

# Dead Weight Testers

Pressure ranges 25 to 2,500 bar

Model **PD 2500**

Dead weight testers are used for examination and calibration of pressure gauges and other pressure measuring instruments without using an external instrument. The main components are the measuring system, the valve units, the built-in screw pump (PD 2500) for accurate pressure adjustment and the set of weights.

The measuring system itself consists of a precise lapped-in pair of piston and cylinder. During the measuring process the piston is forced up by the pressure produced with the built-in screw pump respectively with external pressure supply, while the regular weights and maybe further extra weights, if required for the designated test pressure, press it down. With the built-in screw pump the test pressure can be adjusted to an equilibrium of the forces. When the forces on both sides of the piston are in balance, the piston will be floating, and the designated test pressure is reached exactly.

For simplifying the handling, the instrument-specific weights are already referred to each relevant determined piston area and stamped with the pressure unit (bar/MPa). When indicating the place of installation these are corrected (3.1 certificate).

The influence of the friction between piston and cylinder is minimised by keeping piston and weights rotating while floating.

The model described in this data sheet is available for pressure ranges 25 to 2,500 bar.

## Technical Data

- Pressure range 25 bar to 2,500 bar
- Set of weights in bar / MPa
- External pressurised air supply up to max. 10 bar necessary for a fast filling of the system
- Reachable admission pressure with manual pump: 1,600 bar
- Accuracy of the adjusted examination pressure: better than 0.06 % resp. 0.05 % (with official verification or DKD-approval) referred to the effective pressure. Up to 250 bar the maximum error is constantly  $\pm 250$  mbar (at 0.06%) resp.  $\pm 150$  mbar (at 0.05%)
- Reference conditions for the guaranteed accuracy:
  - ambient temperature  $+ 20$  °C  $\pm 2$  °C
  - acceleration of fall =  $9.80968$  m/s<sup>2</sup>
- Dimension of the crosssection of the measuring unit:  $0.02$  cm<sup>2</sup>  $\pm 0.2$
- Rotation of the weights: by electrical drive (220 VAC / 50 Hz / 28.5 W)
- Connection for pressure gauges:
  - 1 clamping sleeve G  $\frac{1}{2}$  and M 20x 1.5 each
- Connection for external pressurised air: plug connection (Prestolock) for PA hose N 4 x 1 with adapter for N 6 x 1
- Medium: special oil
- Case:
  - grey-painted Al-case (self-supporting cap)
  - 3 machine mounts for the exact horizontal positioning according to installed circular level
- Case dimensions including star handle and handpump: (L x W x H) 700 x 560 x 450 mm (27.56" x 22.05" x 17.72")
- Weights: (approx.):

Dead weight tester	48 kg
Set of weights	56 kg
Transport box dead weight tester	41 kg
Transport box set of weights	2x 6 kg

## Special Options:

- Set of weights in kp/cm<sup>2</sup>; other set of weights upon request
- Test certificate 3.1 EN 10204<sup>1)</sup>
- Official verification or DKD-approval<sup>1)</sup> (the installation location has to be specified for this)
- Pressurised air driven liquid pump to 1,000 bar instead of manual pump



## Operation

### ATTENTION !

Please handle the dead weight tester only at the hanholds for transporting and repositioning, but never at the measuring system. Otherwise this can lead to serious damage.

Please do not tilt the instrument, as the oil tank (3) is filled. Should oil leak from the tank, it has to be refilled according to the instructions.

## Putting into operation

The dead weight tester and the sets of weights are supplied in separate wooden transport boxes. Please release the transport screws before taking the instrument out of the transport boxes and place the instrument at the work station. Then adjust the instrument by the circular level. The machine mounts have orifices for mounting to the work station. Screw in the clamp handles in the helicoidal gear pump head. Before putting the oil tank (28) into operation, it has to be filled with the supplied oil up to the rim of the bleeder.

For this please remove the seal (24) and the base plate (14).

Insert the supplied plug into the connection (21). Plug in the motor.

## Connection of the admission pressure

The admission pressure connection happens optionally via a PA-hose N 4 x 1 or with an adapter for N 6 x 1 to plug connection (29) (Prestolock).

To protect the dead weight tester against impurities, an air control unit consisting of pressure regulator and filter (pores 10-20  $\mu$ m with oil and water separator) has to be applied to the air control unit.

The pressure regulator has to be limited to the maximum final value.

