

## Operating Manual

### Vacuum Deadweight tester

Model: CWZ



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*Manufactured by* Shaanxi Creat Wit Technology Co., Ltd

## Contents

I Application.....	1
II Basic principle and structure .....	1
III Technical parameters .....	3
1. Measuring range and weight set data .....	3
2. Accuracy:0.02%, 0.05%.....	3
3. Connection: M20 x 1.5 or user defined e.g. NPT.....	3
4. Dimension: 560 (L) ×410(W) ×550(H) mm.....	3
IV Mass Calculation Formula of Special Weight.....	3
V. Operation instruction .....	4
1. Precision pressure gauge calibration .....	4
2. Precision vacuum gauge calibration.....	5
VI. Maintenance .....	6
VII Order notice .....	7

## I Application

The vacuum deadweight tester (hereinafter referred to as the pressure gauge) is mainly used to test the precision pressure gauges (Range: -0.1~0.25MPa; Accuracy: 0.16%, 0.25%, 0.4%).

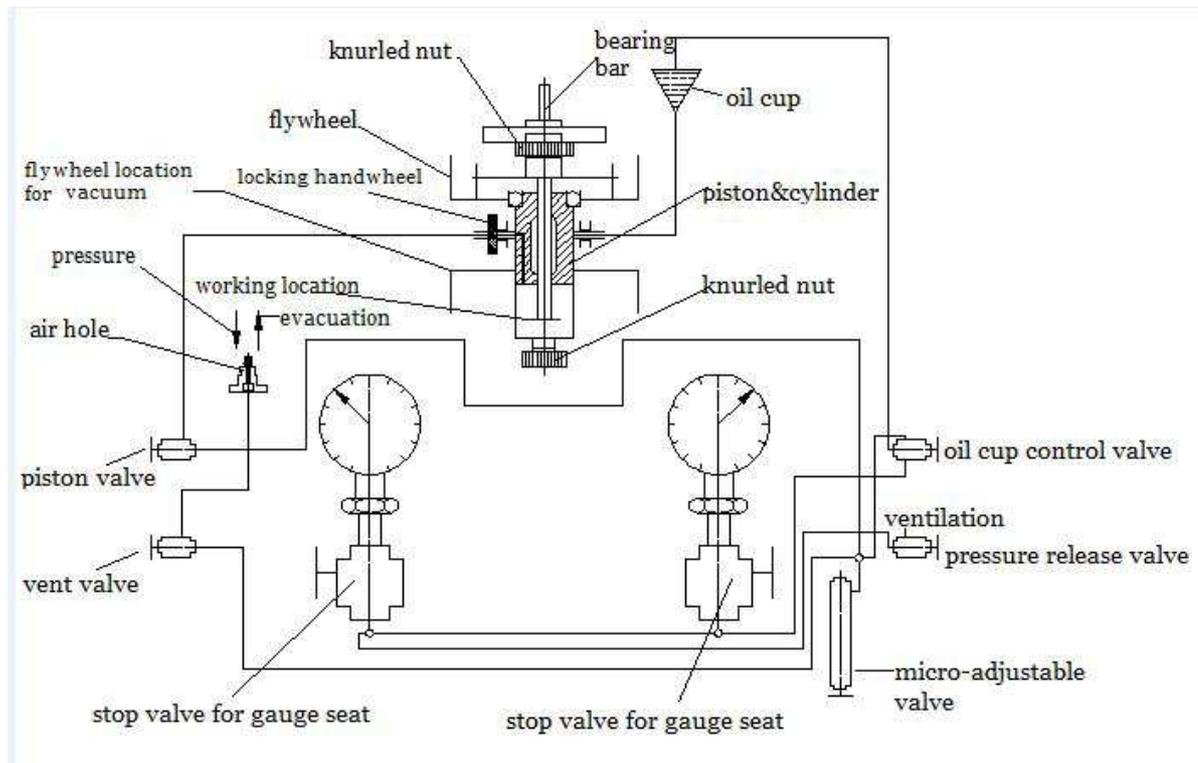
**Accuracy:** 0.02 0.05, and the working medium is air.

## II Basic principle and structure

### Basic principle

The piston-cylinder system and the weight load apply to nominal effective area of the piston to generate standard pressure, and the pressure is transmitted to precision pressure gauge through working medium.

The basic structure is shown in figure 1. There are piston system, trimming valve and six valves on the pressure gauge base.



**Figure 1: (Schematic diagram of structure principle of deadweight tester)**

**For pressure measurement,** piston system should be in the position shown in figure 1, and then compressed air source (maximum pressure  $\geq 0.25$  MPa, if pressure value is over 0.4 MPa, there should be pressure-relief devices) or manual pressurized air pump should be connected to air connection port to let gas into adjustment valve. And then through the measured precision table seat valve and pressure gauge connected, through the piston valve on the piston bottom, through pressure on the surface of the oil cup control valves on the oil cup, to lubrication and sealing piston.

**For vacuum measurement,** piston system should be rotated  $180^\circ$  from front around the horizontal axis and locked, and the gas connection should be connected with hand vacuum pump. The gas resource is applied on the piston upper end through the pipeline with precision vacuum gauge connected. Now, the oil cup control valves should be closed and open the oil cup cover to connected with atmosphere in order to get zero.

**The weight** of the bearing bar and knurled nut of the piston system is 0.05kg, and the weight of the remaining piston rod is 0.05kg, and the bearing rod and knurled nut should be removed

for 0.005 MPa measurement.

