

Pressure Balance

GB

压力天平

CN

CPB 5000



Pressure Balance CPB 5000

CPB 5000 压力天平



Information

This symbol provides you with information, notes and tips.



Warning!

This symbol warns you against actions that can cause injury to people or damage to the instrument.

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1. General

1.1 General Instructions

In the following chapters detailed information on the CPB 5000 pressure balance and its proper use can be found.

Should you require further information, or should there be problems which are not dealt within detail in the operating instructions, please contact the address below:

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If nothing to the contrary is agreed, the pressure balance is calibrated in compliance with the currently valid body of international regulations and can be referred directly to a national standard.

The warranty period for the pressure balance is 24 months according to the general terms of supply of ZVEI.

The guarantee is void if the appliance is put to improper use or if the operating instructions are not observed or if an attempt is made to open the appliance or to release attachment parts or the tubing. We also point out that the content of these operating instructions neither forms part of an earlier or existing agreement, assurance or legal relationship nor is meant to change these. All obligations of WIKA Alexander Wiegand SE & Co. KG result from the respective sales contract and the general business terms of WIKA Alexander Wiegand SE & Co. KG.

WIKA is a registered trade mark of WIKA Alexander Wiegand SE & Co. KG.

Names of companies or products mentioned in this handbook are registered trade marks of the manufacturer.

The devices described in this manual represent the latest state of the art in terms of their design, dimension and materials. We reserve the right to make changes to or replace materials without any obligation to give immediate notification.

Duplication of this manual in whole or in part is prohibited.

1.2 Safety Instructions



Read these operating instructions carefully prior to operating the pressure balance CPB 5000. Its trouble-free operation and reliability cannot be guaranteed unless the safety advice given in this manual is followed when using the device.

1. The system must only be operated by trained and authorised personnel who know the manual and can work according to them.
2. Trouble-free operation and reliability of the device can only be guaranteed so long as the conditions stated under "Setting up the device" are taken into consideration.
3. The CPB 5000 always has to be handled with the care required for an precision instrument (protect from humidity, impacts and extreme temperatures). The device, the piston-cylinder-system and the mass-set must be handled with care (don't throw, hit, etc.) and protect them from contamination. By no means apply any force to the operating elements of the CPB 5000.
4. If the device is moved from a cold to a warm environment, you should therefore ensure the device temperature has adjusted to the ambient temperature before trying to put it into operation.
5. If the equipment is damaged and might no longer operate safely, then it should be taken out of use and securely marked in such a way so that isn't used again.
Operator safety may be at risk if:
 - There is visible damage to the device
 - The device is not working as specified
 - The device has been stored under unsuitable conditions for an extended period of time.If there is any doubt, please return the device to the manufacturer for repair or maintenance.
6. Customers must not attempt to alter or repair the device themselves. If the instrument is opened or attachment parts or the tubing are released, its trouble-free operation and reliability is impaired and endangers the operator. Please return the device to the manufacturer for any repair or maintenance.
7. There must be used only the original sealings in the device.
8. Any operation not included in the following instructions or outside the specifications must not be attempted.

2. Product Description

2.1 General Product Information

■ Application

Pressure balances are the most accurate instruments for the calibration of electronic or mechanical pressure measuring instruments. The direct measurement of pressure, according to its definition as a quotient of force and area, and the use of high-quality materials result in small uncertainties of measurement and an excellent long-term stability of five years.

For these reasons pressure balances have already been used in calibration laboratories of industry, national institutes and research labs for many years. Due to the integrated pressure generation and the purely mechanical measuring principle the CPB 5000 is also ideally suited for on-site use as well as service and maintenance purposes.

■ Piston/cylinder measuring system

Pressure is defined as a quotient of force and area. Correspondingly, the core of the CPB 5000 is a very precisely manufactured piston/cylinder system. Both the piston and cylinder are manufactured from Tungsten Carbide and are very well protected in a solid stainless steel housing against touching, impacts or contamination from outside.

As a standard the connection of the piston/cylinder system is a M30 x 2 male thread. The patented ConTect quick connector is available as an option. It allows a quick and safe change of the measuring range without the need for tools. Thus it is possible to set up a compact complete system at a favourable price, consisting of an universal instrument base and up to 3 ConTect piston/cylinder systems with different measuring ranges with only one weight set.

The pneumatic piston/cylinder systems are available for vacuum and pressure ranges from 2 bar up to 100 bar resp. 30 psi up to 1500 psi and the hydraulic systems are available for pressure ranges from 60 bar up to 1000 bar resp. 1000 psi up to 14500 psi. The accuracy is 0.015 % (optional also 0.008 %) of reading.

The entire construction design of the piston/cylinder unit and the very precise manufacturing of the piston and the cylinder stand for excellent operating characteristics with a long free rotation time and low fall rates and for a very high long term stability. Therefore the recommended re-calibration interval is 5 years.

■ Functioning

Depending on the measuring range of the device under test you can fit the instrument basement with the corresponding system. In order to generate the individual test points, the piston cylinder system is weighted with mass-loads. The weight applied is proportional to the desired pressure and provided by using optimally graduated weights. These weights are manufactured to standard gravity (9.80665 m/s²) although for fixed location usage they can be adjusted to a customer specified local gravity.

Depending on the instrument version the pressure is set either via an integrated pump or via external pressure supply by the use of control valves. For fine adjustment an adjustable volume with precision spindle is available. As soon as the measuring system reaches equilibrium, there is a balance of forces between pressure and wheel weights.

Due to the high-grade quality of the system this pressure remains stable over several minutes, so that for instance adjustments of your device under test can be carried out without any problems.

2.2 Basic principle of the Pressure Balance

Their operating principle is based on the physical definition of pressure, the quotient of force and surface.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

The key element of the pressure balance is a precision-manufactured piston/cylinder system with a precisely measured cross-sectional surface.

To apply a pressure charge to the system, the piston is placed under a load with (calibrated) weight pieces.

Each holding disk from the set of weights is identified by a nominal weight, which generates a pressure value in the system (assuming standard reference conditions). Each weight has a number and in the calibration certificate there is described the mass value to each weight with its resultant pressure value. The weights are chosen according to the desired pressure value.

After that, the integrated spindle pump increases the pressure until the weights are in a floating state.

2.3 Factors at work

The piston pressure gauge is calibrated to standard reference conditions when it leaves the factory (depending on customer specifications).

If there are significant deviations between the application conditions and the defined reference conditions, appropriate corrections must be made.

Following are the main factors that enter into play and must be considered.



These corrections can be made automatically with the CalibratorUnit CPU 5000 (see accessories point 8)!

2.3.1 Local fluctuations in the gravity-value

The local force of gravitation is subject to major fluctuations caused by geographical variation. The value may differ from one place on earth to another by as much as 0.5 %. Since this value has a direct effect on the measurement, it is essential that it be taken into consideration.

The weight pieces can even be adjusted during manufacturing to match the location where they will be used. Another option, especially if the device will be used at multiple locations, is to perform a calibration to the standard gravity, "Standard-g = 9.80665 m/s²".

Then a correction must be performed for each measurement according to the formula below:

$$\text{True pressure} = \text{Nominal value} \cdot \frac{g - \text{Application site}}{\text{Standard} - g}$$

Example:

Local gravity set during manufacturing:	9.806650 m/s ²
Locale gravity at application site:	9.811053 m/s ²

Nominal pressure: 100 bar

$$\text{True pressure: } p = p_{\text{Nominal}} \cdot \frac{g^{\text{Local}}}{g^{\text{Standard}}} = 100\text{bar} \cdot \frac{9.81105}{9.80665} = 100.0449\text{bar}$$

Without the correction, measurements would all be "off" by 0.05 %.

2.3.2 Temperature (Piston/Cylinder)

The effective cross-sectional surface of the piston/cylinder system depends on the temperature. The effect depends on the material used and is described by the temperature coefficient (TK).

In the event of deviations from standard reference conditions (typically 20°C), the following formula must be used to make a correction:

$$\text{True pressure} = \text{Nominal value} \cdot \frac{1}{1 + (t_{\text{Appl}} - t_{\text{Reference}}) \cdot \text{TK}}$$

Example:

Reference temperature: 20°C
Temperature during use: 23°C
TK: 0.0022%

$$\text{True pressure} = 100\text{bar} \cdot \frac{1}{1 + (23 - 20) \cdot 2.2 \cdot 10^{-5}} = 99.99340\text{bar}$$

Without the correction, measurements would all be "off" by 0.007 %.

2.3.3 Ambient conditions

The effects of ambient conditions

- air pressure
- room temperature
- relative humidity

should always be taken into consideration if the highest level of accuracy is required. Fluctuations in ambient conditions change air density.

The air density affects the pressure through the buoyancy of the weights:

$$\text{Weight} = \text{Nominal weight} \cdot \left(1 - \frac{\text{Air density}}{\text{Weight density}} \right)$$

The air density is typically 1.2 kg/m³

The density of the weights (non-magnetic steel) is 7900 kg/m³

A fluctuation of 5% in the relative humidity causes an additional uncertainty in the measurement of about 0.001%.

2.3.4 How the cross-sectional surface responds to pressure

At higher pressures, the effective cross-sectional surface changes due to the pressure load. The ratio of the cross-section and prevailing pressure is linear within an initial approximation. It is represented by the coefficient of expansion caused by pressure distortion (λ).

$$\text{True pressure} = \frac{\text{Nominal pressure}}{1 + \lambda \cdot \text{Nominal pressure}}$$

Example:

Measuring point: 1000 bar

System with distortion coefficient: 10^{-7} 1/bar:

$$\text{True pressure} = \frac{1000}{1 + 1 \cdot 10^{-7} \cdot 1000} \text{ bar} = 999.90 \text{ bar}$$

Without the correction, measurements would all be "off" by 0.01 %.

2.4 Arrangement of control elements

The CPB 5000 instrument bases are available in the 4 following versions, which vary in the arrangement of the control elements:

■ **Pneumatic low-pressure base**

- up to max 10 bar / 150 psi
- with integrated pressure generation via initial pressure pump and spindle pump
- tubing made of flexible hose (polyurethane), 6 x 1 mm

■ **Pneumatic high-pressure / vacuum base**

- up to max 100 bar / 1,500 psi
- for external pressure or vacuum connection
- tubing made of stainless steel (1.4571), 3 x 1 mm

■ **Pneumatic base with integrated gas to oil separator**

- up to max. 400 bar / 5000 psi
- for external pressure connection
- for the use with hydraulic piston cylinder systems with M30 x 2 connection
- test item can be calibrated easily, dryly and cleanly with air
- tubing made of stainless steel (1.4571), 3 x 1 mm

■ **Hydraulic base**

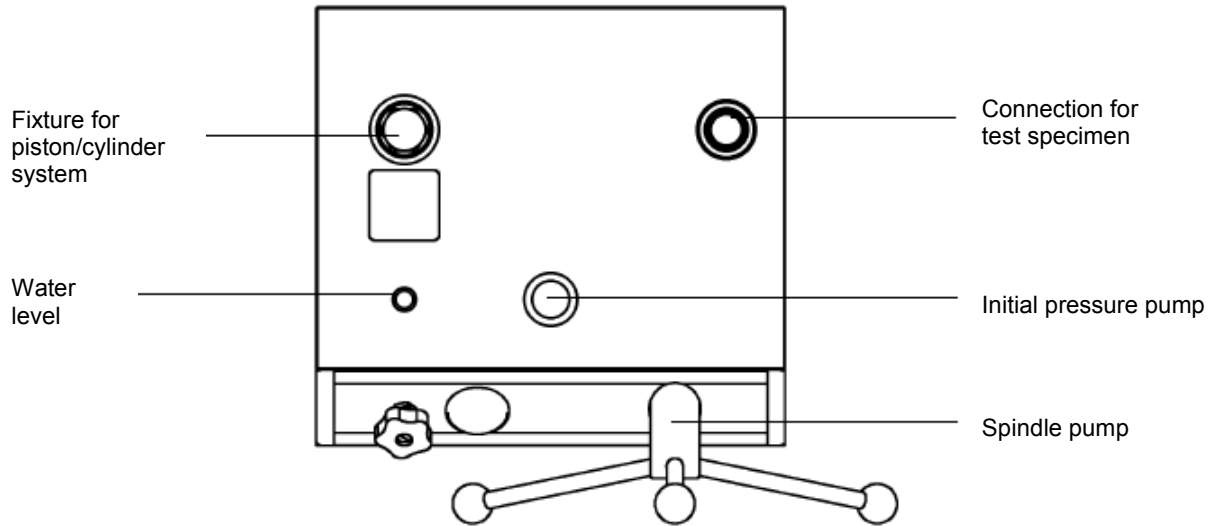
- up to max 1,000 bar / 14,500 psi
- with integrated pressure generation via initial pressure pump and spindle pump
- tubing made of stainless steel (1.4404), 6 x 2 mm
- up to 1200 bar / 17400 psi available as special version

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

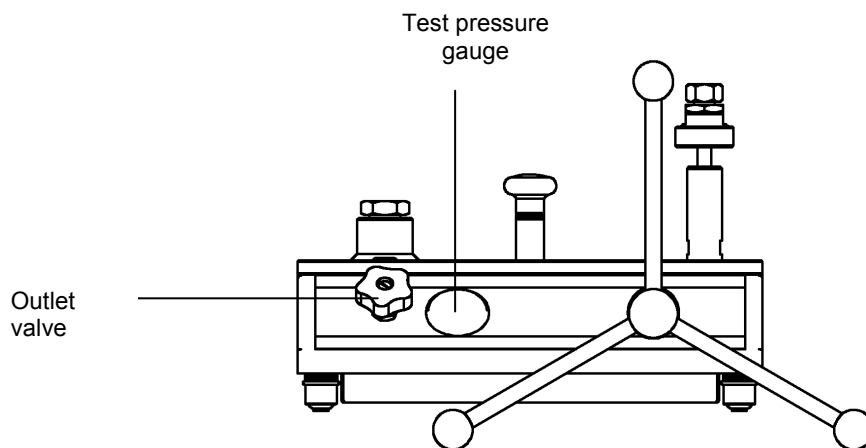
The patented ConTect quick connector can be installed as an option allowing a quick and safe change of the measuring range without the need for tools (not available for the version with integrated gas to oil separator).

2.4.1 Pneumatic low-pressure base

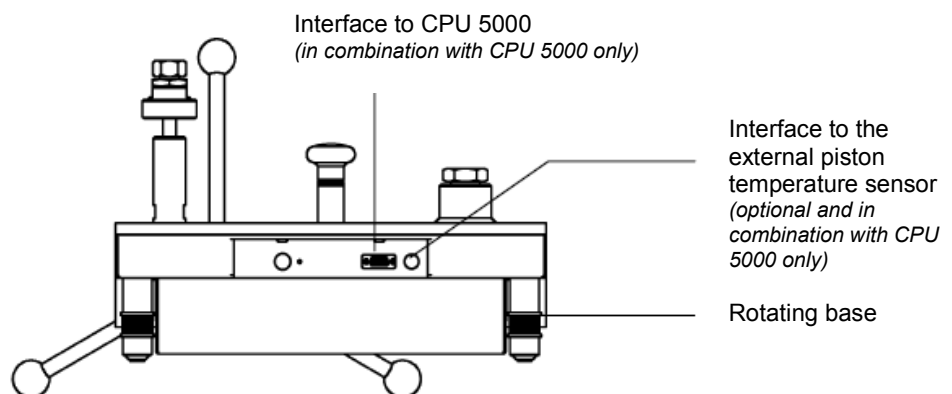
■ View from above



■ Front view



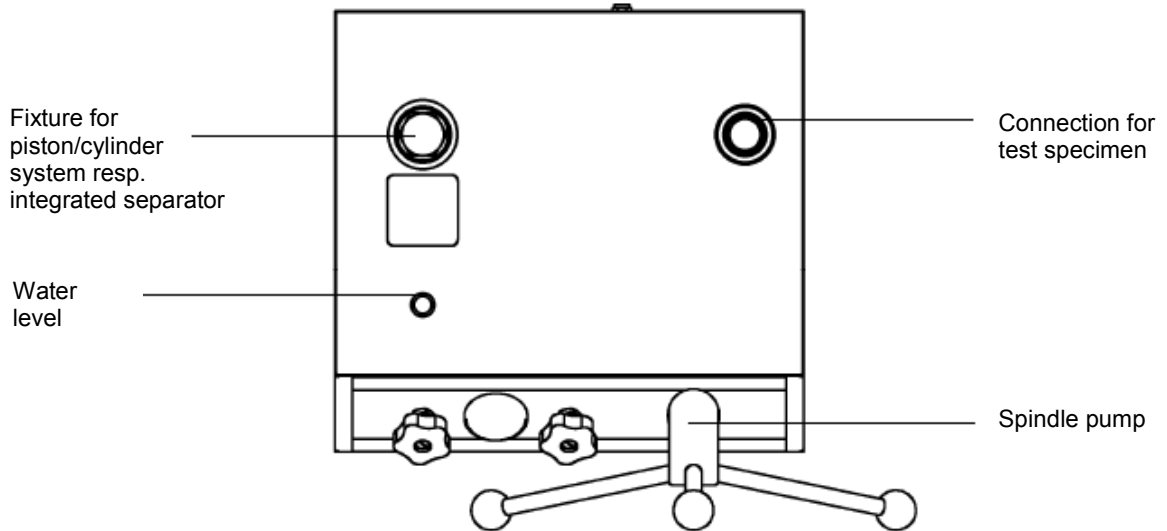
■ Rear view



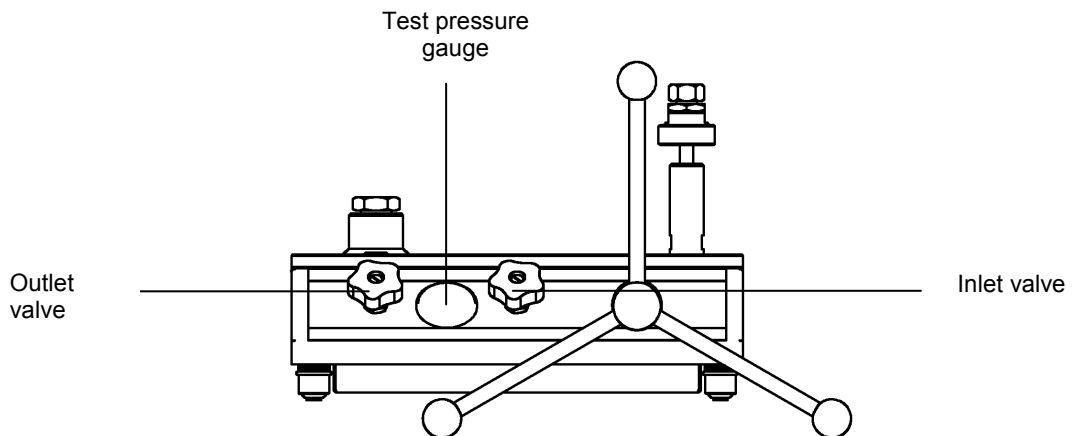
2.4.2 Pneumatic high-pressure / vacuum base

(also valid for version with integrated gas to oil separator)