## Refilling of the oil reservoir (3)

The instrument is being supplied in a filled condition. Oil must be refilled immediately when the oil level is no longer visible through the window of the oil column. For refilling the change over valve (18) has to be switched to "Entlüften" ("vent"). Remove the screw (24) from the oil tank, fill in the oil up to the lower rim and close the reservoir by screwing in the screw (24). Use only the oil included in shipment respectively reordered oil, which will be delivered upon request.

## Advice

After approximately 40 operating hours the overflow oil of the system (via outlet 21) and the overflow oil of the measuring cylinder (via outlet 26) should be emptied in depressurised condition.

<sup>1)</sup> Because of the high accuracy of the dead weight tester the influence of the acceleration of gravity may not be disregarded. As precondition for a official verification the dead weight tester has to be calibrated with the acceleration of gravity at the place of installation. For this the value has to be specified when ordering. A calibration for the place of installation is also recommended without official verification (3.1 certificate). Without an indication of the acceleration of gravity the dead weight tester is being calibrated with the value ( $g_{Hst} = 9.80968$  m/s<sup>2</sup>) at the place of manufacture. Then the measured values have to be converted for the compliance with the accuracy classes at the place of installation.



Sales and Export South, West, North

**ARMATURENBAU GmbH**  
Manometerstraße • D-46487 Wesel - Ginderich  
Tel.: +49 (0) 28 03 / 91 30 - 0 • Fax: +49 (0) 28 03 / 10 35  
armaturenbau.com • mail@armaturenbau.com



Subsidiary Company, Sales and Export East

**MANOTHERMBeierfeld GmbH**  
Am Gewerbepark 9 • D-08340 Beierfeld  
Tel.: +49 (0) 37 74 / 58 - 0 • Fax: +49 (0) 37 74 / 58 - 545  
manotherm.com • mail@manotherm.com

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## Examination of pressure gauges at connected admission pressure

With external admission pressure (up to max. 10 bar resp. 150 psi) the system can be filled faster.

All valves are closed.

Before connecting the pressure gauge, fill in oil with the screw pump up to the sealing face of the connection (13). Screw the pressure gauge tight into the connection.

Open the valve (10).

Put the weights corresponding to the desired pressure to the base plate (14). Therefore consider the advice regarding the set of weights.

For filling the system, please switch the change-over valve (18) to "Vordruck" (admission pressure).

Generate the requested pressure - max. 1,600 bar- by using the manual pump.

Use the screw pump (2) to raise the pressure until the piston starts floating.

### ATTENTION!

During measuring operation the piston neither may touch the lower nor the upper stopper.

Except of the 5 bar weight the weights can be laid down during ongoing operation.

The motor and the measuring system have to be stopped respectively switched off before laying down the 250 bar weights.

Please also stop the motor before pressure relief.

Switch on the electrical drive (22).

Adjust the pressure by turning the star handle until the upper edge of the base plate (14) is exactly covering the lower marking line on the mirror (Fig. 3) respectively until the marking on the ring weight base plate is on the same level like the upper marking line of the mirror (5).

For pressure relief open valve (9).

For pressure relief down to "0 bar" the admission pressure has to be relieved, too. Therefore switch the change-over valve (18) to "Entlüften" (vent).

When using the change-over valve (18), please regard on a explicit engaging.

## SET OF WEIGHTS

### ATTENTION !

Treat the set of weights carefully!  
Avoid all kinds of damage!

The set of weights is delivered in wooden boxes.

The weights (disc weight plates and ring weight plates) (14) and the base plate (14) are marked with their pressure in bar and MPa, with the serial number and the final value (2,500 bar). The weights without weight plates (basic load) produce a pressure of 25 bar.

The additional ring weight plate (225 bar) is marked with number 1, the other ring weight plates (250 bar) are marked with number 2 to 10. Please use them only in this order, i.e. start with no. 1, let no. 2 follow, then add no. 3 etc.

Additional ring weights are the weights of 225 bar as addition to the basic load 25 bar to produce a pressure of 225 bar.

The set of weights is being composed as follows:

9	weights	250 bar	
1	weight	225 bar	(additional weight)
4	weights	50 bar	
1	weights	25 bar	
2	weights	10 bar	
1	weights	5 bar	

The smallest graduation of the supplies set of weights is 5 bar.

Special weights for smaller pressure graduations are available upon request. They may be required for example to compensate operation conditions deviating from our standard reference conditions.