### III Technical parameters

#### 1. Measuring range and weight set data

Model	CWZ-2.5T	CWZ-4T	CWZ-6T
Measuring range(MPa)	-0.1~0.25	-0.1~0.4	-0.1~0.6
Weight specification(MPa)	Weight quantity (piece)		
0.1	/	3	5
0.05	3	/	/
0.02	3	4	4
0.01	2	1	1
0.005	2	1	1
-0.01	1	1	1
-0.02	4	4	4

2. Accuracy:0.02%, 0.05%

3. Connection: M20 x 1.5 or user defined e.g. NPT

4. Dimension: 560 (L) ×410(W) ×550(H) mm

### IV Mass Calculation Formula of Special Weight

1. The mass of special weight shall be adjusted according to formula before use.

$$M = p \times A' \times 1/g \times (1 + \rho_a / \rho_m)$$

**Notes:**

M-Mass of piston system and weight (kg)

p - Pressure value measured, **Pa**;

A' - Effective area of piston, **m<sup>2</sup>**;

g -local gravity, m/s<sup>2</sup>;

$\rho_a$  - air density, its value can be  $1.2 \text{ kg/m}^3$  ;

$\rho_m$  - Material density of special weight, piston, it can take following value:

m - Mass of special weight, piston and its fittings, **kg**;

$\rho$  carbon steel:  $7.8 \times 10^3 \text{ kg/m}^3$        $\rho$  aluminum:  $2.73 \times 10^3 \text{ kg/m}^3$

$\rho$  stainless steel:  $7.93 \times 10^3 \text{ kg/m}^3$

2. The special weights can not be adjusted but pressure values are adjusted as follows:

$$\Delta P' = P' (g/9.80665 - 1)$$

**Notes:**

$\Delta P'$  — modified pressure value (Pa)

$P'$  — measured pressure value (Pa)

g-local gravity (  $m/s^2$  )

## **V. Operation instruction**

### **1. Precision pressure gauge calibration**

a) Loosen locking hand wheel of the piston cylinder, piston system should be rotated from front around the horizontal axis to make the flywheel above the horizontal axis and lock it when the piston is in vertical position. Adjust the knurl nut of the bottom of the piston system base to make the level bubbles in the middle position, and tighten the knurled nut.

b) The tester can calibrate two gauges at one time. The calibrated gauge should be connected to quick connector of stop valve of the gauge seat. Then open the piston valve, control valve of the oil cup and gauge cut-off valve; close the vent valve and pressure relief valve, and make the adjustment screw out about 30 mm to be in the middle position.

c) Use a hose to connect the nozzle of the air source.

d) Load weight according to the measured pressure point on the piston system.

e) Open the vent valve slowly to increase the pressure to close to the calibrated pressure point, make the piston rises slowly and turn the hand wheel clockwise slowly to drive the piston, and then close the vent valve, use micro-adjustable valve to keep the piston in the line of working location indicator. Now, the pressure value of the precision pressure gauge at this point can be calibrated. Other points can also be calibrated in this method.

f) For pressure decreasing, close the vent valve, open the pressure relief valve slowly to close it when the pressure value close to the calibrated pressure point, use micro-adjustable valve to keep the piston in the line of working location indicator. Now, the pressure value of the precision pressure gauge at this point can be calibrated. For zero value, users open the relief valve to connect with air to get it.

## 2. Precision vacuum gauge calibration

g) Loosen locking hand wheel of the piston cylinder, piston system should be rotated from front around the horizontal axis to make it below the horizontal axis and lock it when the piston is in vertical position. Adjust the level bubbles of piston cylinder in the middle position, and tighten the knurled nut.

h) The calibrated vacuum gauge should be connected to stop valve of the gauge seat. Then open cut-off valve of gauge seat, the piston valve and oil cup cover; close the pressure relief valve, oil cup control valve and make the micro-adjustment screw out about 30 mm to be in the middle position.

- i) Use a hose to connect the nozzle of the gas source of evacuating device.
- j) Load weight according to the measured vacuum point on the bearing bar of the piston system.
- k) Open the vent valve slowly to adjust the vacuum value close to calibrated point, make the piston rises slowly and turn the hand wheel clockwise slowly to drive the piston, and then close the vent valve, use micro-adjustable valve to keep the piston in the line of working location indicator. Now, the vacuum value of the precision vacuum gauge at this point can be calibrated. Other points can also be calibrated in this method.
- i) For return calibration, open the pressure relief valve to close it when the vacuum value close to the calibrated point, use micro-adjustable valve to keep the piston in the line of working location indicator. Now, the vacuum value of the precision vacuum gauge at this point can be calibrated. For zero value, users open the relief valve to connect with air to get it.

Piston, cylinder, bearing bar, weight, etc. must be matched with same factory serial number of the deadweight tester, which cannot be exchanged.

## **VI. Maintenance**

1. When the user receives the products, please open the case to dismantle the underlay, check if its appearance is in good condition, and check if accessories (e.g. the calibration certificate, operating manual and etc.) are complete according to the packing list. If there is any problem, please inform and contact us in time.

2. The piston rod and piston cylinder of deadweight tester are precision components.

Forbidden to disassemble randomly and damage, and keep it clean.

3. In case of air leakage, the tester can be used to apply the soap water to check the joint to find out the leak carefully, and then tighten the sealing ring after finding it, do not disassemble it randomly.
4. Before use, the tester should be filled with half cup of clean transformer oil, which kinematic viscosity is  $9 \sim 12 \text{ mm}^2/\text{s}$ ; Liquid and dirt are not allowed in the remaining pipelines. In the course of use, when the oil in the oil cup is not enough, it needs to be added in time.
5. The piston end is not allowed to retain too much oil. If there is oil, users can loosen the knurled nut to discharge the oil.
6. When the tester is not used, please put on the dust cover to prevent dust from entering the tester and coat some anti-rust oil to the weight.
7. Recalibration interval is one year.

## **VII Order notice**

Order must indicate: model, product name, measuring range and accuracy.