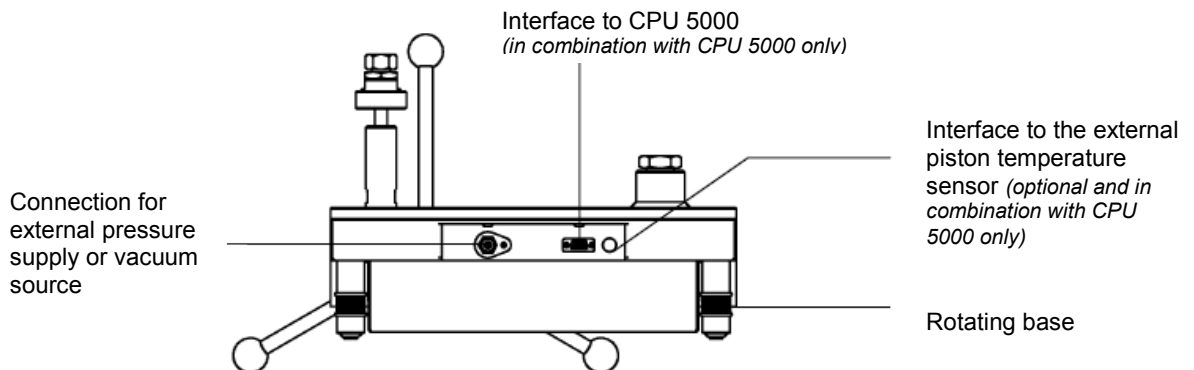
■ View from above



■ Front view

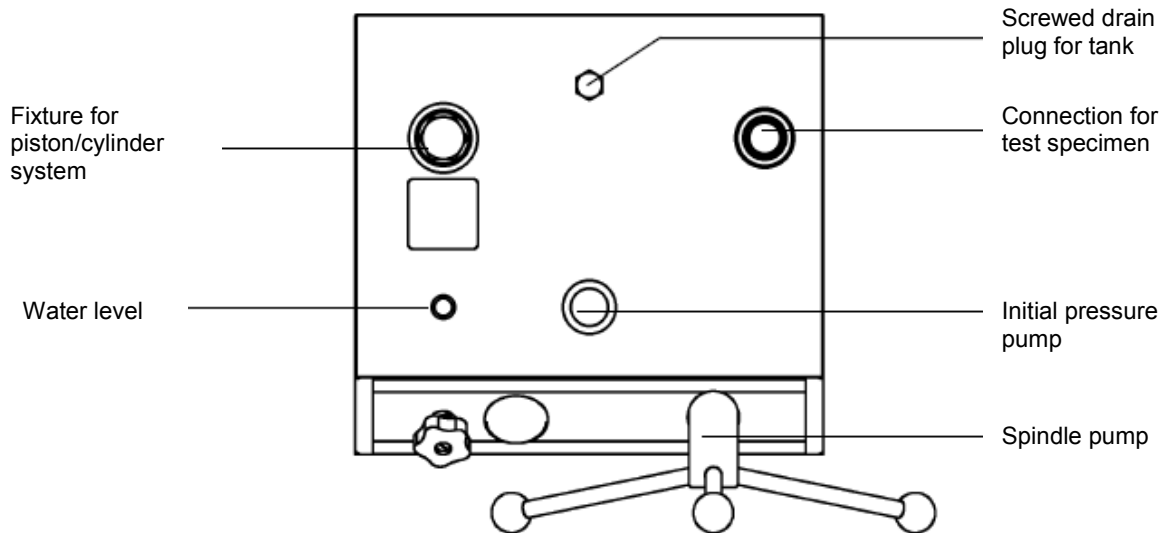


■ Rear view

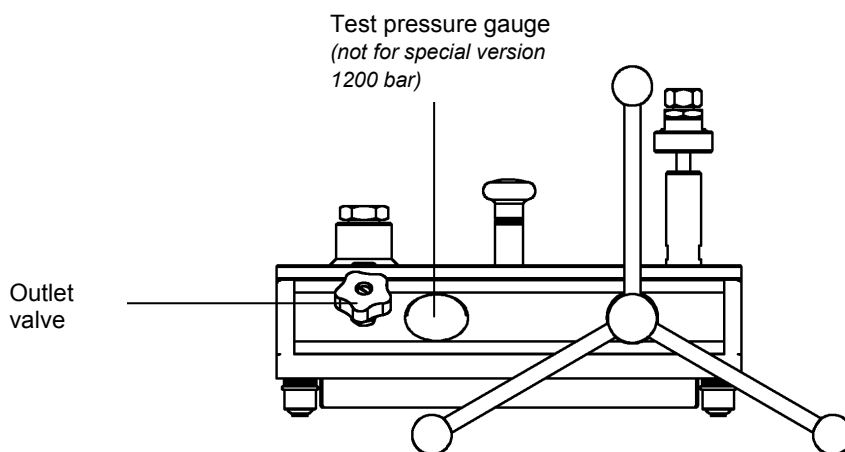


2.4.3 Hydraulic base

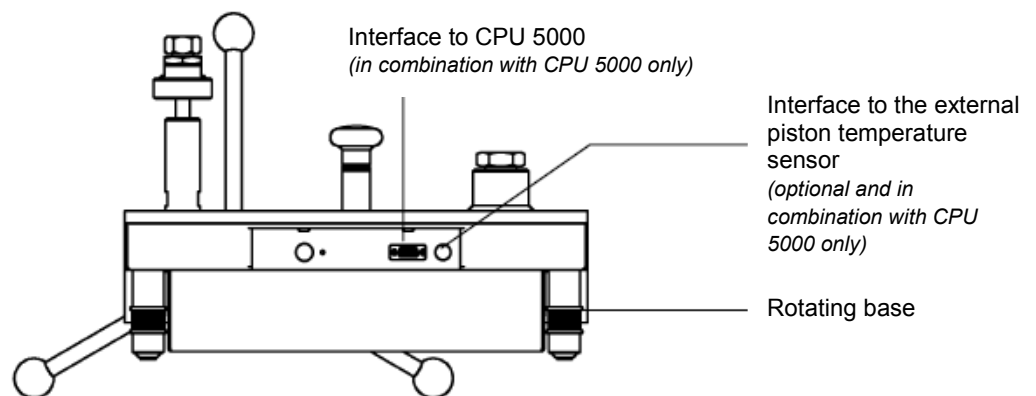
■ View from above



■ Front view



■ Rear view



3. Commissioning and Operation

3.1 Preparation

3.1.1 Setting up the Device

- Set up the pressure balance on a solid surface. If it is not resting on a solid foundation or is subject to vibrations, measurements could be affected. This should be avoided.
- If no temperature control system is present, the device should at least not be placed near a heat element or window. This will reduce drafts and warm air flows as much as possible.
- The water level should be used to align the device. At this time, rough alignment can already be performed without the piston/cylinder system. Using the rotating feed, position the device so that it is horizontal.
- Place the star handle with knobs onto the spindle pump. Ensure that the spring-loaded thrust pad engages into the star handle bushing.
- We recommend unscrewing the spindle pump completely when you start to record measurement values, (turning anticlockwise) to allow enough volume for measurements. The outlet valve must be opened during this process.

3.1.1.1 Instructions for pneumatic high-pressure / vacuum version

- In the **pneumatic high-pressure / vacuum version**, an external compressed air supply or a vacuum source has to be connected.
The pressure connection is specified as SWAGELOK® pipe connection with an outside pipe diameter of 6 mm at the back of the instrument base.



Attention: The maximum supply pressure must not exceed 110% of the range of the device to be tested or piston/cylinder system in use. The maximum permissible pressure is 110 bar!

The tubing is to be carried out by a fitter trained in SWAGELOK® -connections according to SWAGELOK® -tubing instructions.

- Only dry, cleaned and particle-free gases (for example nitrogen 4.0 or synthetic air) may be used.

3.1.1.2 Instructions for pneumatic version with integrated gas to oil separator

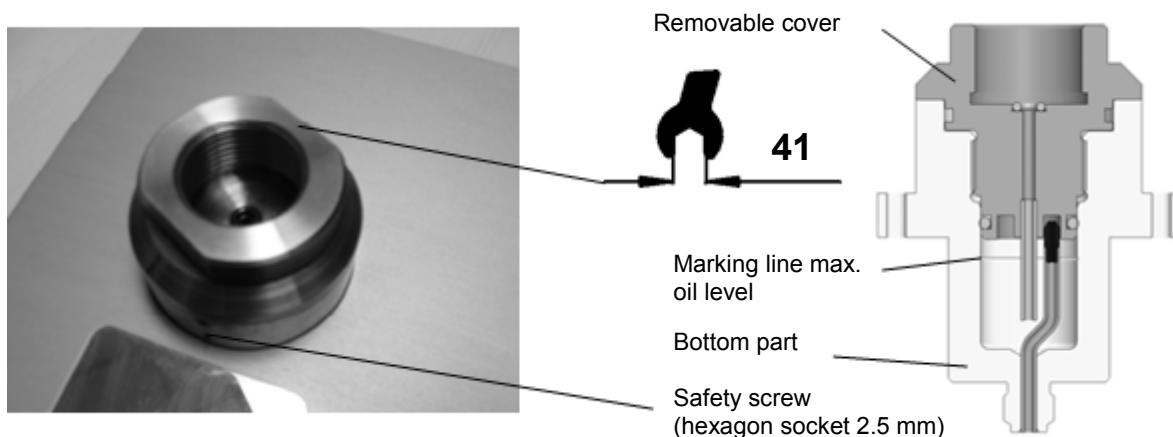
- In the **pneumatic version with integrated gas to oil separator**, an external compressed air supply has to be connected.
The pressure connection is specified as SWAGELOK® pipe connection with an outside pipe diameter of 6 mm at the back of the instrument base.



Attention: The maximum supply pressure must not exceed 110% of the range of the device to be tested or piston/cylinder system in use. The maximum permissible pressure is 440 bar!

The tubing is to be carried out by a fitter trained in SWAGELOK® -connections according to SWAGELOK® -tubing instructions.

- Only dry, cleaned and particle-free gases (for example nitrogen 4.0 or synthetic air) may be used.
- The integrated separator at the fixture for the piston/cylinder system may need to be filled, or refilled with oil. For this purpose the removable cover of the piston fixture must be opened. First of all the lateral safety screw must be unscrewed by the help of a hexagon socket wrench size 2.5 mm. Afterwards the removable cover has to be opened using a flat wrench size 41. Special oil must be used for refilling (0.25 litre supplied, or available as accessory). During filling look to it, that no oil gets into the upwards facing tubing. The oil level must not exceed the marking line.



- After filling screw the removable cover of the separator carefully and slowly into the bottom part. Tighten the cover firmly with the flat wrench and screw the lateral safety screw in again. After this the piston/cylinder system can be installed. For this purpose, please proceed according to section 3.1.2.4.

3.1.1.3 Instructions for hydraulic version

- The oil container may need to be filled, or refilled in the **hydraulic design** (volume 250 ml). For this purpose, the locking screw with the oil filling symbol on top of the basement must be opened. Special oil must be used for refilling (1 litre supplied, or available as accessory). The system must be vented before initial filling, or after a complete oil change. For this purpose, please proceed according to section 5.3.3.
- The protection film on the screwed drain plug of the oil container need to be removed before operating in the **hydraulic design** (coverage of the ventilation hole during transportation).

3.1.2 Installing the ConTect System

- The ConTect system that is used depends on the device to be tested. You should select a system with a comparable or higher range.

Example:

Calibration of a 600-bar pressure gauge → 600 bar ConTect system

Calibration of a 160-bar pressure gauge → 250 bar ConTect system

- The connection for the piston/cylinder system in the instrument base is available in 2 different versions:
 - Connection for piston/cylinder system with M30 x 2 female thread (see section 3.1.2.1)
 - Connection for piston/cylinder system with ConTect quick connector (see section 3.1.2.2)
- For vacuum operation a special piston/cylinder system and a special set of masses is required. The installation of the vacuum piston/cylinder system is described in section 3.1.2.3.

3.1.2.1 Connection for piston/cylinder system with M30 x 2 female thread



Before releasing the closure plug on the bottom of the device, make sure the system is not under pressure (open the outlet valve).

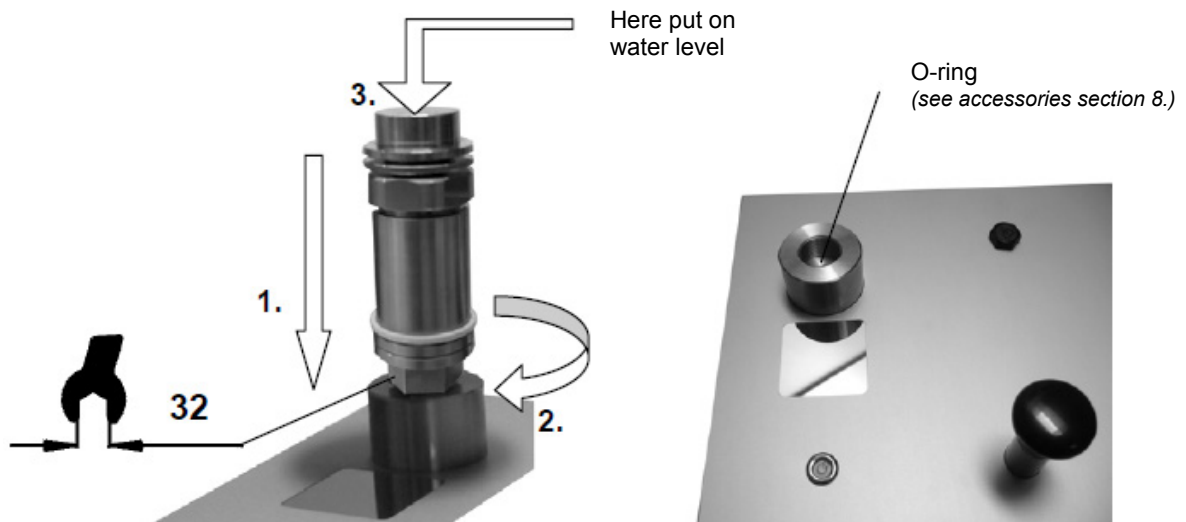
- The piston/cylinder system is inserted vertically into the thread of the piston receptacle, and firmly tightened using a flat wrench with SW 32. An O-ring seal is already fitted, so no additional sealing material is required.



Note: Do not mix up the air and oil systems

Check the O-ring seal in the receptacle for the piston/cylinder system for proper seat and for any wear. Replace, if necessary.

- For an exact alignment of the device, the water level may be removed from the basement plate and placed on the top of the clamped piston/cylinder system. This will ensure the most accurate referencing of the piston/cylinder system.



3.1.2.2 Connection for piston/cylinder system with ConTect quick connector



Before releasing the closure plug on the bottom of the device, make sure the system is not under pressure (open the outlet valve).

- Place the ConTect system vertically in the quick connector.

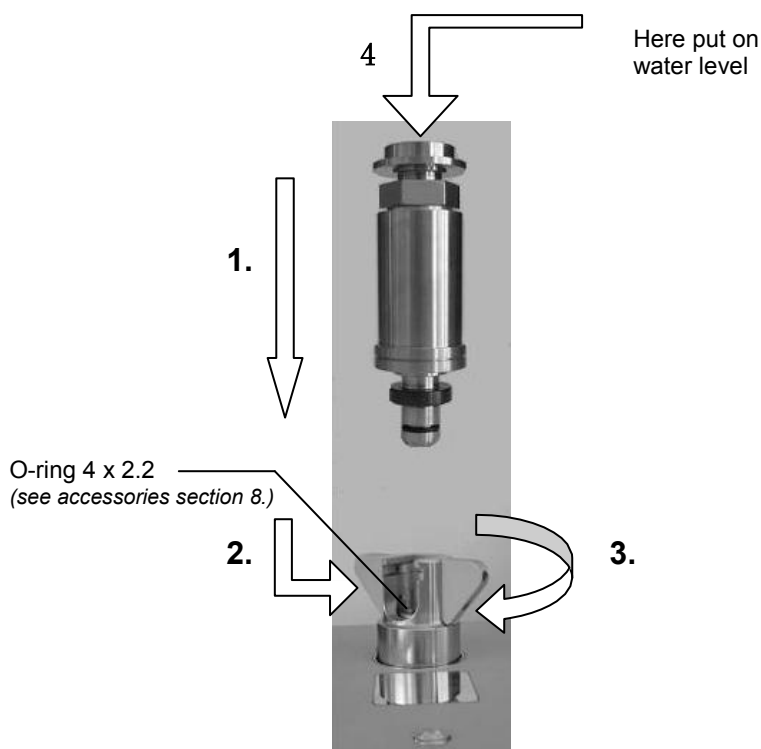


Note: Do not mix up the air and oil systems



Check the O-ring seal in the receptacle for the ConTect system for proper seat and for any wear. Replace, if necessary.

- Turning the butterfly screw about one and a half turn clockwise (as far as it will go) is enough to screw the in place with an automatic seal (finger-tight).
- For an exact alignment of the device, the water level may be removed from the basement plate and placed on the top of the clamped piston/cylinder system. This will ensure the most accurate referencing of the piston/cylinder system.

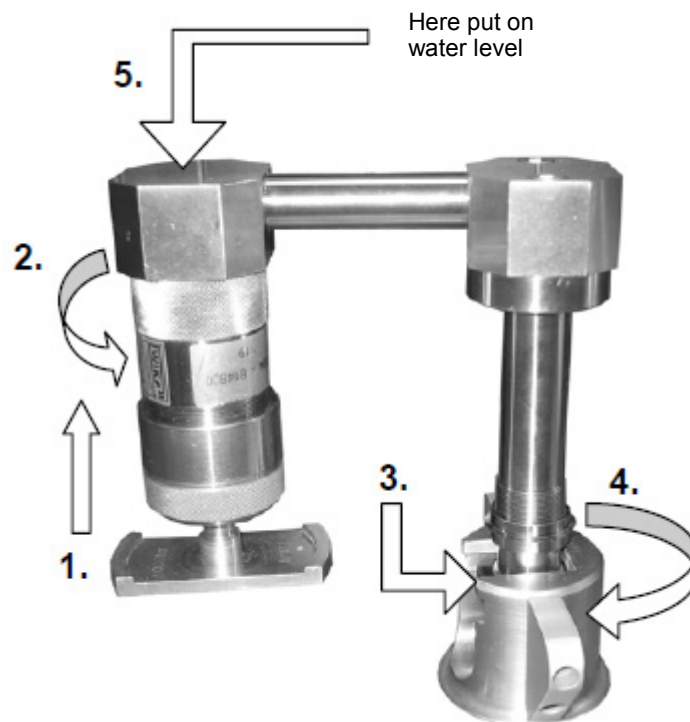


3.1.2.3 Vacuum piston/cylinder system



The vacuum piston/cylinder system can only be installed into a connection for piston/cylinder systems with ConTect quick connector.

- Screw the piston/cylinder system into the holding traverse. Hand-tightening will suffice for safe sealing. (step 1 and 2)
- Place the holding traverse with piston/cylinder system vertically in the quick connector. (step 3)
- Turning the butterfly screw about one and a half turn clockwise (as far as it will go) is enough to screw the system in place with an automatic seal (finger-tight). (step 4)
- For an exact alignment of the device, the water level may be removed from the basement plate and placed on the top of the clamped piston/cylinder system. This will ensure the most accurate referencing of the piston/cylinder system. (step 5)



3.1.2.4 Connection for piston/cylinder system with integrated separator, M30 x 2 female thread .



Before releasing the closure plug on the fixture for piston/cylinder system, make sure the system is not under pressure (open the outlet valve).

- Before installing the piston/cylinder system the separator must be vented. For this purpose the external pressure supply is admitted by opening and closing the integrated fine adjustment valve (inlet valve) carefully. Pressure is admitted as long as the oil reaches the O-ring sealing inside the opened piston fixture. For this the outlet valve must be closed and a blind plug must be mounted into the connection for test specimen.



For the venting procedure it makes sense to adjust the external pressure supply to a very low pressure value. Hence with the inlet valve can be charged as carefully and smoothly as possible.

Before venting the oil level inside the separator may need to be checked and filled up, if necessary. For this purpose, please proceed according to section 3.1.1.2.

