

# Pressure Balance Model CPB5000



WIKA Data Sheet CT 31.01

## Applications

- Primary standard for defining the pressure scale in a range up to 100 bar (pneumatic) or 1,000 bar (hydraulic)
- Reference instrument for testing, adjusting and calibrating pressure measuring instruments in factories and calibration laboratories
- Self-contained, complete system also suitable for on-site measurements/calibrations

## Special Features

- Total uncertainty of measurement down to 0.008 % of reading
- Factory calibration certificate as standard, traceable to National Standards, DKD calibration certificate available as an option
- High long-term stability with a recommended recalibration cycle of 5 years
- Masses manufactured from stainless steel and aluminium, local gravity adjustment possible at no additional charge
- The patented ConTect quick-change system enables fast and secure exchange of the piston cylinder system in order to change the measuring range.



Pressure Balance Model CPB5000

## Description

### Proven primary standard

Pressure balances are the most accurate instruments for the calibration of electronic or mechanical pressure measuring instruments.

The direct measurement of pressure, ( $P = F/A$ ) and the use of high-quality materials, result in small measurement uncertainties and an excellent long-term stability of five years. For these reasons pressure balances have already been used in the calibration laboratories of industry, national institutes and research laboratories for many years.

### Self-contained operation

Due to the integrated pressure generation and the purely mechanical measuring principle, the CPB5000 is ideally suited to on-site use as well as service and maintenance purposes.

### Basic principle

Pressure is defined as the quotient of force and area. Correspondingly, the core of the CPB5000 is a very precisely-manufactured piston cylinder system, which is loaded with masses in order to generate the individual test points.

The weight applied is proportional to the desired pressure and accomplished by using optimally graduated weights. These weights are manufactured to standard gravity ( $9.80665 \text{ m/s}^2$ ) although, for fixed location usage, they can be adjusted to a customer-specified local gravity.

## Easy operation

Depending on the instrument version the pressure is set via an integrated pump or via an external pressure supply by the use of control valves. For fine adjustment a very precisely adjustable spindle pump with a precision spindle running only within the pump body is mounted.

## Piston Cylinder System

Both the piston and cylinder are manufactured from Tungsten Carbide. Compared to other materials, Tungsten Carbide has very small pressure and thermal expansion coefficients, which results in a very good linearity of the effective cross-sectional area of the piston and high measurement accuracy.

Piston and cylinder are very well protected in a solid stainless steel housing, against contact, impacts or contamination from outside. In addition, overpressure protection is integrated, which prevents the piston from being forced out vertically and avoids damage to the piston cylinder system in the event of weight removal under pressure.

The weight discs are stacked on a bell jar which is fitted to the piston skirt. Due to the construction of the bell jar, the centre of gravity for the stacked weights is very low, which minimises both the side thrust on the piston cylinder system and the friction. For relatively low starting pressures, a lighter aluminium plate can be used instead of the bell jar.

The overall design of the piston cylinder unit and the very precise manufacturing of both the piston and the cylinder ensure excellent operating characteristics with a long free-rotation time, low sink rates and a very high long-term stability. Therefore the recommended recalibration interval is 5 years.

## High-performance instrument range

The CPB5000 instrument bases are available in the following 3 designs:

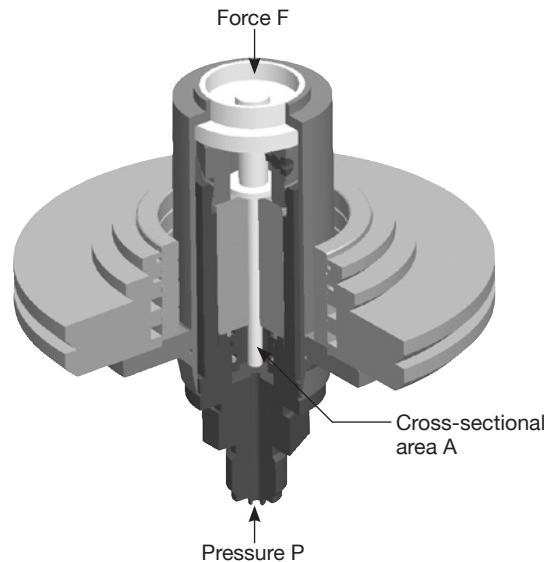
- **Low-pressure pneumatic base**
  - up to a max. 10 bar / 150 psi
  - with integrated pressure generation through inlet pressure pump and spindle pump
- **High-pressure/Vacuum pneumatic base**
  - up to a max. 100 bar / 1,500 psi
  - Connection for an external pressure supply or vacuum
- **Hydraulic base**
  - up to a max. 1,000 bar / 15,000 psi
  - with integrated pressure generation through inlet pressure pump and spindle pump

As soon as the measuring system reaches equilibrium, there is a balance of forces between pressure and mass applied.

