100 to 70 000 kPa  
**P3224-5** 0.1 to 70 MPa

### Options

**A. 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.

**B. Instruments can be supplied for use with Skydrol or brake fluids.** Due to the aggressive nature of these fluids the standard nitrile seals and the acrylic reservoir tube will be replaced by either Viton or EPDM seals (as applicable) and an aluminum reservoir tube. For these or any other specialty fluid applications, please consult the factory.



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