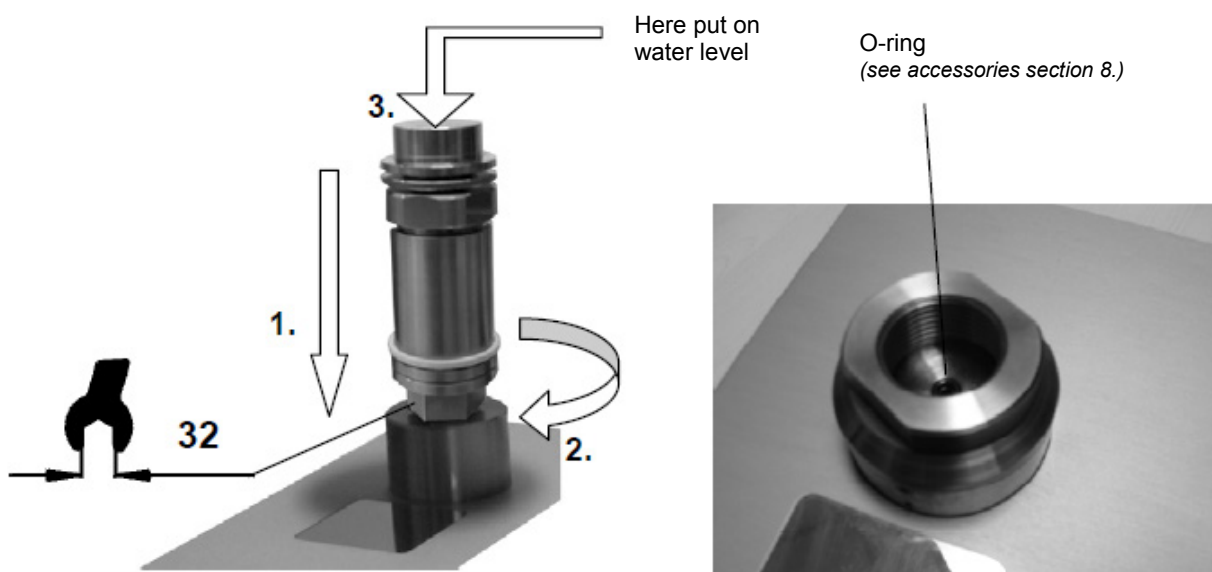
- Afterwards the piston/cylinder system is inserted vertically into the thread of the piston receptacle, and firmly tightened using a flat wrench with SW 32. An O-ring seal is already fitted, so no additional sealing material is required.



Note: Only hydraulic piston/cylinder systems must be used.

Check the O-ring seal in the receptacle for the piston/cylinder system for proper seat and for any wear. Replace, if necessary.

- For an exact alignment of the device, the water level may be removed from the basement plate and placed on the top of the clamped piston/cylinder system. This will ensure the most accurate referencing of the piston/cylinder system.



3.1.3 Connecting the test specimen

- Place the device to be checked in the quick connector with the knurled nut. It can be freely positioned. Hand-tightening will suffice for safe sealing.
- To calibrate instruments with back pressure entry there is an angle connection 90° available (see accessories section 8).

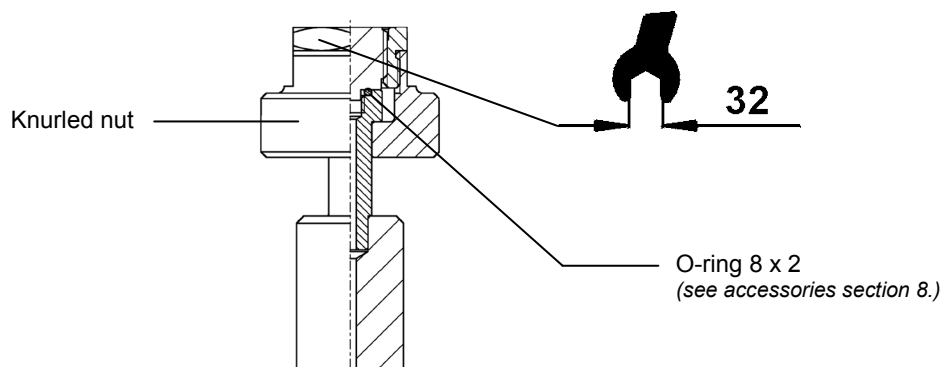


Check the O-ring seal in the test specimen connection for proper seat and for any wear. Replace, if necessary. Please see to it, that each instrument mounted to the pressure balance must be clean inside.

- The quick connector comes equipped with a G 1/2 threaded insert in the standard delivery package.



When you are calibrating devices with different connection threads, the threaded inserts can be changed as appropriate (see accessories "Adapter Set").



3.1.4 Venting the System (Hydraulic Design only)

After the clamping of the ConTect system and the test specimen, air may be trapped in the system. The system may be vented before beginning with calibration using the following procedure:

- The ConTect system and test specimen must be clamped, and the complete weight set must be placed on the piston/cylinder system.
- Generate a pressure of approximately 50 bar using the initial pressure pump
- Increase the pressure with the spindle pump until just below the final value of the value range of the ConTect system, or of the test specimen (the smaller pressure range is the decisive factor).



Important: The piston/cylinder system must remain in its lower position for this operation, i.e. not yet moving into equilibrium.

- Open the outlet valve, any trapped air will escape into the tank

This procedure may need to be repeated 1 to 2 times in order to remove all trapped air.

The device is now ready to use.

3.2 Operation

3.2.1 Weight Pieces

- Stack the weight pieces onto the bell depending on the pressure value that is required.
- It is usually best to start with the heaviest weight so that the centre of gravity is as low as possible.
- Each component is identified by a consecutive number. In the calibration certificate to each number the resultant pressure assuming reference conditions is listed.

Example table from a calibration certificate page 2:

Pressure values of masses

type of weight piece	no.	true mass in kg	pressure value for system in bar
piston	1262	0.08160	0.4002
bell	1	0.81560	3.9998
plate	2	0.05097	0.2499
weight piece	3	1.01954	5.0000
weight piece	4	1.01954	5.0000
weight piece	5	1.01954	5.0000
weight piece	6	1.01954	5.0000
weight piece	7	1.01954	5.0000
weight piece	8	1.01954	5.0000
weight piece	9	1.01954	5.0000
weight piece	10	1.01953	5.0000
weight piece	11	1.01952	4.9999
weight piece	12	0.50976	2.5000
weight piece	13	0.20391	1.0000
weight piece	14	0.20391	1.0000
weight piece	15	0.12234	0.6000
weight piece	16	0.10196	0.5000
weight piece	17	0.07137	0.3500
weight piece	18	0.05098	0.2500

Example: weight piece no. 5 generates a pressure value of 5.0000 bar with its weight value of 1.01954 kg assuming reference conditions (room temperature 20°C, air pressure 1013 mbar, relative humidity 40 %)

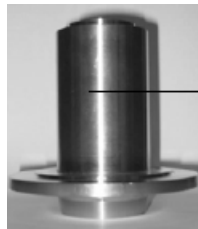
- The pressure that will be achieved thus corresponds to the sum of the basic weight (piston), the bell and the weight rings.
- To reduce the starting value, the weight plate (No. 2) can be used as the basic holding surface instead of the bell (No. 1).

Weight pieces with bell



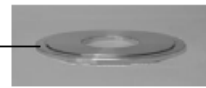
Weight pieces

Weight pieces with plate



Bell (No. 1)

Plate (No. 2)



ConTect system

Marking line for float position



3.2.2.1 Approaching the pressure value – hydraulic base

- In hydraulic systems, the system must first be filled with oil and pre-compressed.
- For this the outlet valve must be closed.
- Then run the initial pressure pump for several strokes. The pressure increases to a maximum of about 50 bar (depending on the volume of the connected test specimen).
- After that, increase the pressure by turning the built-in spindle pump clockwise.

3.2.2.2 Approaching the pressure value – pneumatic low-pressure base

- The built-in initial pressure pump is used to generate pressures up to 10 bar (depending on the volume of the connected test specimen).
- For this the outlet valve must be closed.
- The spindle pump can be used to make a fine adjustment close to the pressure value.



The maximum permissible pressure for the pneumatic low-pressure version is 10 bar. Higher pressures may damage the instrument. The piston/cylinder system, test specimen and any connecting tubes that are used must not be subjected to pressures above the maximum permissible level.

3.2.2.3 Approaching the pressure value – pneumatic high-pressure / vacuum base

- An external compressed air supply has to be connected in the back of the instrument.
- The external pressure supply can be admitted by opening and closing the integrated fine adjustment valve (inlet valve) slightly.
- For this the outlet valve must be closed.
- The spindle pump can be used to make a fine adjustment close to the pressure value.
- For vacuum operation see section 3.2.5.



The maximum permissible pressure for the pneumatic high-pressure / vacuum version is 100 bar. Higher pressures may damage the instrument. The piston/cylinder system, test specimen and any connecting tubes that are used must not be subjected to pressures above the maximum permissible level.

3.2.2.4 Approaching the pressure value – pneumatic version with separator

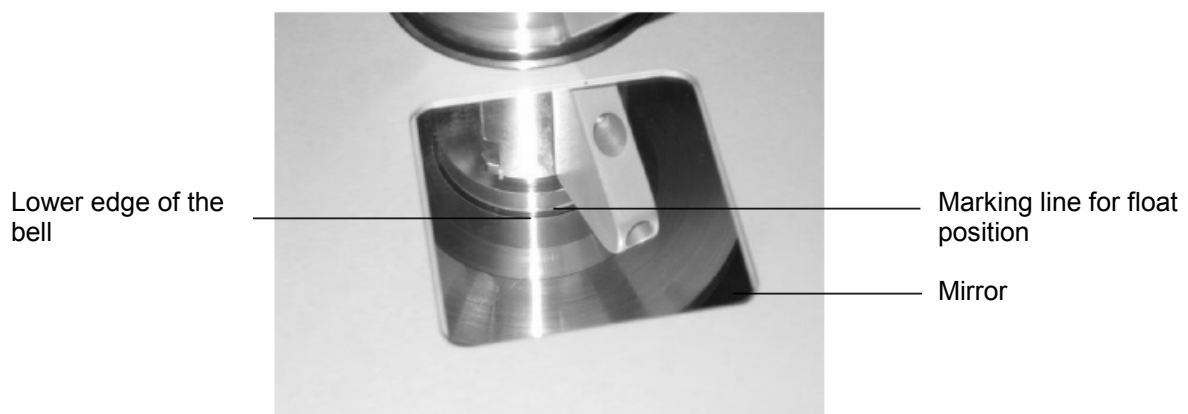
- An external compressed air supply has to be connected in the back of the instrument.
- The external pressure supply can be admitted by opening and closing the integrated fine adjustment valve (inlet valve) slightly.
- For this the outlet valve must be closed.
- The pressurization with air causes the displacement of the oil inside the separator upwards into the piston/cylinder system.
- The spindle pump can be used to make a fine adjustment close to the pressure value.



The maximum permissible pressure for the pneumatic version with separator is 400 bar. Higher pressures may damage the instrument. The piston/cylinder system, test specimen and any connecting tubes that are used must not be subjected to pressures above the maximum permissible level.

3.2.3 Pressure stable

- Continue admitting pressure until the system is in a state of equilibrium.
- This state is easy to identify with the aid of the level indicator and mirror. In this case the lower edge of the bell must stay at the position of the marking line of the piston/cylinder system.





**Just before the float position, the system increases quickly.
We therefore recommend turning the spindle slowly and evenly clockwise.**

- To minimise the effect of friction, move the system up against the weight pieces carefully and make a turning movement.



Never move the system up and make a turning movement, if the piston is in the lower or upper block position.

- The piston and thus the test pressure as well now remain stable for several minutes.

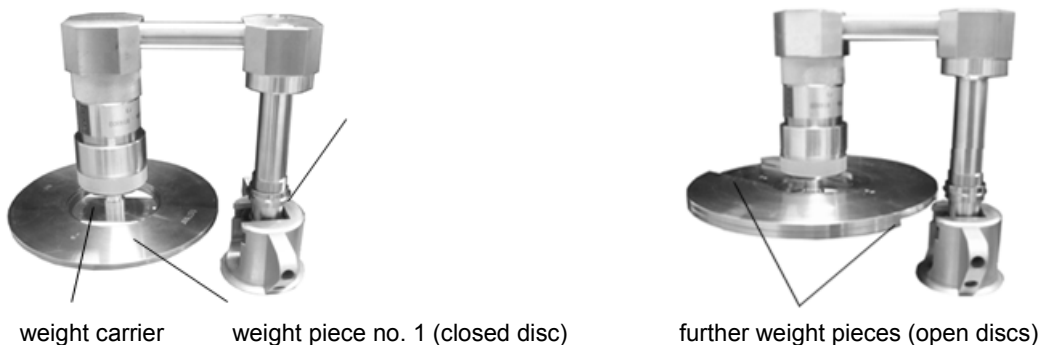
3.2.4 Next pressure level

- To adjust to the next highest pressure, repeat the previous steps from 3.2.1 to 3.2.3

3.2.5 Vacuum operation

For generating vacuum the use of an external vacuum source is necessary. It must be connected to the back of the instrument. The external vacuum can be admitted resp. deflated via the integrated fine adjustment valves for inlet and outlet. The spindle pump can be used to make the fine adjustment.

3.2.5.1 Weight pieces for vacuum



- In each case weight piece no. 1 (closed disc) must be put on the weight carrier first. The centring collar of the disc should face downwards.
- Stack the further weight pieces onto no. 1 depending on the pressure value that is required. Please see to it, that the weight pieces are stacked on top of each other in such a way, that the open sections of the discs are always staggered around 180°, this means oppositely positioned.

3.2.5.2 Approaching the vacuum values

- A vacuum source must be connected to the back of the instrument.
- We recommend screwing in the spindle pump before starting to record measurement values, (turning clockwise) to allow enough volume for measurements. The outlet valve must be opened during this process.
- The system can be evacuated with the external vacuum pump via the integrated fine adjustment valve (inlet valve).
- For this the outlet valve must be closed.
- The spindle pump can be used to make a fine adjustment close to the pressure value.

3.2.5.3 Vacuum stable

- Continue evacuation until the system is in a state of equilibrium.
- The adjustable ring at the holding traverse of the piston/cylinder system acts as an orientation tool for the float position (= half of piston stroke). For example in the float position it can be adjusted to the level of a lower or upper edge of a weight piece.



Just before the float position, the system increases quickly. We therefore recommend turning the spindle slowly and evenly anticlockwise.

- To minimise the effect of friction, move the system up against the weight pieces carefully and make a turning movement.



Never move the system up and make a turning movement, if the piston is in the lower or upper block position.

- The piston and thus the test pressure as well now remain stable for several minutes.

3.2.5.4 Next vacuum level

- To adjust to the next highest vacuum value, repeat the previous steps from 3.2.5.2 to 3.2.5.3

3.2.6 Releasing pressure – hydraulic , pneumatic and vacuum

- Turn the spindle pump anticlockwise to release pressure in the system. During vacuum operation turn clockwise.
- If the pressure is close to the next test level, make the fine adjustment with the spindle wheel.
- To release pressure more quickly or for venting, the fine adjustment valve (outlet valve) can also be carefully opened.



Attention: In this case the piston must stay in the lower position!



**Caution:
The piston is lowered very quickly just before equilibrium is achieved.**



Caution:
Do not remove masses completely from the piston/cylinder system under pressure.

- Look to it, that in the pneumatic **version with integrated gas to oil separator** the pressure is released only very slowly. Hence turbulences of oil inside the separator and a flowing back of the oil into the pressure pipe are avoided.

3.3 Disassembly

- After all pressure points have been recorded, close the inlet valve and open the outlet valve.
- Now the test specimen can be removed from the quick clamp and all masses can be removed from the piston/cylinder system.
- If there is another test specimen with the same measurement range, the piston/cylinder system can stay clamped in place.
- Otherwise, we recommend removing the system and then storing it in its protective container.



Do not disconnect the test specimen or the piston/cylinder system until the pressure in the pressure balance has been completely released.

- In order to remove the star handle from the spindle pump, the spring-loaded thrust pad must be pressed downward with the aid of a small screwdriver, or a ball-point pen. The star handle may now be pulled off toward the front.

Spring-loaded thrust pad



- For transportation of the **pneumatic version with integrated gas to oil separator** the oil should be removed from the separator free of residues, see section 3.1.1.2.

4. Troubleshooting measures



If faults cannot be repaired, the system must be put out of operation immediately and this information is to be given to the manufacturer.

Repairs must only be carried out by the manufacturer. Interventions and changes on the appliance are not allowed.

In case of faults caused by defects of the pneumatic/hydraulic equipment the operators must inform their superiors immediately and call in the qualified and authorised technical staff for maintenance.

Table: Fault description and measures

Type of fault	Measures
I. Unable to build up pressure / leak in the system	<ul style="list-style-type: none"> ■ Close outlet valve correctly ■ Attention: Do not tighten the fine adjustment valves more than finger tight. Otherwise the valve seat could be damaged. ■ Check whether the seals have been placed in the clamp for the piston/cylinder system and test specimen and whether they are properly positioned.
II. Unable to build up pressure, or range cannot be reached (with hydraulic design only)	<ul style="list-style-type: none"> ■ After the clamping of the piston/cylinder system and the test specimen, air may be trapped in the system. ■ Please note: The system should be vented before beginning with calibration. For this purpose, proceed according to section 3.1.4. ■ Afterwards, build the pressure back up.
III. Slow lowering of the piston in equilibrium	<ul style="list-style-type: none"> ■ Leak in the system, see fault I. ■ After the clamping of the piston/cylinder system and the test specimen, air may be trapped in the system (hydraulic design only), see point II. ■ Afterwards, build the pressure back up.
IV. Piston is not turning or does not respond readily	<ul style="list-style-type: none"> ■ Attention: If the piston is not turning easily or "squeaks", do not under any circumstances force it to turn. Doing so could cause lasting damage that would seriously affect measurement properties. ■ The piston must be cleaned (see section 5.1.1)

Further help can be found through WIKA's Calibration Technology Department.

5. Maintenance and Care

5.1 Cleaning

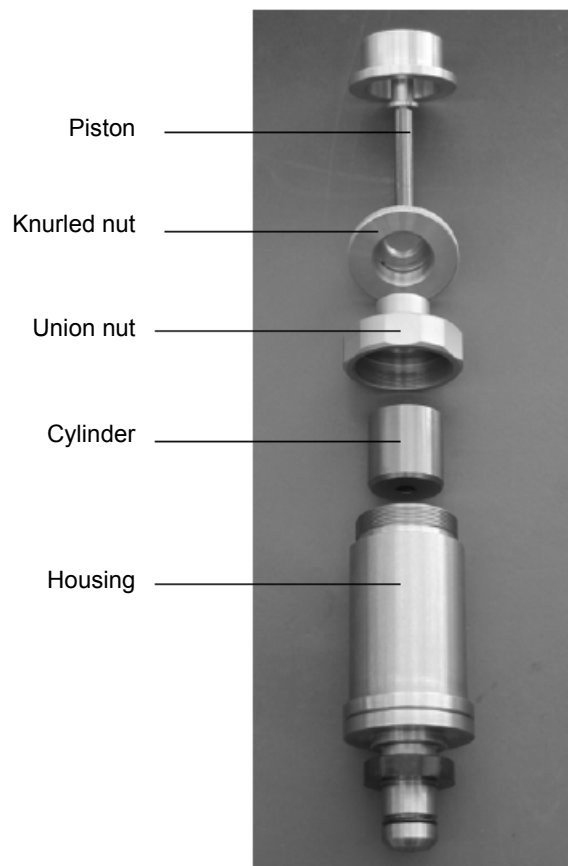
5.1.1 Piston/Cylinder system

We recommend you to clean the piston/cylinder systems after every use as needed. Poor sensitivity or short free turning duration are indications the system needs to be cleaned.

To do this, remove the piston/cylinder system from the base and disassemble it under consideration of the following references.