The excellent quality of the system ensures that this pressure remains stable over several minutes, so that the device under test can be calibrated or time-consuming adjustments can be carried out without any problems.

The standard connection for the piston cylinder system is an M30 x 2 male thread.

The patented ConTect quick-connect system, for easy measuring range changes without tools, is available as an option.



**Piston Cylinder System**

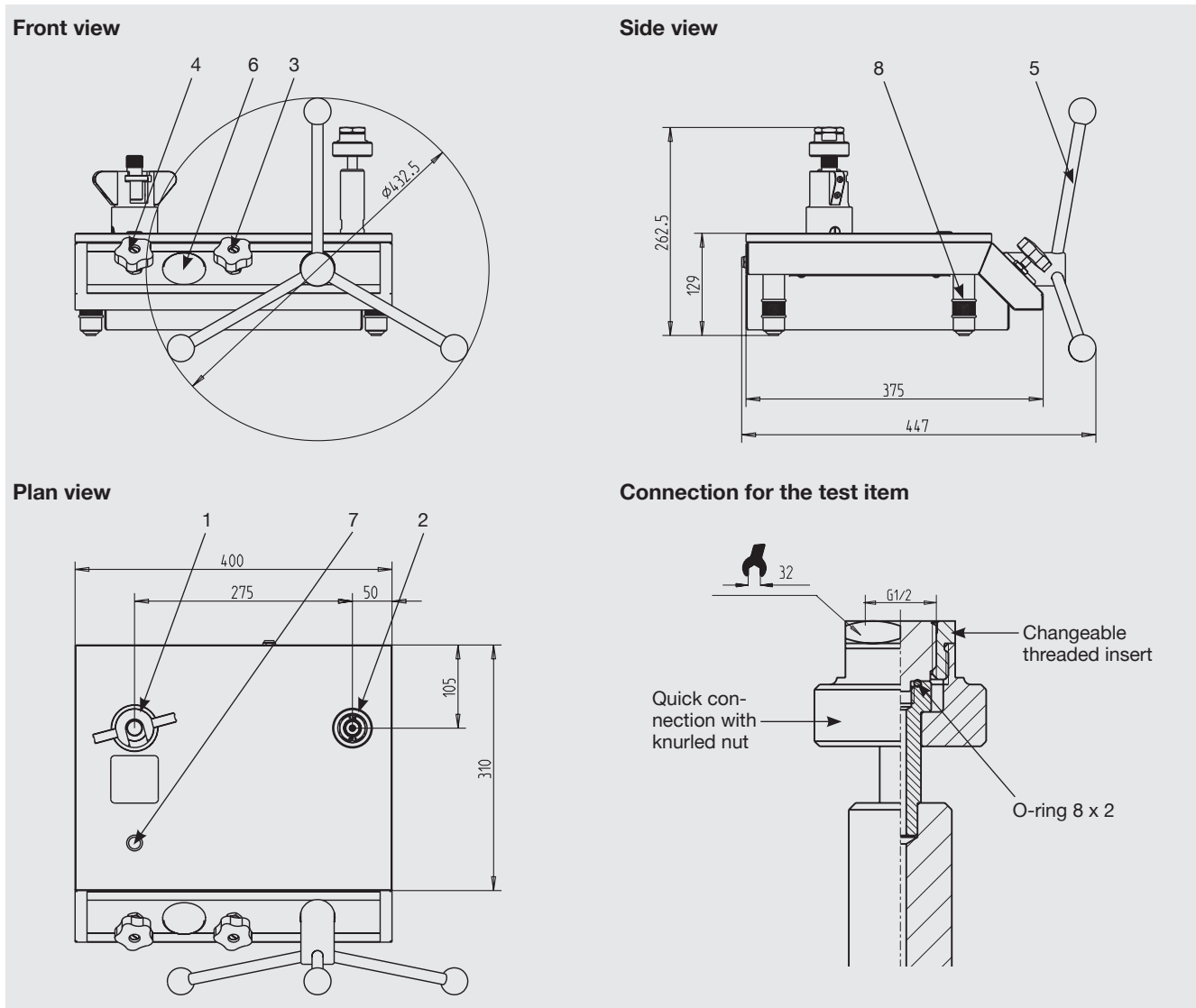
As a standard all instrument bases are equipped with a connection for the piston cylinder system with M30 x 2 female threads.

Optionally, the integrable patented ConTect quick-change adapter enables fast and secure changing of the measuring range, without the need for tools. In this way you can build a price-optimised complete system from one universal base and up to 3 ConTect piston cylinder systems for different measuring ranges, which can be operated with only one mass set.