### SCOPE OF DELIVERY

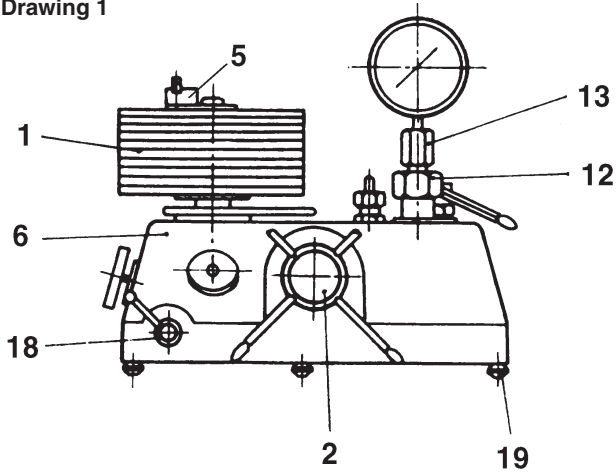
Beside the dead weight tester and the set of weights, the scope of delivery comprises the following:

- 1 operating instructions
- 1 canister with 1 litre special oil
- 1 cover cap
- 1 clamping sleeve M 20 x 1.5 (clamping sleeve G ½ is installed)
- 1 special sealing for test items with 2 chambered o-rings
- 4 o-rings as replacement
- 2 adapters for N 6 x 1 (admission pressure connection)
- 1 plug for connection (21)

### Upon request:

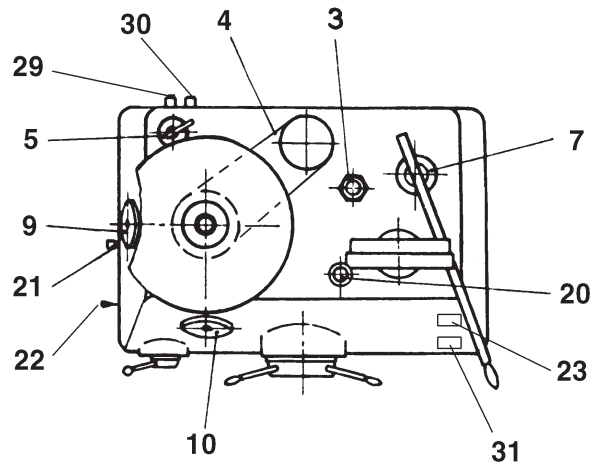
- Hose 4 x 1 for Prestolock

Drawing 1

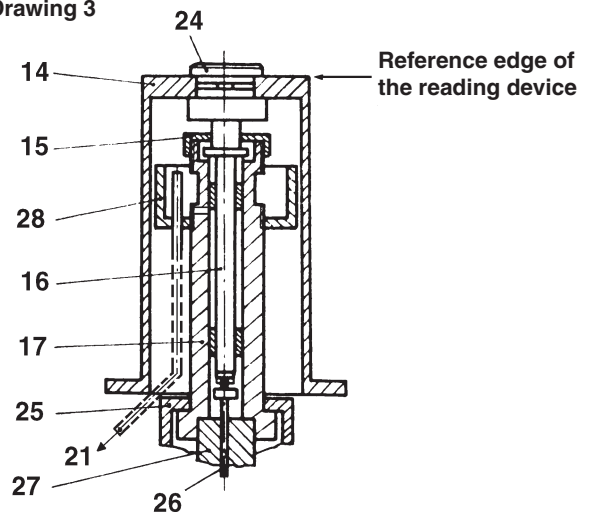


- 1 = Measuring system
- 2 = Helicoidal gear pump with star handle
- 3 = Oil reservoir
- 4 = Electrical motor
- 5 = Reading device (mirror)
- 6 = Case
- 7 = Manual pump
- 9 = Pressure relief valve ("Druckentlastung")
- 10 = Shut-off valve for measuring system ("Messsystem")
- 12 = Pressure gauge connection
- 13 = Clamping sleeve (SW 27)
- 14 = Base plate (giving the basic weight)
- 15 = Union nut
- 16 = Piston
- 17 = Cylinder
- 18 = Change-over valve for external admission pressure ("Vordruck", "Zu", "Entlüften") (admission pressure, closed, vent)
- 19 = Machine mounts
- 20 = Circular level
- 21 = Oil drain port "Ölablass" (to drain off the overflow of the system)
- 22 = Switch of the electrical motor drive
- 23 = Calibration plate (for official verification)
- 24 = Plug

Drawing 2



Drawing 3



- 25 = Union nut
- 26 = Piston
- 27 = Cylinder
- 28 = Tank
- 29 = Connection for external admission pressure "Vordruck"
- 30 = Vent for admission pressure "Vordruck"
- 31 = Nameplate

**Schematic diagram**

Drawing 4