5.1.1.1 Hydraulic piston/cylinder system

Layout of the piston/cylinder system (hydraulic):



Disassembly of the piston/cylinder system (hydraulic):

- Loosen the knurled nut completely
- Now the piston can be drawn slowly and carefully out of the cylinder, removing it vertically upward. The best way to do this is set the piston/cylinder unit down on a plate and keeps it still.
- Unscrew the union nut
- The cylinder can be removed out of the housing

Cleaning of the piston/cylinder system (hydraulic):

There are a number of ways to clean the individual parts. It is recommended to wipe the parts with a dust-free, lint-free and soft wipe soaked in alcohol (e.g. ethyl alcohol), or to pull it through the cylinder, then drying them off with a dry, dust-free, lint-free and soft wipe.

For this we recommend the use of the cleaning-set for piston/cylinder systems, which is available as an accessory (see section 8. Accessories). It contains a detailed operating instruction for the cleaning process.



Never touch the cleaned piston with your bare hands. The natural dermal-grease can cause a jamming of the piston/cylinder system.

Assembly of the piston/cylinder system (hydraulic):

Put the parts together again in the opposite order.

- Insert the cylinder into the housing (slanted edge facing down)
- Screw on the union nut
- Place the system vertically on the plate and carefully insert the piston from above. The piston should "fall" into the cylinder by its own weight.
- Tighten the knurled nut again

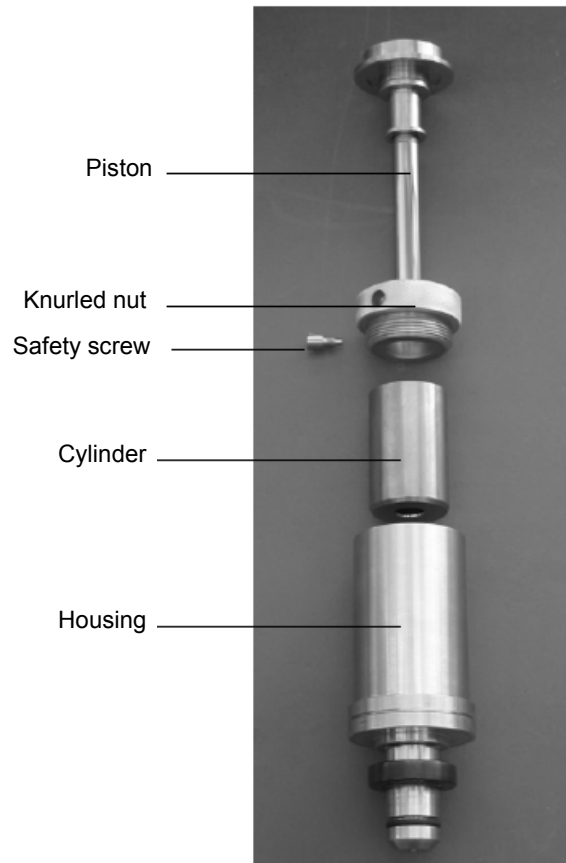


Never press the piston forcibly into the cylinder. Otherwise it is damaged.

The system is now ready to use again.

5.1.1.2 Pneumatic piston/cylinder system

Layout of the piston/cylinder system (pneumatic):



Disassembly of the piston/cylinder system (pneumatic):

- Loosen the safety screw at the side
- Now the piston can be drawn slowly and carefully out of the cylinder, removing it vertically upward. The best way to do this is set the piston/cylinder unit down on a plate and keep it still.
- Unscrew the knurled nut
- The cylinder can be removed out of the housing

Cleaning of the piston/cylinder system (pneumatic):

There are a number of ways to clean the individual parts.

It is recommended to wipe the parts with a dust-free, lint-free and soft wipe soaked in alcohol (e.g. ethyl alcohol), or to pull it through the cylinder, then drying them off with a dry, dust-free, lint-free and soft wipe.

For this we recommend the use of the cleaning-set for piston/cylinder systems, which is available as an accessory (see section 8. Accessories). It contains a detailed operating instruction for the cleaning process.



Never touch the cleaned piston with your bare hands. The natural dermal-grease can cause a jamming of the piston/cylinder system.

Assembly of the piston/cylinder system (pneumatic):

Put the parts together again in the opposite order.

- Insert the cylinder into the housing (slanted edge facing down)
- Screw on the knurled nut
- Place the system vertically on the plate and carefully insert the piston from above. The piston should "fall" into the cylinder by its own weight.
- Tighten the safety screw at the side again



Never press the piston forcibly into the cylinder. Otherwise it is damaged.

The system is now ready to use again.

5.1.2 Weight Set

- The weights should be handled with gloves.
- If fingerprints or other impurities are found on the weight pieces in spite of this precaution, they can be removed with alcohol (spirit).

5.2 Wear Parts

O-rings in the piston/cylinder retaining system and test specimen receptacles are subjected to wear. Both O-rings must be checked for proper seat and any wear before any calibrating is performed. If necessary, the O-rings must be replaced in regular intervals, or whenever necessary (see Accessories, section 8).



Important: Use original seals only. Seals having deviant measurements, or materials, or material grades, may cause damage to the device and test specimen, and pose a danger for the operator.

5.3 Changing the Hydraulic Oil (Hydraulic Design only)

The hydraulic oil should be changed whenever visible contamination is present.

5.3.1 Removing Hydraulic Oil

- Open the locking screw with the oil filling symbol on top of the basement
- Siphon the oil out of the tank, for example, by using a suitable nozzle
- Small amounts of oil residue additionally may be siphoned off the connections with the receptacle for the piston/cylinder system and test specimen connection opened and with the outlet valve closed, by means of slowly turning in of the spindle pump
- Minute amounts of oil residue may remain in the piping



In case of severe contamination of the hydraulic oil, the complete cleaning of the piping and of all media-contacted individual components of the basement in a dismantled state may be advisable. This procedure may be performed by the manufacturer only.



Waste oil must be disposed of according to legal requirements.

5.3.2 Filling in of Hydraulic Oil

- Turn in the spindle pump clockwise until it reaches the initial stop
- Close the outlet valve
- Open the locking screw with the oil filling symbol on top of the basement
- Fill in special oil (1 litre supplied, or available as accessory) via the tank opening, until the fill level reaches the thread of the tank opening (approximately 250ml). The fill level must always be observed.
- Twist out the spindle pump counter-clockwise until it reaches the rear stop. The filling medium is suctioned out of the tank into the system.
- Close the tank opening with the locking screw

5.3.3 Venting of the System (after Complete Filling only)

After initial filling, or after a complete oil change, air may be trapped in the system. The system should be vented using the following procedure:

- The piston/cylinder system and test specimen connections must be open
- Close the outlet valve
- Twist out the spindle pump counter-clockwise until it reaches the rear stop.
- Carefully pump using the initial pressure pump, while continuously observing the filling medium in the open piston/cylinder system and test specimen connections. At this point, trapped air escapes toward the exterior by means of the formation of bubbles. The initial pressure pump must be actuated until air bubbles no longer appear.
- Any oil escaping in the open piston/cylinder system and test specimen connections should be siphoned off, for example, with a nozzle.

5.4 Recalibration

The recommended interval between recalibrations is 5 years.

This is the recommendation of the German Calibration Service (DKD/DAkkS)

This interval assumes the system and weights are handled carefully.

If the system is in rough usage, we recommend shortening the interval to about three years.

The pressure balance should be immediately maintained and recalibrated, if:

- the operating characteristics deteriorate (duration of free rotation, sink rate, sensitivity)
- the weight pieces are damaged or corroded

For recalibration or if you have questions about the optimal recalibration cycle, the DKD lab would be happy to assist you:

WIKA Alexander Wiegand SE & Co. KG
DKD-Kalibrierlaboratorium
Alexander-Wiegand-Strasse
63911 Klingenberg / Germany

Phone: (+49) 93 72 / 132 - 473

Fax: (+49) 93 72 / 132 - 8767

E-Mail: calibration@wika.de

6. Specifications

Version		pneumatic					
Measuring range ¹⁾	bar ²⁾	-0.03 ... -1	0.03 ... 2	0.2 ... 10	0.4 ... 50	0.4 ... 100	
Required weights	kg	5	10	10	10	20	
Smallest step	bar ³⁾	0.01	0.01	0.05	0.25	0.25	
Nominal cross-sectional area of the piston	cm ²	5	5	1	0.2	0.2	
Version		pneumatic					
Measuring range ¹⁾	psi ²⁾	-0.435 ... -14	0.435 ... 30	2.9 ... 150	5.8 ... 500	5.8 ... 1,000	5.8 ... 1,500
Required weights	kg	5	10	10	7	13	20
Smallest step	psi ³⁾	0.1	0.2	1	5	5	5
Nominal cross-sectional area of the piston	cm ²	5	5	1	0.2	0.2	0.2
Version		hydraulic					
Measuring range ¹⁾	bar ²⁾	0.2 ... 60	0.2 ... 100	1 ... 250	1 ... 400	2 ... 600	2 ... 1,000
Required weights	kg	30	50	25	40	30	50
Smallest step	bar ³⁾	0.1	0.1	0.5	0.5	1	1
Nominal cross-sectional area of the piston	cm ²	0.5	0.5	0.1	0.1	0.05	0.05
Version		hydraulic					
Measuring range ¹⁾	psi ²⁾	2.9 ... 1,000	14.5 ... 5,000	29 ... 10,000	29 ... 14,500		
Required weights	kg	34	34	34	50		
Smallest step	psi ³⁾	2	10	20	20		
Nominal cross-sectional area of the piston	cm ²	0.5	0.1	0.05	0.05		
Accuracy ⁴⁾	% of reading	0.015 / optional: 0.008 ⁵⁾					
Base version							
pneumatic low-pressure		up to max 10 bar / 150 psi; with internal pressure generation					
pneumatic high-pressure / vacuum		up to max 100 bar / 1500 psi; for external supply and vacuum					
pneumatic with separator		up to max. 400 bar / 5,000 psi; for external supply with integrated gas to oil separator; for the use for hydraulic pistons with M30 x 2 connection					
hydraulic		up to max 1,000 bar / 14,500 psi; with internal pressure generation up to max. 1,200 bar / 17,400 psi on request					
Connection at the piston/cylinder system		M30 x 2 male thread / optional: ConTect quick connector					
Connection for the test specimen		Quick connector G 1/2 B female thread as standard, freely rotating, changeable, other threaded inserts see accessories					
Pressure transmission medium	pneumatic	clean, dry and noncorrosive gases (e.g. air or nitrogen)					
	hydraulic	Operating fluid (1 litre is included in delivery), other mediums on request					
Oil reservoir	cm ³	250					
External pressure connection		6 mm SWAGELOK® tube fitting; max 110 % of the measuring range in use; only with the pneumatic high-pressure / vacuum version and with separator					
Material							
■ Piston		Tungsten Carbide					
■ Cylinder		Tungsten Carbide					
■ Mass-set		Stainless steel 1.4305 and aluminium, unmagnetic					
■ Instrument base tubing		pneumatic low-pressure: flexible hose made of polyurethane, 4 x 0.75 mm pneumatic high-pressure / vacuum and with separator: stainless steel 1.4571, 3 x 1 mm hydraulic: stainless steel 1.4404, 6 x 2 mm					
Operating temperature	°C	18 ... 28					
Weight							
■ Pneumatic low-pressure base	kg	18.0 / 19.0 (incl. optional ConTect quick connector)					

¹⁾ Theoretical starting value; corresponds to the pressure value generated by the piston (by its own weight). To optimise the operating characteristics more weights should be loaded.

²⁾ The lowest pressure change value that is reached based on the standard weight set. A fine weight set is also available for lower values.

³⁾ The accuracy is in reference to the measurement value, from 10% of the measurement range. A fixed error is considered in the lower area in reference to 10% of the area.

⁴⁾ Measurement uncertainty assuming reference conditions (room temperature 20°C, air pressure 1013 mbar, relative humidity 40 %). Corrections may be required for use without CalibratorUnit.

⁵⁾ Other on request.

■ Pneumatic high-pressure base	kg	18.0 / 19.0 (incl. optional ConTect quick connector)
■ Pneumatic base, with separator	kg	16.5
■ Hydraulic base	kg	20.5 / 21.5 (incl. optional ConTect quick connector)
■ Piston/cylinder system	kg	1.5 / 5.7 (incl. bell and plate in optional carrying case)
■ BAR weight set for vacuum	kg	13.1 kg (incl. piston/cylinder system in carrying case)
■ BAR basic mass-set pneumatic	kg	16.2 (incl. carrying case)
■ BAR mass-set extension pneumatic	kg	14.0 (incl. carrying case)
■ BAR basic mass-set hydraulic	kg	36.0 (incl. carrying case)
■ BAR mass-set extension hydraulic	kg	24.0 (incl. carrying case)
■ PSI weight set for vacuum	kg	13.0 kg (incl. piston/cylinder system in carrying case)
■ PSI basic mass-set pneumatic	kg	12.5 (incl. carrying case)
■ PSI mass-set extension 1 pneumatic	kg	11.0 (incl. carrying case)
■ PSI mass-set extension 2 pneumatic (only for 1,500 psi)	kg	18.5 (incl. carrying case)
■ PSI basic mass-set hydraulic	kg	42.0 (incl. carrying case)
■ PSI mass-set extension hydraulic	kg	21.5 (incl. carrying case)
Dimensions		
■ Instrument base	mm	400 (W) x 375 (D) x 265 (H), for details see technical drawing
■ Carrying case for basic mass- set	mm	400 (W) x 310 (D) x 310 (H)
■ Carrying case for mass-set extension	mm	215 (W) x 310 (D) x 310 (H)
■ Carrying case for piston/ cylinder system (optional)	mm	300 (W) x 265 (D) x 205 (H)
CE-conformity		
■ Pressure equipment directive		97/23/EG (Module A) only for version 1,200 bar / 17,400 psi
Calibration		Factory calibration certificate / optional: DKD/DAkkS calibration certificate

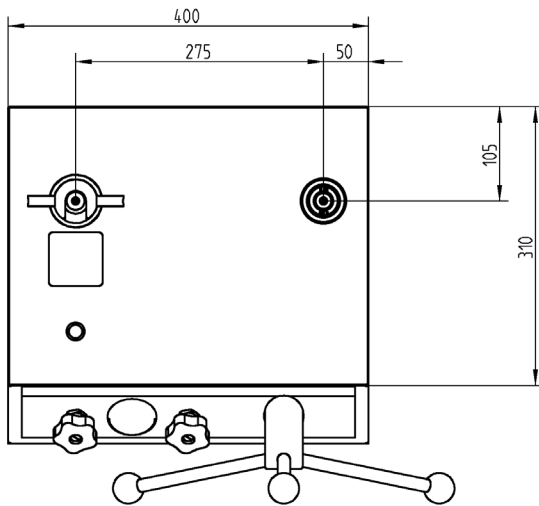
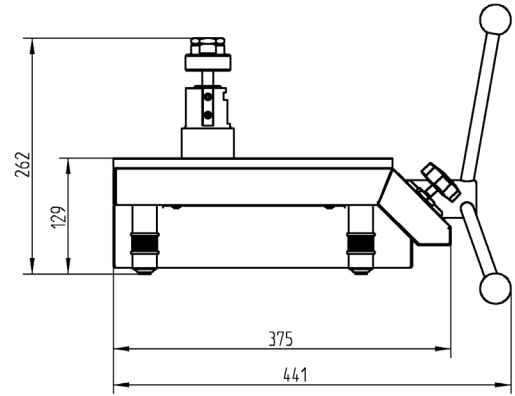
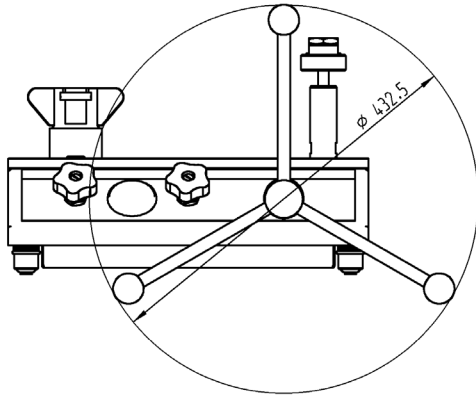
Scope of supply

- Instrument base with textile cover
- Initial pressure pump (not for base version pneumatic high-pressure / vacuum and with separator)
- Spindle pump for pressure generation / fine adjustment
- Connection for piston/cylinder system with M30 x 2 female thread
- Quick connection for test devices
- Piston cylinder system with bell jar
- Basic mass-set in carrying case
- Mass-set extension in carrying case (depending on measuring range)
- Mass-set manufactured to standard gravity (9.80665 m/s²)
- Operating fluid 1 litre (only for hydraulic version) resp. 0.25 litre (for separator version)
- Operating instructions in German and English
- Factory calibration certificate

Options

- Systems with increased accuracies up to 0.008 %
- Connection for piston/cylinder system with ConTect quick connector
- Carrying case for piston/cylinder systems
- Mass-set manufactured to local gravity
- DKD/DAkkS calibration certificate

Dimensions



The drawing shows a pneumatic high-pressure base CPB5000 including the ConTect quick connector available as an option. The pneumatic low-pressure version and the hydraulic version do not vary in their dimensions.

7. Tables of masses

The following tables show the amount of weight pieces per measuring range within a weight set with their nominal mass values and the resulting nominal pressures.

Should you not operate the device under reference conditions (ambient temperature 20°C, air pressure 1013 mbar, relative humidity 40%), the corrections according to section 2.3 must be considered.