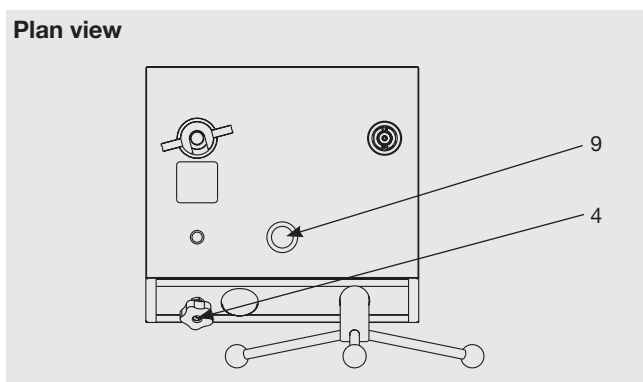
## Dimensions in mm

The drawing shows a pneumatic, high-pressure CPB5000 base with the ConTect quick-connect option.

The pneumatic low-pressure version and hydraulic version differ only in the arrangement of the control elements, and not dimensionally.

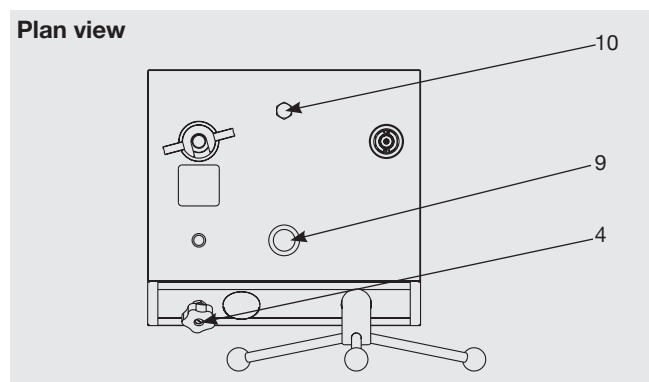


### Base low-pressure pneumatic



- (1) Adapter piston cylinder system
- (2) Adapter test item
- (3) Inlet-valve (only pneumatic high-pressure)
- (4) Outlet-valve
- (5) Spindle pump with star handle, removable

### Base hydraulic



- (6) Test-pressure gauge
- (7) Water level
- (8) Rotating base
- (9) Inlet pressure pump
- (10) Oil reservoir screw plug

## Accessories

### Set of trim-masses

The weights included in the standard scope of delivery are ideally suited for everyday use. If you would like to generate intermediate values, however, we recommend using a set of class F1 trim-masses, with the following weights:

1 x 50 g / 2 x 20 g / 1 x 10 g / 1 x 5 g / 2 x 2 g / 1 x 1 g /  
1 x 500 mg / 2 x 200 mg / 1 x 100 mg / 1 x 50 mg /  
2 x 20 mg / 1 x 10 mg / 1 x 5 mg / 2 x 2 mg / 1 x 1 mg



Set of trim-masses

### Set of adapters for quick connector

As a standard, the pressure balance is equipped with a quick connector for connecting the test item. For this purpose, various threaded adapters, which can be easily exchanged, are available:

- Set of adapters: G ¼, G ⅜, ½ NPT, ¾ NPT and M20 x 1.5
- Set of adapters NPT: ¼ NPT, ½ NPT, ¾ NPT and 1 ½ NPT

Additionally the sets of adapters include spare O-rings as well as a spanner, 32 flats and 14 flats, for exchanging the adapters.

Other threaded inserts are available on request.



Set of adapters

### Dirt trap, purifier

For test objects that are very dirty, the use of a dirt trap is recommended in order to avoid the penetration of dirt particles into the pressure balance.

The purifier (without diaphragm) has been specially designed for measuring instruments where the fill fluid should not come into contact with the pressure balance.

It is typically used with pneumatic pressure balances for the calibration of instruments with the test media water but also for pneumatic pressure balances (only with external pressure supply) for calibrating devices with test medium water or oil.



Fig. left: Purifier  
Fig. right: Dirt trap

Description / Features	Order no.
Trim-masses (1 mg up to 50 g), class F1	7093874
Set of adapters for quick-connector, in a case with threaded inserts G ¼, G ⅜, ½ NPT, ¾ NPT and M20 x 1.5 for fitting to the knurled nut of the test item connection.	2036941
Set of "NPT" adapters for quick-connection in a case with threaded inserts ¼ NPT, ½ NPT, ¾ NPT and 1 ½ NPT for fitting to the knurled nut of the test item connection	12563626
Angle connection 90°, for test specimens with back mounting connection	1564838
Purifier, max. 800 bar	1565389
Dirt trap, -1 ... +400 bar	2015820
Dirt trap, -1 ... +1,000 bar	2015714
Set of O-rings consisting of 5 spare 8 x 2 and 5 spare 4 x 2.2	12328562
Operating fluid for CPB5000 up to 4,000 bar, 1 litre	2099882
Cleaning set for ConTect-systems, pneumatic version	12485943
Cleaning set for ConTect-systems, hydraulic version	12481425
Special test item admission with quick-connector, to the adaptation into the ConTect system admission, operation as comparison test pump possible	2152634