7.1 Hydraulic models

Measuring range [bar]	0.2 ... 60		0.2 ... 100		1 ... 250		1 .. 400		2 ... 600		2 ... 1,000	
	Pieces	Nominal pressure per piece bar	Pieces	Nominal pressure per piece bar	Pieces	Nominal pressure per piece bar	Pieces	Nominal pressure per piece bar	Pieces	Nominal pressure per piece bar	Pieces	Nominal pressure per piece bar
Piston	1	0.2	1	0.2	1	1	1	1	1	2	1	2
Bell jar	1	1.6	1	1.6	1	8	1	8	1	16	1	16
Aluminium plate	1	0.1	1	0.1	1	0.5	1	0.5	1	1	1	1
Mass 4 kg	6	8	11	8	5	40	11	40	6	80	11	80
Mass 2 kg	2	4	2	4	2	20	2	20	2	40	2	40
Mass 1 kg	1	2	1	2	1	10	1	10	1	20	1	20
Mass 0.5 kg	1	1	1	1	1	5	1	5	1	10	1	10
Mass 0.2 kg	1	0.4	1	0.4	1	2	1	2	1	4	1	4
Mass 0.1 kg	1	0.2	1	0.2	1	1	1	1	1	2	1	2
Mass 0.05 kg	1	0.1	1	0.1	1	0.5	1	0.5	1	1	1	1

Measuring range [psi]	2.9 ... 1,000		14.5 ... 5,000		29 ... 10,000		29 ... 14,500	
	Pieces	Nominal pressure per piece psi	Pieces	Nominal pressure per piece psi	Pieces	Nominal pressure per piece psi	Pieces	Nominal pressure per piece psi
Piston	1	2.9	1	14.5	1	29	1	29
Bell jar	1	23.1	1	115.5	1	231	1	231
Aluminium plate	1	1.1	1	5.5	1	11	1	11
Mass 3.5 kg	9	100	9	500	9	1000	14	1000
Mass 1.4 kg	1	40	1	200	1	400	1	400
Mass 1 kg	1	30	1	150	1	300	1	300
Mass 0.7 kg	2	20	2	100	2	200	2	200
Mass 0.35 kg	1	10	1	50	1	100	1	100
Mass 0.175 kg	1	5	1	25	1	50	1	50
Mass 0.14 kg	1	4	1	20	1	40	1	40
Mass 0.07 kg	1	2	1	10	1	20	1	20

7.2 Pneumatic models

Measuring range [bar]	-0.03 ... -1		0.03 ... 2		0.2 ... 10		0.4 ... 50		0.4 ... 100	
	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece
	bar		bar		bar		bar		bar	
Piston	1	0.03	1	0.03	1	0.2	1	0.4	1	0.4
Bell jar	-	-	1	0.16	1	0.8	1	4	1	4
Aluminium plate	1	0.07	1	0.01	1	0.05	1	0.25	1	0.25
Mass 2 kg	-	-	-	-	-	-	-	-	5	10
Mass 1 kg	-	-	9	0.2	9	1	9	5	9	5
Mass 0.5 kg	8	0.1	1	0.1	1	0.5	1	2.5	1	2.5
Mass 0.25 kg	1	0.05	-	-	-	-	-	-	-	-
Mass 0.2 kg	-	-	1	0.04	1	0.2	1	1	1	1
Mass 0.12 kg	-	-	1	0.024	1	0.12	1	0.6	1	0.6
Mass 0.1 kg	2	0.02	1	0.02	1	0.1	1	0.5	1	0.5
Mass 0.07 kg	-	-	1	0.014	1	0.07	1	0.35	1	0.35
Mass 0.05 kg	1	0.01	1	0.01	1	0.05	1	0.25	1	0.25

Measuring range [psi]	-0.435 ... -14		0.435 ... 30		2.9 ... 150		5.8 ... 500		5.8 ... 1,000		5.8 ... 1,500	
	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece	Pieces	Nominal pressure per piece
	psi		psi		psi		psi		psi		psi	
Piston	1	0.435	1	0.435	1	2.9	1	5.8	1	5.8	1	5.8
Bell jar	-	-	1	2.22	1	11.1	1	55.5	1	55.5	1	55.5
Aluminium plate	1	0.565	1	0.22	1	1.1	1	5.5	1	5.5	1	5.5
Mass 1.4 kg	-	-	5	4	5	20	-	-	5	100	8	100
Mass 1 kg	-	-	2	3	2	15	2	75	2	75	2	75
Mass 0.7 kg	4	2	4	2	4	10	4	50	4	50	9	50
Mass 0.35 kg	4	1	3	1	3	5	3	25	3	25	3	25
Mass 0.19 kg	-	-	1	0.548	1	2.74	1	13.7	1	13.7	1	13.7
Mass 0.175 kg	1	0.5	-	-	-	-	-	-	-	-	-	-
Mass 0.14 kg	-	-	1	0.4	1	2	1	10	1	10	1	10
Mass 0.12 kg	-	-	1	0.345	1	1.725	1	8.625	1	8.625	1	8.625
Mass 0.07 kg	2	0.2	1	0.2	1	1	1	5	1	5	1	5
Mass 0.035 kg	1	0.1	-	-	-	-	-	-	-	-	-	-

8 Accessories

CalibratorUnit type CPU 5000

Compact Tool for the use with a pressure balance.
The CalibratorUnit CPU5000 calculates the required mass-loads for any pressure step. As an option, it includes the required sensors for automatical correction of ambient conditions. Also available is a package for calibrating transmitters.



Specifications according to data sheet CT 35.01.

The following models are available:

Description / Features	Order no.
CalibratorUnit CPU 5000 Basic system	7261369
CalibratorUnit CPU 5000 Basic system incl. Metrology-Extension ¹⁾	7322031
CalibratorUnit CPU 5000 Basic system incl. Transmitter-Extension ²⁾	7432945
CalibratorUnit CPU 5000 Basic system incl. Visualisation-Extension ³⁾	7433046
CalibratorUnit CPU 5000 Basic system incl. Metrology- and Transmitter-Extension	12351199
CalibratorUnit CPU 5000 Basic system incl. Metrology- and Visualisation-Extension	7512329
CalibratorUnit CPU 5000 Basic system incl. Metrology-, Transmitter- and Visualisation-Extension	12168025

- 1) includes sensors for piston temperature (measurement directly at the system) and ambient conditions (temperature, air pressure, humidity)
- 2) multimeter function for analog transmitters incl. power supply DC 24 V
- 3) sensor for touchless measurement of the float position and indication

Further accessories

Description / Features	Order no.
Trim-masses (1 mg – 50 g)	7093874
Set of adapters for quick-connector in a case with threaded inserts G 1/4, G 3/8, 1/2 NPT, 1/4 NPT and M 20 x 1.5 for adaptation to the knurled nut of the test item connection	2036941
Set of adapters „NPT“ for quick-connector in a case with threaded inserts 1/8 NPT, ¼ NPT, 3/8 NPT and 1/2 NPT for adaptation to the knurled nut of the test item connection	1256362
Angle connection 90°, for test specimens with back mounting connection	1564838
Purifier, up to 1000 bar	1565389
Dirt trap, -1/+1000 bar, volume 0.2 litre	2015820
Dirt trap, -1/+1000 bar, volume 0.03 litre	2015714
Set of O-rings consisting of 5 pieces 8 x 2 and 5 pieces 4 x 2.2	12328562
Operating fluid for CPB5000 up to 4000 bar, 1 litre	2099882
Cleaning set for ConTect-systems, pneumatic version	12485943
Cleaning set for ConTect-systems, hydraulic version	12481425
Special test item connection with quick-connector, for adaptation into the fixture for the ConTect-System, operation as comparison test pump possible	2152634

CN



提示
提供信息、备注和实用窍门。



警告!
表示潜在危险情况，可能导致人身伤害或设备损坏。

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1. 概述

1.1 简介

以下各章节将对 CPB 5000 压力天平以及如何正确使用进行详细说明。
如果需要更多信息，或遇到操作说明书中未提及的问题，请按照如下地址与我们联系：

威卡自动化仪表（苏州）有限公司
威卡国际贸易（上海）有限公司
电话：+86 0512 6878 8000
传真：+86 0512 6878 0300
info@wika.cn
www.wika.com.cn

如无相反约定，压力天平依照当前有效的国际法规体系进行校准，并可直接引用国家标准。

根据 ZVEI（德国电气与电子工业协会）的总体要求，该款压力天平的质保期为 24 个月。
若设备使用不当、未遵守操作说明，或尝试打开设备或拆除附带零部件或管道，则将不再享受质保服务。需强调的是，这些操作说明的内容既不构成先前或现有协议、担保或法律关系的一部分，也不会对它们产生影响。WIKA Alexander Wiegand SE & Co. KG 的所有义务均产生于 WIKA Alexander Wiegand SE & Co. KG 的相应销售合同和一般商务条款。
WIKA 是 WIKA Alexander Wiegand SE & Co. KG 的注册商标。

该手册中提及的公司或产品名称均为制造商的注册商标。

该手册中所述的设备代表了在设计、尺寸和材料方面的最高水平。我们保留随时修改或更换材料的权利，恕不另行通知。

严禁对该手册整体或部分进行复制。

1.2 安全说明



在对压力天平 CPB 5000 进行操作之前，请仔细阅读这些操作说明。在使用该设备时，除非按照本手册中提供的安全建议进行操作，否则无法保证它的无故障运行及可靠性。

1. 本系统只能由经过培训的授权人员进行操作，而且必须熟悉本手册并能按照其中要求进行工作。
2. 只有充分考虑到“设置设备”部分中规定的条件，才能保证设备的无故障运行及可靠性。
3. 必须按照精密仪器所要求的谨慎程度对待本 CPB 5000（防止潮湿、碰撞和极端温度）必须谨慎对待设备、活塞缸系统和砝码组（请勿抛掷、撞击等）并防止污染。切勿对 CPB5000 的操作元件施加任何力。
4. 如果设备从温度较低的环境移至温度较高的环境，在操作使用之前，应确保设备温度已适应环境温度。
5. 如果仪器已受损，无法继续安全操作，应停止使用并进行安全标记，直至再行使用。
操作人员在以下情况中可能面临安全风险：
 - 设备有明显损坏
 - 设备的运行不符合规定
 - 设备在不适宜的条件下存放过长时间。如有任何疑问，请将设备返回制造商进行修理或维护。
6. 客户不得擅自改动或修理设备。如果打开设备或拆除附带零部件或管道，其无故障运行及可靠性将受损，并且可能给操作人员带来危险。请将设备返回制造商进行修理或维护。
7. 设备仅限使用原装密封件。
8. 切勿尝试以下说明或规格中未包含的任何操作。

2. 产品说明

2.1. 一般信息

■ 应用

压力天平是用于校验电子或机械压力测量仪表的最准确的仪器。压强是指单位面积内承受的压力，压力天平根据该定义直接测量压力。天平采用高质量材料制造，降低了测量的不准确度，并可在长达五年的时间内稳定运行。

由于这些原因，压力天平已在工业、国家机构和研究实验室的校验实验室中应用多年。CPB5000 采用集成压力源和纯机械测量原理，是现场使用以及维修和维护的理想选择。

■ 活塞/缸测量系统

压强是指单位面积内承受的压力。基于此，CPB5000 采用精密制造的活塞/缸系统作为核心组件。活塞和气缸都是由硬质合金制造，并由坚固的不锈钢外壳提供良好保护，以防止外部触摸、碰撞或者污染。

作为标准，活塞/缸系统采用 M 30 x 2 外螺纹连接。已获专利的 ConTect 快速连接器可供选择。它不需任何工具即可安全迅速地变更量程。这样即可以合适的价格设置一套完整的紧凑系统，包括通用仪器底座、一组砝码和多达 3 套量程不同的 ConTect 活塞/缸系统。

气动活塞/缸系统可用于真空环境，以及 2 bar 至 100 bar 或 30 psi 至 1500 psi 的压力范围，液压系统可用于 60 bar 至 1000 bar 或 1000 psi 至 14500 psi 的压力范围。读数准确度为 0.015%（也可选 0.008%）。

活塞/缸装置的整体结构设计以及活塞和气缸的精密制造，有助于实现卓越的运行特性、长时间的自由旋转，以及较低的下降速率和极高的长期稳定性。因此，建议每隔五年重新校准一次

■ 功能

视受测设备的量程而定，可为仪器底座配备相应的系统。为生成单独测试点，以砝码加载活塞缸系统。砝码以最佳方式分成不同质量等级，使得负载质量与目标压力成正比。这些砝码按照标准重力 (9.80665 m/s²) 制造，但也可根据客户指定地点重力进行调整。

视仪器型号而定，压力可以通过集成泵或由控制阀控制的外部压力源进行设置。针对微调提供带有精密主轴的可调式容积。只要测量系统达到平衡，就会在压力和轮式砝码之间达到平衡。

得益于系统的优越品质，该压力能够保持稳定达数分钟，如此即可顺利地针对受测设备进行调整。

2.2 压力天平的基本原理

压力天平的操作原理基于压强的物理定义，即单位表面上承受的压力。

$$\text{压力} = \frac{\text{作用力}}{\text{面积}}$$

压力天平的关键元件是精密制造的活塞缸系统，其具有经过准确测量的截面。

为了给系统加压，活塞位于加载（校准）砝码块的下方。

砝码组中的每个承载盘均以标称重量进行标识，可在系统中产生一个压力值（假定为标准参考条件）。每个砝码都具有一个编号，在校准证书中说明了每个砝码的质量值及由之产生的压力值。根据所需压力值选择砝码。

之后，集成型轴泵增压，直到砝码处于浮动状态。

2.3 工作中的相关因素

活塞压力表出厂时会根据客户规格校准到标准参考条件。

如果应用条件与指定参考条件之间有明显差异，则需进行适当修正。

以下是会产生影响的主要因素，必须予以考虑。



这些修正可以通过 CPU 5000 校准装置自动校准（请参见第 8 节“附件”）！

2.3.1 重力值的地域性波动

当地的重力因地理变化会发生重大波动。

地球不同地方的重力值最高可能相差 0.5 %。由于该值对测量有直接的影响，所以必须将其考虑在内。

在制造过程中甚至可以调整砝码，使其与应用地点相匹配。另一种选择是对标准重力执行校准，当设备将用于多个地点时尤其如此。

“标准-g = 9.80665 m/s²”。

那么每次测量都必须根据以下公式执行修正：

$$\text{实际压力} = \text{标称值} \cdot \frac{g - \text{应用地点}}{\text{标准压力} - g}$$

示例：

制造过程中的当地重力设置： 9.806650 m/s²

应用地点的当地重力： 9.811053 m/s²

标称压力： 100 bar

$$\text{实际压力： } p = p_{\text{标称}} \cdot \frac{g_{\text{当地}}}{g_{\text{标准}}} = 100\text{bar} \cdot \frac{9.81105}{9.80665} = 100.0449\text{bar}$$

若无修正，测量结果将降低 0.05% 之多。

2.3.2 温度（活塞/缸）

活塞/缸系统的有效截面取决于温度。
该影响取决于所使用的材料，并以温度系数 (TK) 进行描述。

如果与标准参考条件（一般为 20°C）有差异，必须使用以下公式进行修正：

$$\text{实际压力} = \text{标称值} \cdot \frac{1}{(1 + (t_{\text{应用}} - t_{\text{参考}}) \cdot TK)}$$

示例：

参考温度：20°C

使用过程中的温度：23°C

TK：0.0022%

$$\text{实际压力} = 100 \text{ bar} \cdot \frac{1}{(1 + (23 - 20) \cdot 2.2 \cdot 10^{-5})} = 99.99340 \text{ bar}$$

若无修正，测量结果将降低 0.007 % 之多。

2.3.3 环境条件

以下环境条件的影响

- 空气压力
- 室温
- 相对湿度

应始终考虑在内，以便获得最高级别的准确度。环境条件的波动会改变空气密度。

空气密度通过砝码浮力影响压力：

$$\text{重量} = \text{标称重量} \cdot \left(1 - \frac{\text{空气密度}}{\text{砝码密度}} \right)$$

空气密度一般为 1.2 kg/m³

砝码密度（非磁性刚）为 7900 kg/m³

相对湿度 5% 的波动将导致测量的不确定度增加约 0.001%。

2.3.4 截面如何对压力做出反应

在较高压力下，有效截面会因压力负载而发生变化。
截面与现行压力的比率在初始近似值内呈线性关系。它以压力畸变引起的膨胀系数 (λ) 表示。

$$\text{实际压力} = \frac{\text{标称压力}}{1 + \lambda \cdot \text{标称压力}}$$

示例：

测量点：1000 bar

系统畸变系数： 10^{-7} 1/bar：

$$\text{实际压力} = \frac{1000}{1 + 1 \cdot 10^{-7} \cdot 1000} \text{ bar} = 999.90 \text{ bar}$$

若无修正，测量结果将降低 0.01 % 之多。

2.4 控制元件的配置

CPB 5000 型仪器底座因控制元件配置的不同提供以下 4 个型号：

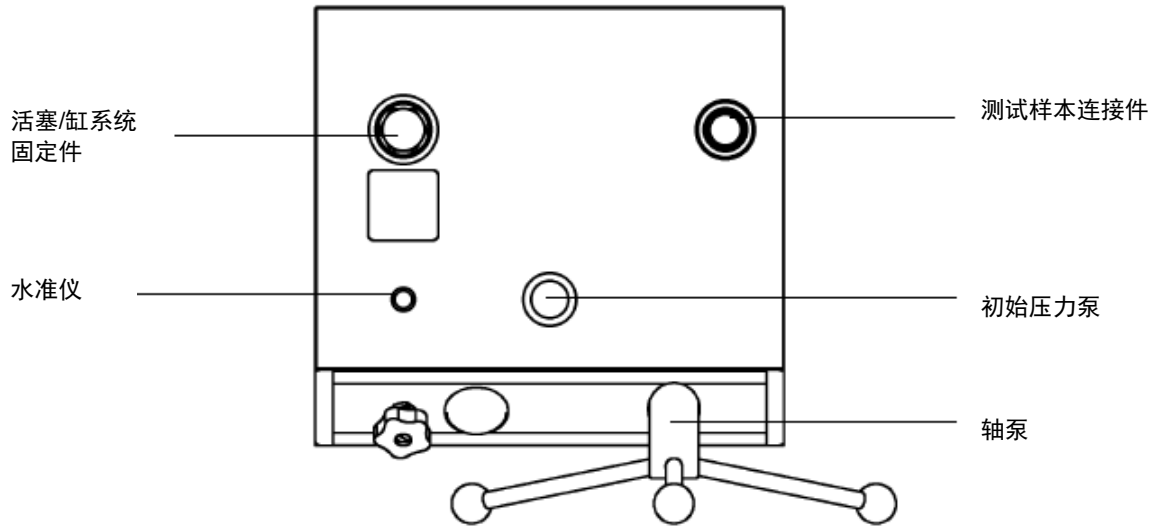
- **气动低压底座**
 - 最高可达 10 bar / 150 psi
 - 通过初始压力泵和轴泵产生集成型压力源
 - 管道由挠性软管（聚氨酯）制成，6 x 1 mm
- **气动高压/真空底座**
 - 最高可达 100 bar / 1,500 psi
 - 连接外部压力源或真空
 - 管道由不锈钢 (1.4571) 制成，3 x 1 mm
- **带集成油气分离器的气动底座**
 - 最高可达 400 bar / 5000 psi
 - 连接外部压力源
 - 以 M 30 x 2 连接配合液压活塞缸系统使用
 - 测试项可轻松、干燥、清洁地使用空气校准
 - 管道由不锈钢 (1.4571) 制成，3 x 1 mm
- **液压底座**
 - 最高可达 1,000 bar / 14,500 psi
 - 通过初始压力泵和轴泵产生集成型压力源
 - 管道由不锈钢制成 (1.4404)，6 x 2 mm
 - 特殊型号最高可达 1,200 bar (17,400 psi)

作为标准，所有仪器底座均以 M30 x2 内螺纹与活塞/缸系统连接。

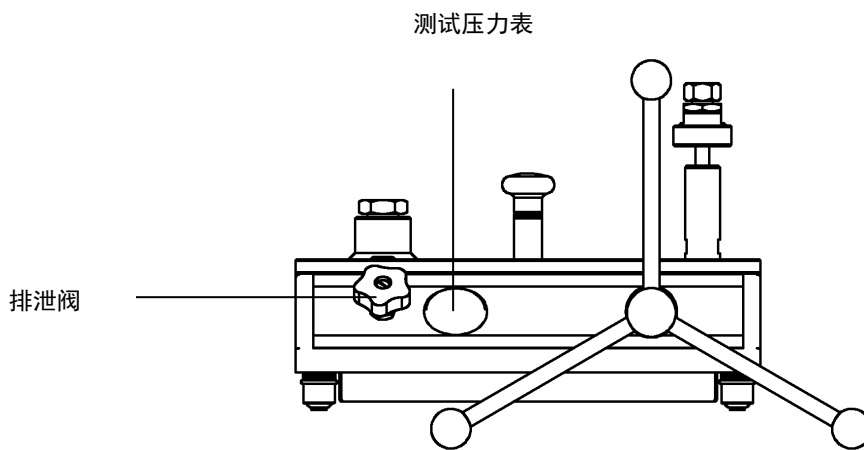
可选择安装已获专利的 ConTect 快速连接器，借助它，无需工具即可快速安全地更换量程（不适用于带集成油气分离器的型号）。

2.4.1 气动低压底座

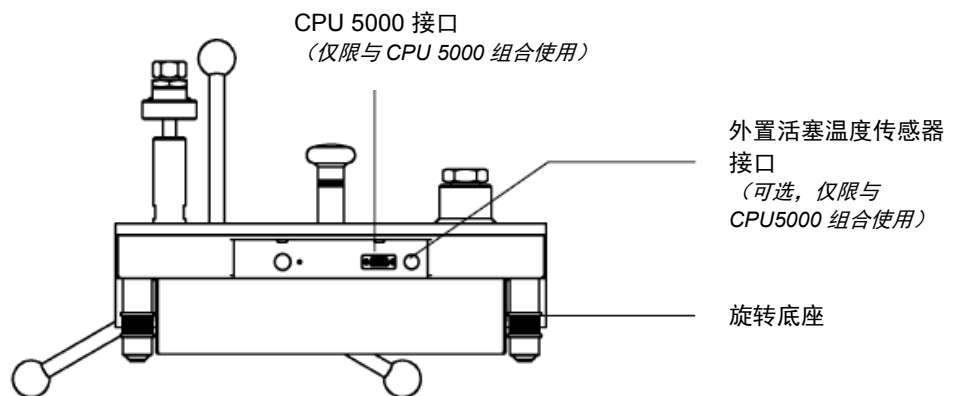
■ 俯视图



■ 前视图



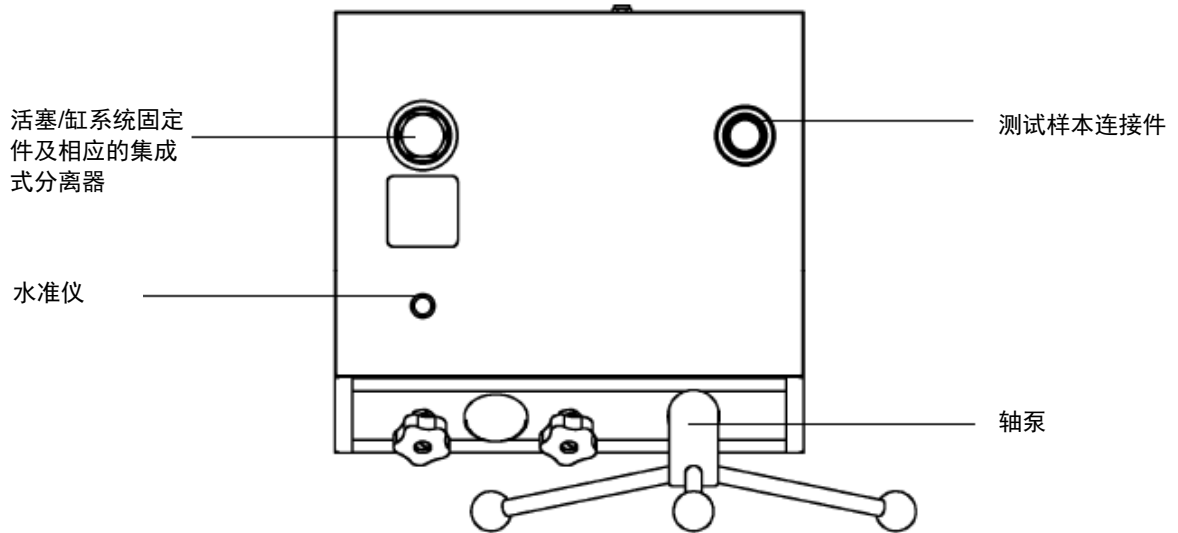
■ 后视图



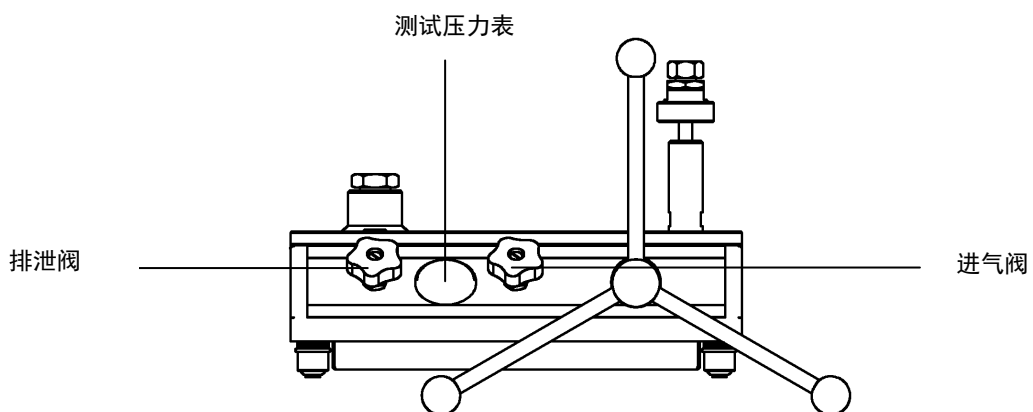
2.4.2 气动高压/真空底座

(也适用于带集成油气分离器的型号)

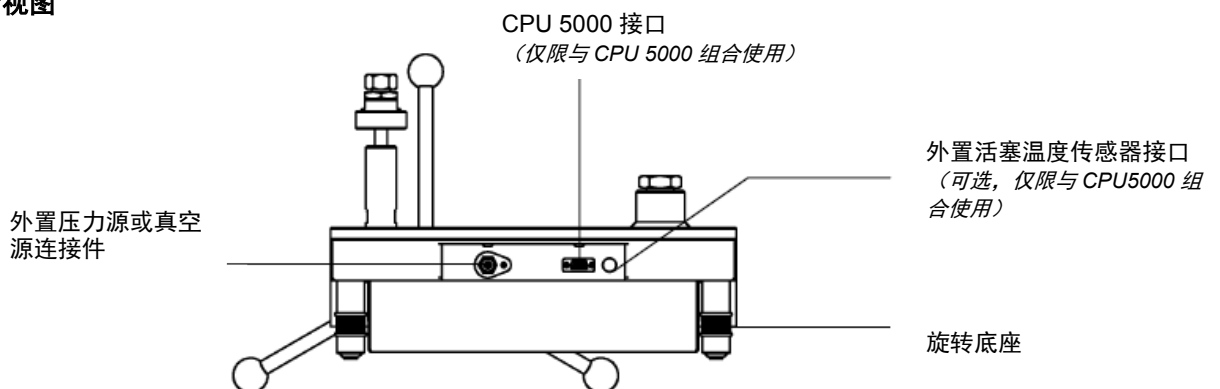
■ 俯视图



■ 前视图

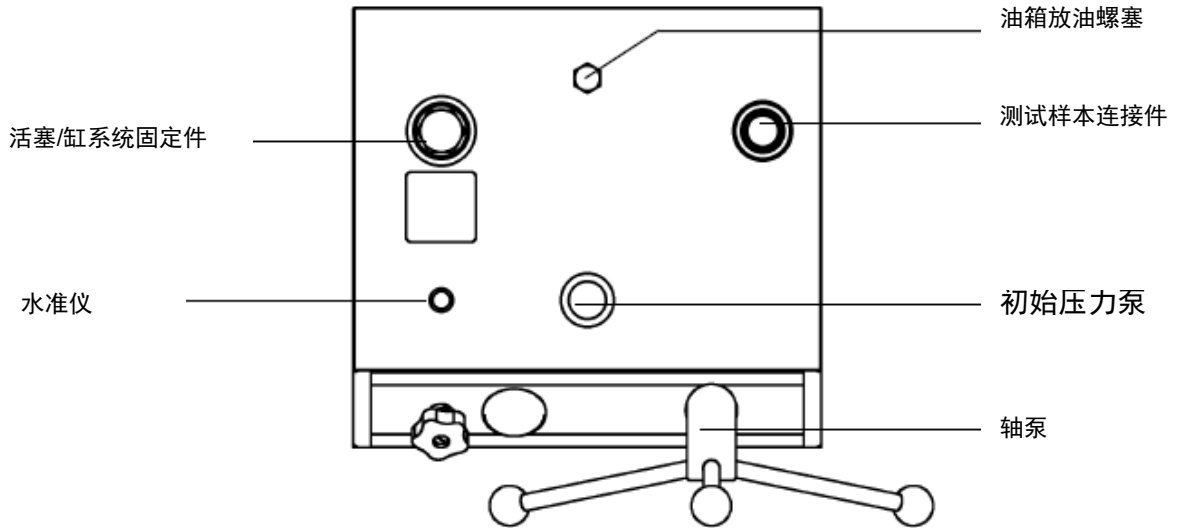


■ 后视图

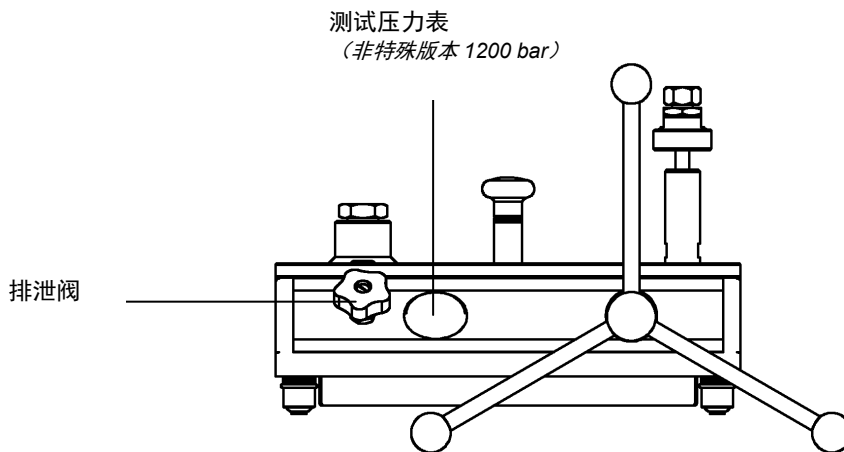


2.4.3 液压底座

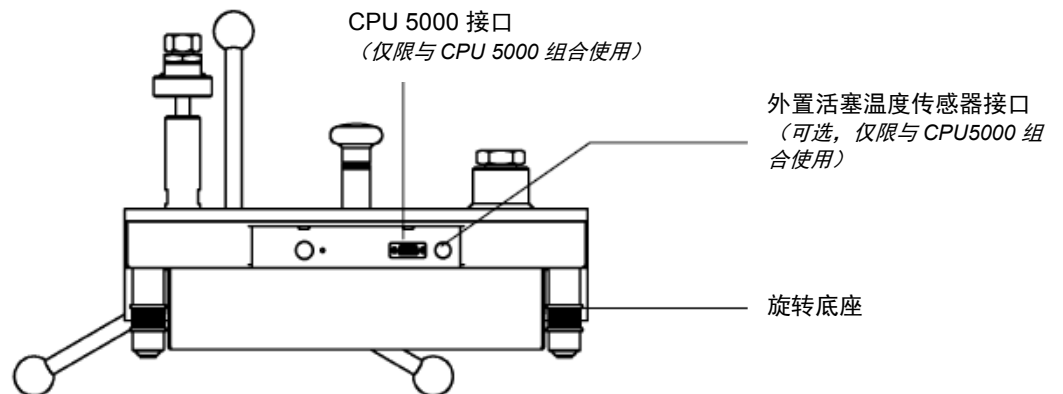
■ 俯视图



■ 前视图



■ 后视图



3. 调试和操作

3.1 准备

3.1.1 设置设备

- 请将压力天平安置在一个固体表面上。如果压力天平并未安置在一个固体底座上或受到震动，可能会影响测量。应避免发生这种情况。
- 如果没有温度控制系统，至少不应将设备放置在发热元件或窗户附近。这样可以尽量减少气流和热气流。
- 应使用水准仪校平设备。此时，可在没有活塞缸系统的情况下进行粗略校平。使用旋转底脚确保设备水平放置。
- 将带旋钮的星形手柄安装到轴泵上。确保弹簧推力垫卡到星形手柄的衬套中。
- 当开始记录测量值时，建议完全拧开轴泵，（逆时针旋转）以便为测量提供足够体积。在此过程中排泄阀必须打开。

3.1.1.1 气动高压/真空型号说明

- 对于**气动高压/真空型号**，必须连接外部压缩空气源或真空源。
指定的压力连接是在仪器底座背面使用管道外径为 6 mm 的 SWAGELOK® 管道连接。



注意：最大供给压力不得超过受测设备或使用中的活塞/缸系统量程的 110%。最大容许压力为 110 bar！

管道连接必须由经过 SWAGELOK® 连接培训且熟悉 SWAGELOK® 管道连接说明的装配人员进行。

- 仅使用干燥、清洁和无尘粒（例如氮气 4.0 或合成气体）的气体。

3.1.1.2 带集成油气分离器的气动型号说明

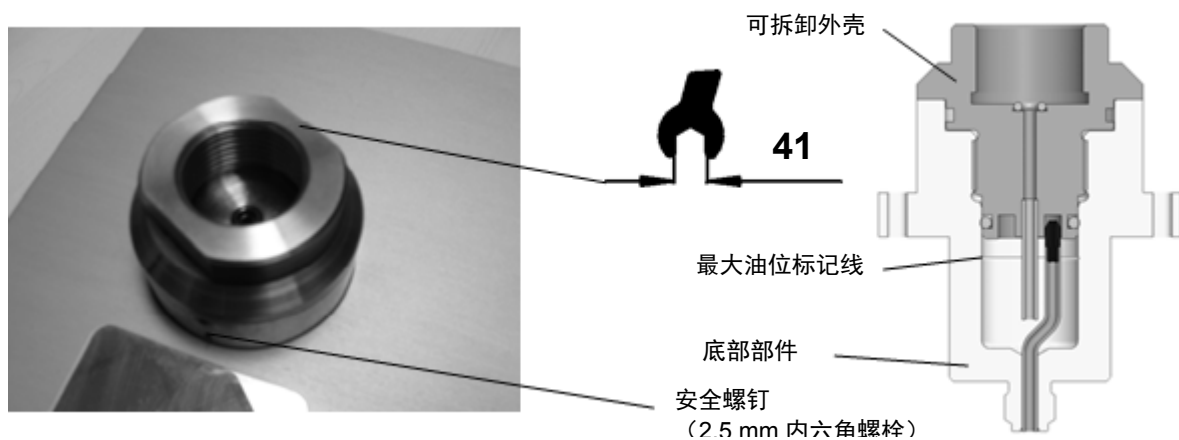
- 对于**带集成油气分离器的气动型号**，必须连接外部压缩气源。
指定的压力连接是在仪器底座背面使用管道外径为 6 mm 的 SWAGELOK® 管道连接。



注意：最大供给压力不得超过受测设备或使用中的活塞/缸系统量程的 110%。最大容许压力为 440 bar！

管道连接必须由经过 SWAGELOK® 连接培训且熟悉 SWAGELOK® 管道连接说明的装配人员进行。

- 仅使用干燥、清洁和无尘粒（例如氮气 4.0 或合成气体）的气体。
- 在活塞/缸系统固定件上的集成分离器可能需要充填或重新充填油液。为此，活塞固定件的可拆卸外壳必须打开。首先，必须使用 2.5 mm 的六角套筒扳手将侧向安全螺钉松开。然后使用 41 号平扳手把可拆卸外壳打开。重新充填时必须使用特殊用油（提供 0.25 升，或可作为附件提供）。充填过程中请注意，切勿使油进入开口朝上的管道中。油位不得超过标记线。



- 充填完成后小心缓慢地将分离器的可拆卸外壳拧到底部部件上。使用平扳手将外壳拧紧，并且拧上侧向安全螺钉。之后便可安装活塞/缸系统。为此，请按照第 3.1.2.4. 节进行。

3.1.1.3 液压型号说明

- 对于**液压设计**，油箱可能需要充填或重新充填（体积 250 ml）。为此，必须打开底座顶部带注油标记的固定螺钉。重新充填时必须使用特殊用油（提供 1 升，或作为附件提供）。初次充填前或完成换油后必须排空系统。为此，请按照第 5.3.3. 节进行。
- 对于**液压设计**，在操作前需要去除油箱放油螺塞上的保护膜（运输过程中通风孔的覆膜）。

3.1.2 安装 ConTect 系统

- 使用何种 ConTect 系统取决于受测设备。应选择具有可比性或较高量程的系统。

示例：

校准 600 bar 的压力表 → 600 bar 的 ConTect 系统

校准 160 bar 的压力表 → 250 bar 的 ConTect 系统

- 仪器底座的活塞/缸系统连接型号有两种：
 - 使用 M30 x 2 内螺纹连接活塞/缸系统（请参见第 3.1.2.1 节）
 - 使用 ConTect 快速连接器连接活塞/缸系统（请参见第 3.1.2.2 节）
- 真空运行需要专门的活塞/缸系统和砝码组。真空活塞/缸系统的安装在第 3.1.2.3 节中说明。

3.1.2.1 使用 M30 x 2 内螺纹连接活塞/缸系统



在卸下设备底部的密封塞之前，请确保系统中没有压力（打排泄阀）。

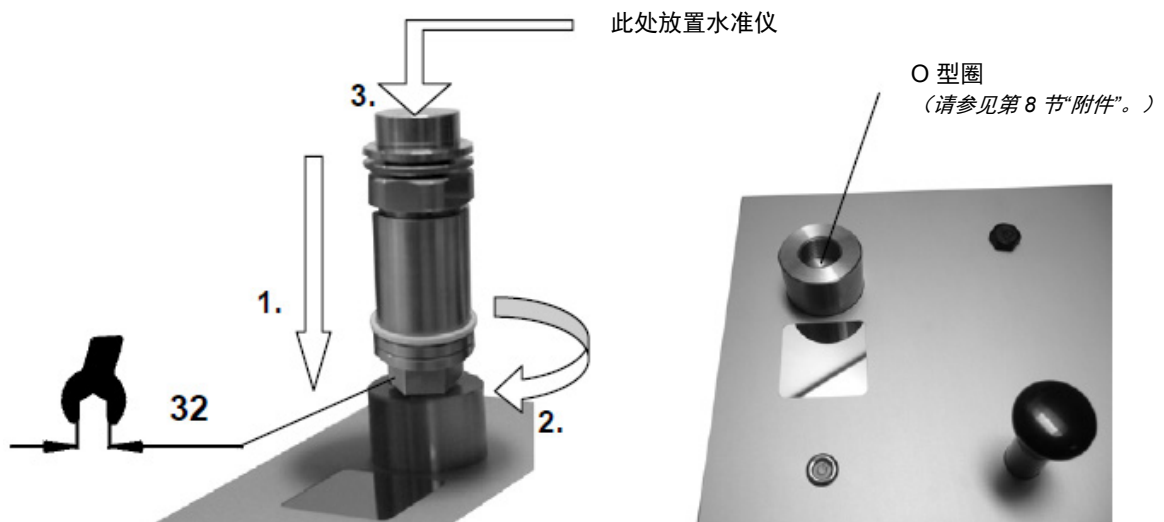
- 将活塞/缸系统垂直连接到活塞插孔的螺纹上，并使用 SW 32 平扳手拧紧。由于已安装 O 型密封圈，因此不需要额外的密封材料。



注意：切勿混淆油气系统

检查活塞/缸系统插孔中的 O 型圈密封件是否正确固定并检查有无磨损迹象。如有必要，请更换。

- 为使设备准确对齐，可将水准仪从底盘移除，并置于已固定活塞/缸系统的顶部。这可确保活塞/缸系统实现最准确的校平效果。



3.1.2.2 使用 ConTect 快速连接器连接活塞/缸系统



在卸下设备底部的密封塞之前，请确保系统中没有压力（打排泄阀）。

- 将 ConTect 系统垂直放在快速连接器上。

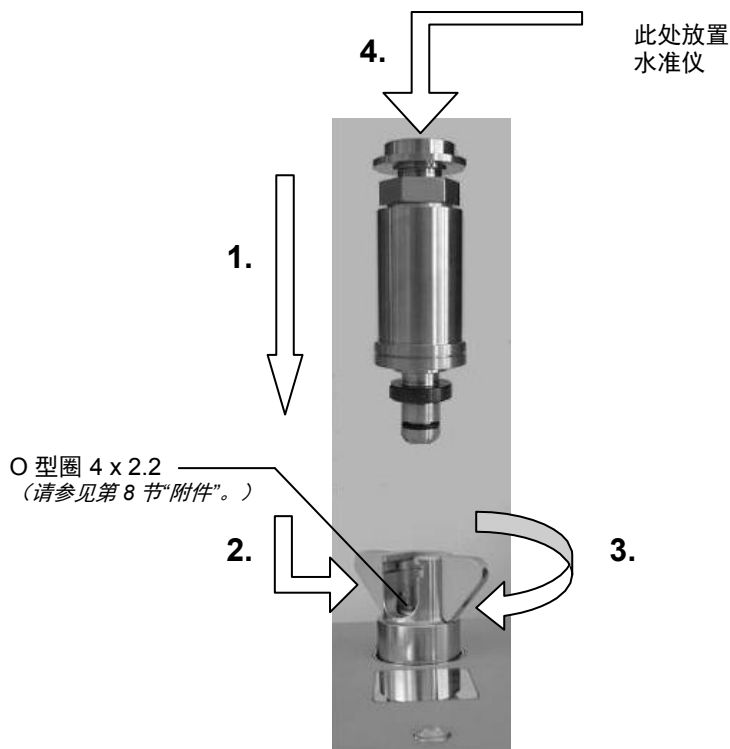


注意：切勿混淆油气系统



检查 ConTect 系统插孔中的 O 型圈密封件是否正确固定并检查有无磨损迹象。如有必要，请更换。

- 顺时针旋转蝶形螺钉约一圈半（拧到底），这样足以将其拧到适当位置并自动密封（用手指拧紧）。
- 为使设备准确对齐，可将水准仪从底盘移除，并置于已固定活塞/缸系统的顶部。这可确保活塞/缸系统实现最准确的校平效果。

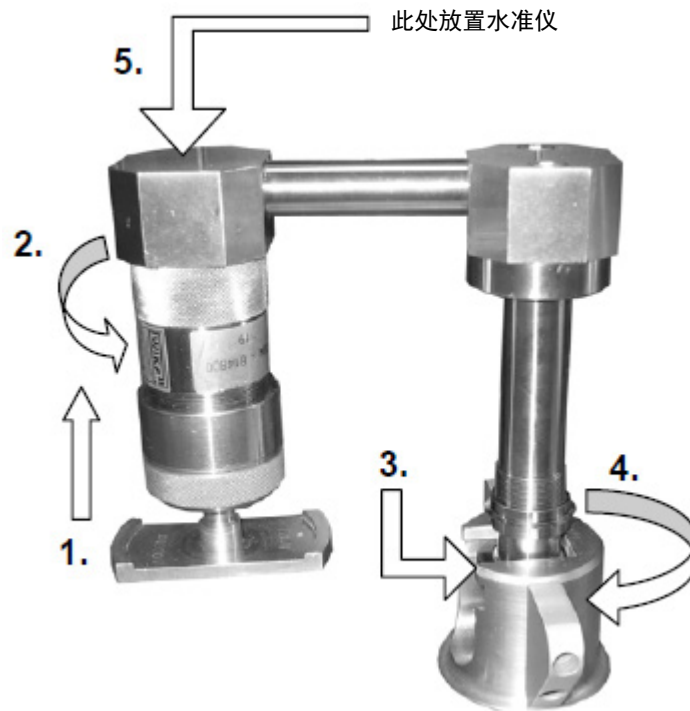


3.1.2.3 真空活塞/缸系统



真空活塞/缸系统仅限使用 ConTect 快速连接器安装到连接件中。

- 将活塞/缸系统固定到支撑杆上。手动拧紧即可实现安全密封。
(步骤 1 和 2)
- 将支撑杆和活塞/缸系统垂直放置于快速连接器中。
(步骤 3)
- 顺时针旋转蝶形螺钉约一圈半（拧到底），这样足以将系统拧到适当位置并自动密封（用手指拧紧）。
(步骤 4)
- 为使设备准确对齐，可将水准仪从底盘移除，并置于已固定活塞/缸系统的顶部。这可确保活塞/缸系统实现最准确的校平效果。
(步骤 5)



3.1.2.4 使用 M30 x 2 内螺纹连接带集成分离器的活塞/缸系统



在卸下活塞/缸系统固定件的密封塞之前，请确保系统中没有压力（打开排泄阀）。

- 安装活塞/缸系统之前必须排空分离器。为此，外部压力通过小心开关集成微调阀（进气阀）来供给。保持压力供给直到油液达到敞开式活塞固定件内的 O 型圈密封处。因此，排泄阀必须关闭，塞头必须安装到测试样本的连接件中。



在排空过程中，应将外部压力供给调整到非常低的压力值。由此配合进气阀即可小心平稳地加压。

如有必要，在排空前需检查并为分离器充填油液。为此，请按照第 3.1.1.2. 节进行。

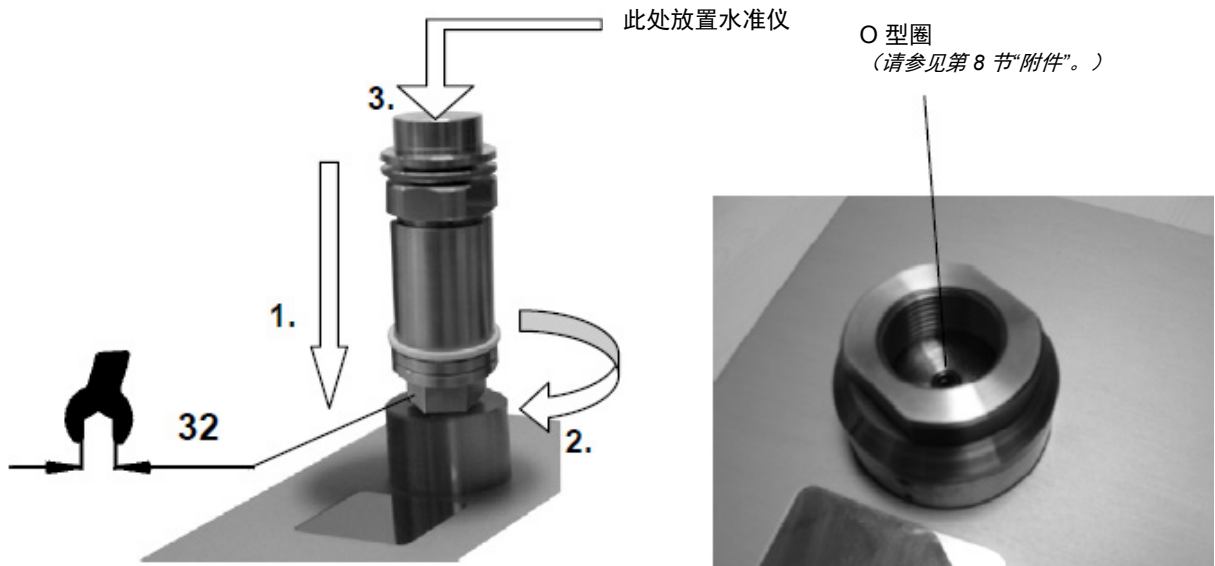
- 之后将活塞/缸系统垂直连接到活塞插孔的螺纹上，并使用 SW 32 平扳手拧紧。由于已安装 O 型密封圈，因此不需要额外的密封材料。



注意：仅液压活塞/缸系统必须使用

检查活塞/缸系统插孔中的 O 型圈密封件是否正确固定并检查有无磨损迹象。如有必要，请更换。

- 为使设备准确对齐，可将水准仪从底盘移除，并置于已固定活塞/缸系统的顶部。这可确保活塞/缸系统实现最准确的校平效果。



3.1.3 连接测试样本

- 将受检查设备用滚花螺母安装到快速连接器上。设备可自由放置。手动拧紧即可实现安全密封。
- 若通过后方压力入口校准仪器，请使用 90°角连接件（请参见第 8 节“附件”）。

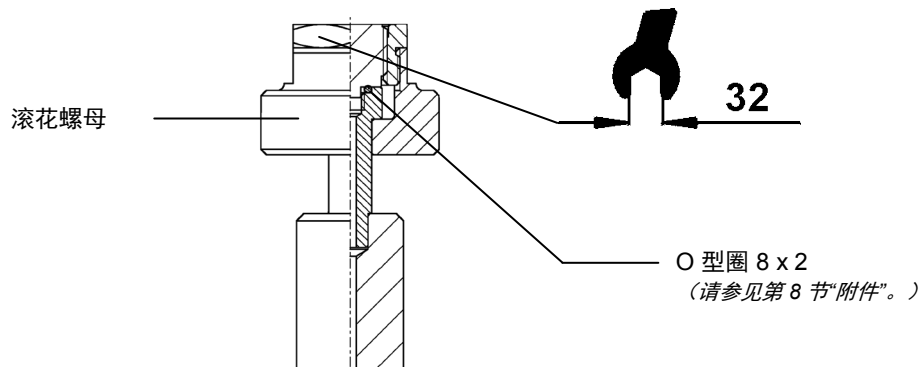


检查测试样本中的 O 型圈密封件是否正确固定并检查有无磨损迹象。如有必要，请更换。
请注意，每个安装到压力天平上的仪器内部必须保持清洁。

- 快速连接器标准交付包中配备一个 G 1/2 螺纹插入件。



当要校准的设备使用不同的连接螺纹时，如果适当，可更换螺纹插入件（请参见附件“适配器设置”）。



3.1.4 排空系统（仅限液压设计）

夹紧 ConTect 系统和测试样本后，系统中可能会滞留空气。校准之前可按照以下程序排空系统内空气：

- 必须夹紧 ConTect 系统和测试样本，并且在活塞/缸系统上加载完整的砝码组。
- 使用初始压力泵生成一个大约 50 bar 的压力
- 以轴泵加压，直至其刚好处于 ConTect 系统或测试样本压力量程的最终值（以较小的压力量程为准）。



重要：此操作中活塞/缸系统必须保持其较低位置，即尚未达到平衡。

- 打开排泄阀，滞留空气会逸入箱体

为排出所有滞留空气，可能需要重复此程序 1 到 2 次。

此设备现在即可供使用。

3.2 操作

3.2.1 砝码块

- 按照所需压力值在加载钟上堆叠砝码块。
- 通常最好先使用最重的砝码，以便使重心尽可能地低。
- 每个组件均以连续编号进行标识。在校准证书中，针对每个编号列出了假定参考条件下所产生的压力。

示例表取自校准证书第 2 页：

砝码的压力值

砝码块类型	编号	实际质量 (kg)	对系统产生的压力值 (bar)
活塞	1262	0.08160	0.4002
加载钟	1	0.81560	3.9998
承载盘	2	0.05097	0.2499
砝码块	3	1.01954	5.0000
砝码块	4	101954	5.0000
砝码块	5	1.01954	5.0000
砝码块	6	1.01954	5.0000
砝码块	7	1.01954	5.0000
砝码块	8	1.01954	5.0000
砝码块	9	1.01954	5.0000
砝码块	10	1.01953	5.0000
砝码块	11	1.01952	4.9999
砝码块	12	0.50976	2.5000
砝码块	13	0.20391	1.0000
砝码块	14	0.20391	1.0000
砝码块	15	0.12234	0.6000
砝码块	16	0.10196	0.5000
砝码块	17	0.07137	0.3500
砝码块	18	0.05098	0.2500

示例：编号为 5 的砝码块在假定参考条件（室内温度 20°C，气压 1013 mbar，相对湿度 40%）下重为 1.01954 kg，产生 5.0000 bar 的压力值。

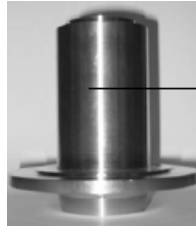
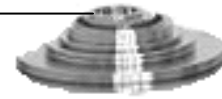
- 压力通过对应的基础重量（活塞）、加载钟和砝码环的重量加和计算而得。
- 为减少起始值，承载盘（编号 2）可以代替加载钟（编号 1）作为基础承载表面使用。

使用加载钟的砝码块

使用承载盘的砝码块

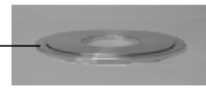


砝码块



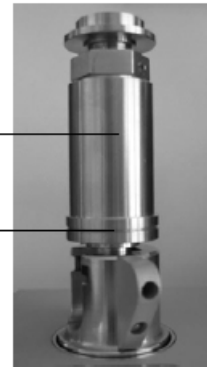
加载钟
(编号 1)

承载盘
(编号 2)



ConTect
系统

浮动位置标
记线



3.2.2.1 接近压力值 - 液压底座

- 在液压系统中，需要首先充填油液并进行预压。
- 因此，必须关闭排泄阀。
- 接着使初始压力泵运行几个冲程。压力最高可增至约 50 bar（取决于连接的测试样本的体积）。
- 之后，顺时针转动内置轴泵进行加压。

3.2.2.2 接近压力值 - 气动低压底座

- 内置初始压力泵用于产生最大 10 bar 的压力（取决于连接的测试样本的体积）。
- 因此，必须关闭排泄阀。
- 使用轴泵进行微调以接近压力值。



气动低压型号的最大容许压力为 10 bar。更高的压力可能损坏仪器。活塞/缸系统、测试样本和所有连接管道所承受的压力不得超过最大容许压力。

3.2.2.3 接近压力值 - 气动高压/真空底座

- 必须在仪器后方连接外部压缩气源。
- 外部压力通过轻缓开关集成微调阀（进气阀）来供给。
- 因此，必须关闭排泄阀。
- 使用轴泵进行微调以接近压力值。
- 真空操作请参见第 3.2.5 节



气动高压/真空型号的最大容许压力为 100 bar。更高的压力可能损坏仪器。活塞/缸系统、测试样本和所有连接管道所承受的压力不得超过最大容许压力。

3.2.2.4 接近压力值 - 带分离器的气动型号

- 必须在仪器后方连接外部压缩气源。
- 外部压力通过轻缓开关集成微调阀（进气阀）来供给。
- 因此，必须关闭排泄阀。
- 气体加压将导致分离器内的油液上移并进入活塞/缸系统。
- 使用轴泵进行微调以接近压力值。

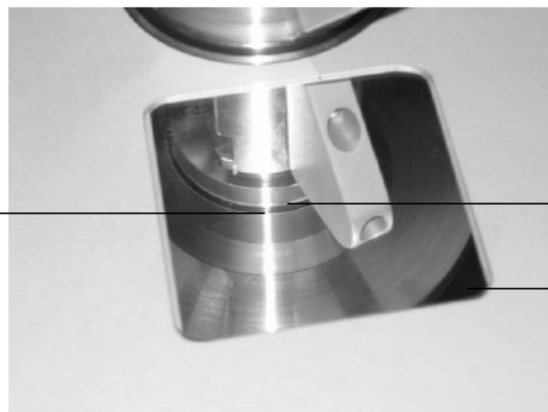


带分离器的气动型号的最大容许压力为 400 bar。更高的压力可能损坏仪器。活塞/缸系统、测试样本和所有连接管道所承受的压力不得超过最大容许压力。

3.2.3 压力稳定

- 继续加压直至系统处于平衡状态。
- 此状态很容易借助液位指示器和油位镜加以识别。在这种情况下，加载钟的底边必须保持在活塞/缸系统的标志线处。

加载钟的底边



浮动位置标记线

油位镜



在刚好到达浮动位置前，系统上升很快。
因此建议缓慢平稳地顺时针旋转主轴。

- 为将摩擦力影响降至最低，朝着砝码块小心地向上移动系统，并执行旋转动作。



如果活塞位于下方或上方定位块，切勿向上移动系统并执行旋转动作。

- 这样活塞和测试压力会保持稳定达数分钟。

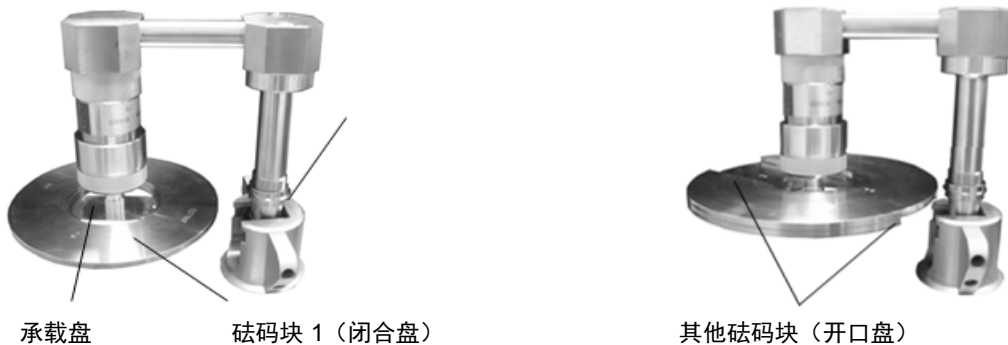
3.2.4 下一压力级

- 为调整到下一个最高压力，重复之前从 3.2.1 到 3.2.3 的步骤。

3.2.5 真空操作

为产生真空，必须使用外接真空源。必须连接到仪器后方。外接真空源可以通过集成微调进气与排气阀抽取气体。可以使用轴泵进行微调。

3.2.5.1 真空用砝码块



- 每次都必须首先将砝码块 1（闭合盘）先放到承载盘上。砝码盘的定心圈必须面朝下。
- 按照所需压力值在砝码块 1 上堆叠其他砝码块。请注意，堆叠砝码块时，砝码开口部分必须错开 180°，即反方向摆放。

3.2.5.2 接近真空值

- 真空源必须连接到仪器后方。
- 当开始记录测量值时，建议拧紧轴泵，（顺时针旋转）以便为测量提供足够体积。在此过程中排泄阀必须打开。
- 系统可以通过集成微调阀（进气阀）借助外部真空泵抽空。
- 因此，必须关闭排泄阀。
- 使用轴泵进行微调以接近压力值。

3.2.5.3 真空稳定

- 继续抽空直到系统达到平衡状态。
- 活塞/缸系统支撑杆上的调节环可充当浮动位置的定位工具（= 半个活塞冲程）。例如在浮动位置，可将其调节至单个砝码块的下缘或上缘。



在刚好到达浮动位置前，系统上升很快。因此建议缓慢平稳地逆时针旋转主轴。

- 为将摩擦力影响降至最低，朝着砝码块小心地向上移动系统，并执行旋转动作。



如果活塞位于下方或上方定位块，切勿向上移动系统并执行旋转动作。

- 这样活塞和测试压力会保持稳定达数分钟。

3.2.5.4 下一真空级

- 为调整到下一个最高真空值，重复之前从 3.2.5.2 到 3.2.5.3 的步骤

3.2.6 释放压力 - 液压、气动和真空

- 逆时针旋转轴泵以释放系统内的压力。在排空操作中，顺时针旋转。
- 如果压力接近下一测试级别，使用轮盘进行微调。
- 为更快泄压或排空，也可小心打开微调阀（排泄阀）



注意：这种情况下活塞必须处于较低位置！



小心：
将要达到平衡之前活塞会下降得很快。



小心：
请不要将砝码从存在压力的活塞/缸系统中完全移除。

- 请注意，针对带集成油气分离器的气动型号，只能进行非常缓慢地泄压。由此可避免油液在分离器内乱流以及回流进入压力管道。

3.3 拆卸

- 记录所有压力点之后，关闭进气阀，打开排泄阀。
- 现在可将测试样本从快速卡箍上移除，并将所有砝码从活塞/缸系统上移除。
- 如果还有另一个具有相同量程的测试样本，活塞缸系统可在其相应位置保持夹紧状态。
- 否则，建议移除系统并将之储存到其防护容器中。



在压力天平中的压力完全释放之前，切勿拆除测试样本或活塞/缸系统。

- 为从轴泵上移除星形手柄，必须借助一个小螺丝刀或圆珠笔向下压弹簧推力垫。现在即可拆下星形手柄。

弹簧推力垫



- 为运输带油气分离器的气动型号，需要彻底移除分离器中的油液，请参见第 3.1.1.2 节。

4. 故障排除方法



如果无法修复故障，必须立即停止系统运行，还应将此信息告知制造商。

修理只能由制造商进行。不得对本设备进行干预和更改。

如果因气动/液压设备缺陷导致故障，操作人员必须立即通知其主管，并申请具有资质且获得授权的技术人员进行维护。

表：故障描述与解决方法

故障类型	解决方法
I. 系统无法产生/释放压力	<ul style="list-style-type: none"> ■ 正确关闭排泄阀 ■ 注意：拧紧微调阀时切勿超过手指力度。否则会损坏阀座 ■ 检查活塞/缸系统和测试样本的夹盘中是否已安装密封件，并检查安装是否妥帖。
II. 无法产生压力，或无法达到量程（仅限液压设计）	<ul style="list-style-type: none"> ■ 夹紧活塞/缸系统和测试样本后，系统中可能会滞留空气。 ■ 请注意：校准开始前应排空系统。为此，请按照第 3.1.4. 节进行。 ■ 然后，重新生成压力。
III. 慢慢降低活塞至平衡状态	<ul style="list-style-type: none"> ■ 系统中有泄漏，请参见故障 I。 ■ 夹紧活塞/缸系统和测试样本后，系统中可能会滞留空气（仅限液压设计），请参见第 II 点。 ■ 然后，重新生成压力。
IV. 活塞不转动或响应度不佳	<ul style="list-style-type: none"> ■ 注意：如果活塞旋转吃力，任何情况下均不要迫使它转动。这样做可能导致持久损坏，会严重影响测量性能。 ■ 活塞必须保持清洁（请参见第 5.1.1 节）

如需进一步帮助，请联系 WIKA 校准技术部。

5. 维护和保养

5.1 清洁

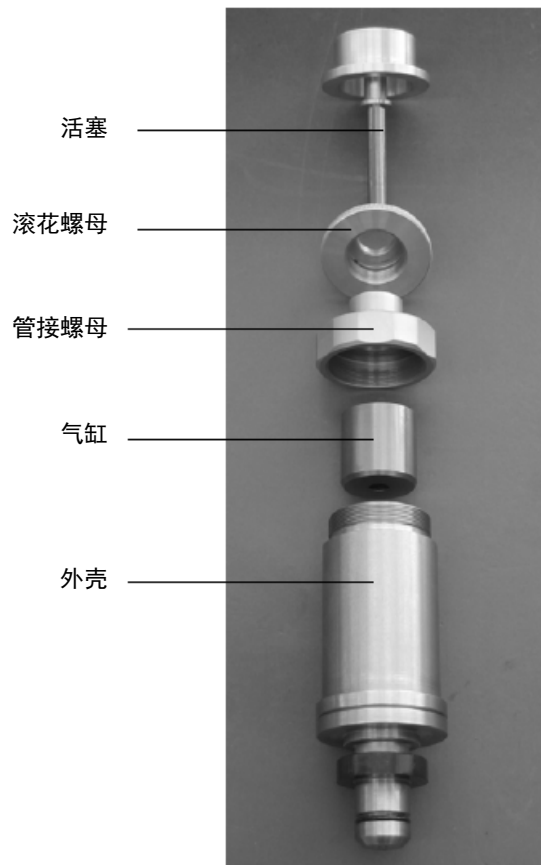
5.1.1 活塞/缸系统

建议在每次用完活塞/缸系统后根据需要进行清洁。如果系统灵敏度不佳或自由旋转持续时间较短，说明系统需要进行清洁。

如需清洁，请考虑以下参考说明将活塞缸系统从底座移除并拆开。

5.1.1.1 液压活塞/缸系统

活塞/缸系统（液压）的布局：



拆卸活塞/缸系统（液压）：

- 完全松开滚花螺母
- 现在可以缓慢而小心地将活塞从气缸中向上垂直取出。最好是将活塞/缸装置向下放在承载盘上并保持静止。
- 松开管接螺母
- 即可将气缸从外壳中取出。

清洁活塞/缸系统（液压）：

有许多方法可用于清洁各个部分。

建议用蘸有酒精（例如乙醇）的无尘无绒软布擦拭部件，或用它穿过气缸，然后以干燥无尘无绒软布擦干。

为此建议使用活塞/缸系统清洁组件，可作为附件提供（请参见第 8 节“附件”）。其中包含有关清洁程序的详细操作说明。



请勿徒手触摸已清洁的活塞。皮肤上的自然油脂可能对活塞缸系统造成干扰。

组装活塞/缸系统（液压）：

按相反步骤重新组装部件。

- 将气缸插入外壳中（斜边向下）
- 拧紧管接螺母
- 将系统垂直放在承载盘上并从上方小心插入活塞。活塞应在自身重力作用下“掉入”气缸。
- 再次拧紧滚花螺母

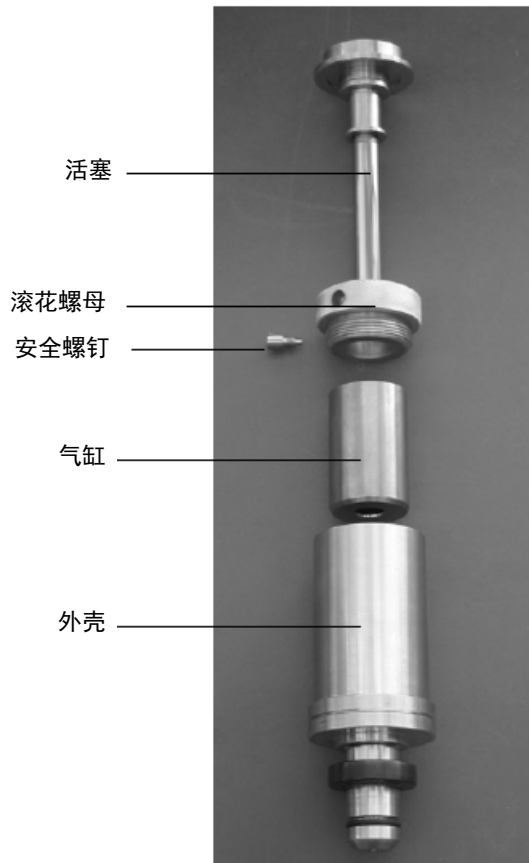


切勿将活塞强行压进气缸。
否则会损坏活塞。

现在此系统可再次使用。

5.1.1.2 气动活塞/缸系统

组装活塞/缸系统（气动）：



组装活塞/缸系统（气动）：

- 松开侧面的安全螺钉
- 现在可以缓慢而小心地将活塞从气缸中向上垂直取出。最好是将活塞/缸装置向下放在承载盘上并保持静止。
- 松开管接螺母
- 即可将气缸从外壳中取出。

清洁活塞/缸系统（气动）：

有许多方法可用于清洁各个部分。
建议用蘸有酒精（例如乙醇）的无尘无绒软布擦拭部件，或用它穿过气缸，然后以干燥无尘无绒软布擦干。

为此建议使用活塞/缸系统清洁组件，可作为附件提供（请参见第 8 节“附件”）。其中包含有关清洁程序的详细操作说明。



请勿徒手触摸已清洁的活塞。皮肤上的自然油脂可能对活塞缸系统造成干扰。

组装活塞/缸系统（气动）：

按相反步骤重新组装部件。

- 将气缸插入外壳中（斜边向下）
- 拧紧滚花螺母
- 将系统垂直放在承载盘上并从上方小心插入活塞。活塞应在自身重力作用下“掉入”气缸。
- 再次拧紧侧面的安全螺钉



切勿将活塞强行压进气缸。否则会损坏活塞。

现在此系统可再次使用。

5.1.2 砝码组

- 拿取砝码时应配戴手套。
- 在采取该预防措施的情况下，如果砝码块上还是留下了指纹或其他杂质，可以用酒精（白酒）去除。

5.2 易损件

活塞/缸固定系统和测试样本插孔中的 O 型圈容易磨损。进行任何校准之前，都应检查这两处的 O 型圈是否正确固定或有无任何磨损。必须定期更换 O 型圈或视需要更换（请参见第 8 节“附件”）。



重要：只能使用原装密封件。非正常尺寸、材料或材料等级的密封件可能对设备和测试样本造成损坏，并可能给操作人员带来危险。

5.3 更换液压油（仅限液压设计）

每当出现可见污染时均应更换液压油。

5.3.1 清除液压油

- 打开底座顶部带注油标记的固定螺钉。
- 使用合适的喷嘴将油液从箱体中抽走。
- 在测试样本连接件打开和排泄阀关闭的情况下，通过缓慢旋转轴泵，可另外抽走活塞/缸系统插孔连接件上的少量残留油。
- 极少量的油可能会残留在管道内。



如果液压油发生严重污染，建议在拆卸状态下，完全清洁管道和底座上与介质接触的所有独立元件。此程序只能由制造商进行。



废油必须依照法律要求进行处置。

5.3.2 充填液压油

- 顺时针旋转轴泵直至初始停止位置。
- 关闭排泄阀
- 打开底座顶部带注油标记的固定螺钉。
- 从箱口充填特殊用油（提供 1 升，或作为附件提供），直到充填液位达到箱口的螺纹处（大约 250ml）。必须一直观察充填液位。
- 逆时针旋转轴泵直至后档位置。充填介质从箱体抽出到系统中。
- 用固定螺钉关闭箱口。

5.3.3 排空系统（仅在完成充填后）

初次充填后，或完成换油后，系统中可能会滞留空气。应按以下程序排空系统：

- 必须打开活塞/缸系统和测试样本连接件
- 关闭排泄阀
- 逆时针旋转轴泵直至后档位置。
- 使用初始压力泵小心泵送，持续观察已打开的活塞缸/系统和测试样本连接件中介质充填。此时，滞留空气形成气泡向外排出。必须一直操作初始压力泵直到不再出现气泡。
- 应抽走打开的活塞/缸系统和测试样本连接件中溢入的油液，例如使用吸嘴。

5.4 重新校准

建议每隔五年进行一次重新校准。

该建议由德国校准服务局 (DKD/DAkkS) 提出
此间隔的假设前提是系统和砝码得到谨慎对待。
如果系统使用条件恶劣，建议缩短将重新校准间隔缩短至大约三年。

以下情况中，压力天平应立即进行维护和重新校准：

- 运行特性（自由旋转时间、下降速率、灵敏度）退化
- 砝码块损坏或腐蚀

如果对重新校准或最佳重新校准周期有疑问，DKD 实验室很乐意为您提供帮助：

WIKA Alexander Wiegand SE & Co. KG
DKD-Kalibrierlaboratorium
Alexander-Wiegand-Strasse
63911 Klingenberg/Germany

电话：(+49) 93 72 / 132 - 473
传真：(+49) 93 72 / 132 - 8767
电子邮件：calibration@wika.de

6. 规格

型号		气动					
量程 ¹⁾	bar ²⁾	-0.03 ...-1	0.03 ...2	0.2 ...10	0.4 ...50	0.4 ...100	
所需砝码	kg	5	10	10	10	20	
最小步进	bar ³⁾	0.01	0.01	0.05	0.25	0.25	
活塞标称截面面积	cm ²	5	5	1	0.2	0.2	
型号		气动					
量程 ¹⁾	psi ²⁾	-0.435 ...-14	0.435 ...30	2.9 ...150	5.8 ...500	5.8 ...1,000	5.8 ...1,500
所需砝码	kg	5	10	10	7	13	20
最小步进	psi ³⁾	0.1	0.2	1	5	5	5
活塞标称截面面积	cm ²	5	5	1	0.2	0.2	0.2
型号		液压					
量程 ¹⁾	bar ²⁾	0.2 ...60	0.2 ...100	1 ...250	1 ...400	2 ...600	2 ...1,000
所需砝码	kg	30	50	25	40	30	50
最小步进	bar ³⁾	0.1	0.1	0.5	0.5	1	1
活塞标称截面面积	cm ²	0.5	0.5	0.1	0.1	0.05	0.05
型号		液压					
量程 ¹⁾	psi ²⁾	2.9 ...1,000	14.5 ...5,000	29 ...10,000	29 ...14,500		
所需砝码	kg	34	34	34	50		
最小步进	psi ³⁾	2	10	20	20		
活塞标称截面面积	cm ²	0.5	0.1	0.05	0.05		
准确度 ⁴⁾	读数百分比	0.015 / 可选: 0.008 ⁵⁾					
底座型号							
气动低压		在生成内压的情况下, 最高可达 10 bar / 150 psi					
气动高压/真空		最高可达 100 bar / 1500 psi, 需要外部压力源和真空源					
带分离器的气动型		最高可达 400 bar / 5000 psi, 带油气分离器并需要外部压力源, 需使用带 M 30 x 2 连接件的液压活塞					
液压		在生成内压的情况下, 最高可达 1,000 bar / 14,500 psi 最高可达 1,200 bar / 17,400 psi (应要求)					
活塞/缸系统连接件		M30 x 2 螺纹连接/可选: ConTect 快速连接器					
测试样本连接件		标准是 G 1/2 B 内螺纹快速连接器, 自由旋转, 可更换, 其他螺纹插入件请见附件					
压力传输介质	气动	清洁、干燥和无腐蚀性气体 (例如空气或氮气)					
	液压	操作液体 (交付产品中含有 1 升), 按要求可提供其他介质					
油箱	cm ³	250					
外部压力连接		6 mm SWAGELOK® 管接头, 使用中最大可承受压力为量程的 110 %; 仅适用于带分离器的气动高压/真空型号					
材料							
■ 活塞		硬质合金					
■ 气缸		硬质合金					
■ 砝码组		不锈钢 1.4305 和铝, 无磁性					
■ 仪器底座管道		气动低压: 聚氨酯材质的挠性软管, 4 x 0.75 mm 带分离器的气动高压/真空: 不锈钢, 1.4571, 3 x 1 mm 液压: 不锈钢, 1.4404, 6 x 2 mm					
工作温度	°C	18 ...28					

¹⁾ 理论初始值; 对应活塞 (自身重量) 所产生的压力值。为达到最佳运行特性, 应加载更多砝码。

²⁾ 基于标准砝码组所达到的最小压力变化值。同时提供微调砝码组以产生更小的值。

³⁾ 准确度与测量值相关, 最低为量程的 10%。在较下方区域应考虑与 10% 的面积相关的固定误差。

⁴⁾ 测量不确定度假定参考条件为环境温度 20°C, 气压 1013 mbar, 相对湿度 40 %。未使用校准装置时可能需要进行修正。

⁵⁾ 其他可按客户要求提供

重量		
■ 气动低压底座	kg	18.0/19.0 (包括可选的 ConTect 快速连接器)
■ 气动高压底座	kg	18.0/19.0 (包括可选的 ConTect 快速连接器)
■ 带分离器的气动底座	kg	16.5
■ 液压底座	kg	20.5/21.5 (包括可选的 ConTect 快速连接器)
■ 活塞/缸系统	kg	1.5/5.7 (包括可选装载盒内的加载钟和承载盘)
■ 真空用砝码组 (BAR)	kg	13.1 kg (包括装载盒内的活塞/缸系统)
■ 气动型基础砝码组 (BAR)	kg	16.2 (包括装载盒)
■ 气动型扩展砝码组 (BAR)	kg	14.0 (包括装载盒)
■ 液压型基础砝码组 (BAR)	kg	36.0 (包括装载盒)
■ 液压型扩展砝码组 (BAR)	kg	24.0 (包括装载盒)
■ 真空用砝码组 (PSI)	kg	13.0 kg (包括装载盒内的活塞/缸系统)
■ 气动型基础砝码组 (PSI)	kg	12.5 (包括装载盒)
■ 气动型扩展砝码组 1 (PSI)	kg	11.0 (包括装载盒)
■ 气动型扩展砝码组 2 (PSI) (仅适用于 1,500 psi)	kg	18.5 (包括装载盒)
■ 液压型基础砝码组 (PSI)	kg	42.0 (包括装载盒)
■ 液压型扩展砝码组 (PSI)	kg	21.5 (包括装载盒)
尺寸		
■ 仪器底座	mm	400 (宽) x 375 (深) x 265 (高), 详细内容请参见技术图纸
■ 基础砝码组装载盒	mm	400 (W) x 310 (D) x 310 (H)
■ 扩展砝码组装载盒	mm	215 (W) x 310 (D) x 310 (H)
■ 活塞/缸系统装载盒 (可选)	mm	300 (W) x 265 (D) x 205 (H)
CE 符合性		
■ 压力设备指令		97/23/EG (A 型) 仅限于 1,200 bar/17,400 psi 型号
校准		工厂校准证书/可选: DKD/DAkS 校准证书

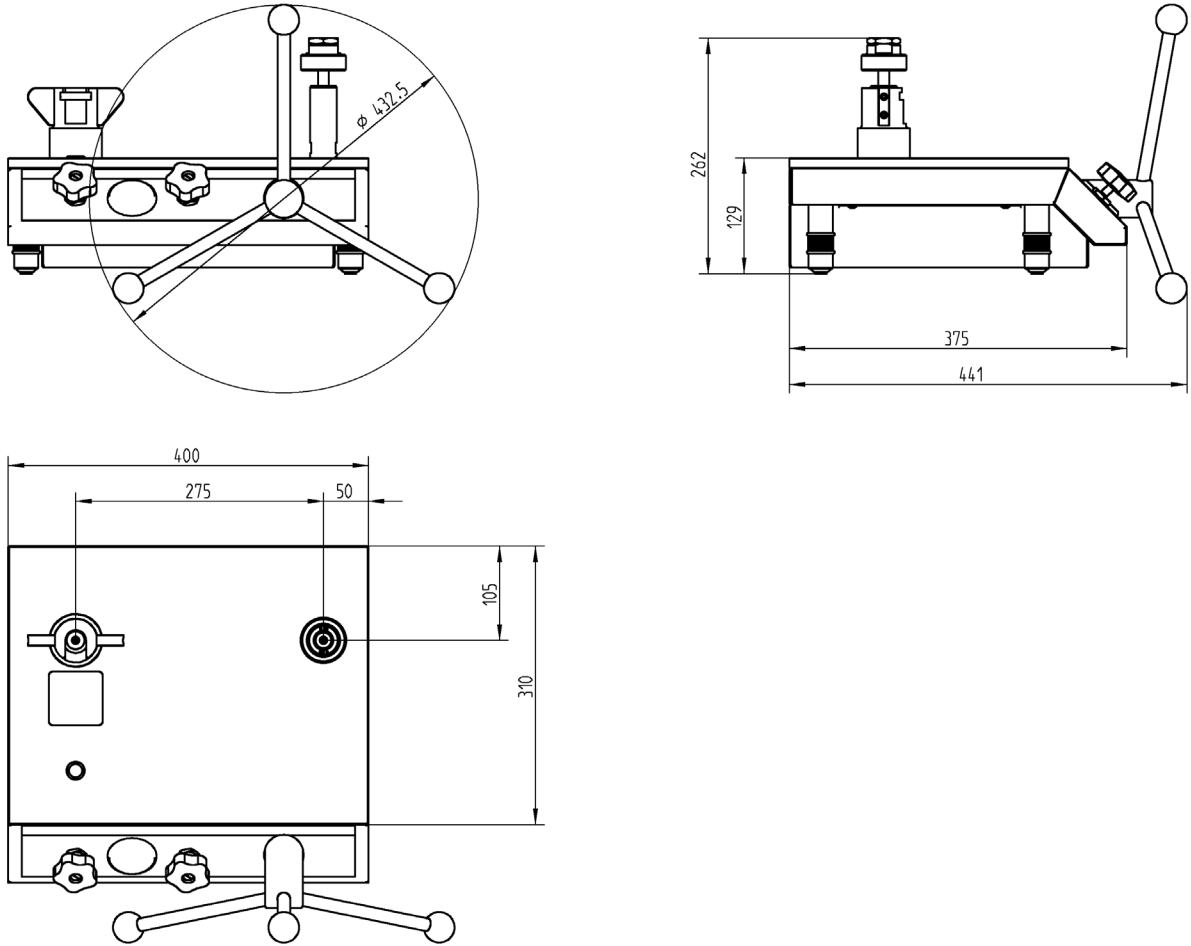
供应范围

- 带液压管的仪底座
- 初始压力泵 (不适用于带分离器的气动高压/真空基础型号)
- 压力生成/微调轴泵
- 使用 M30 x 2 内螺纹连接活塞/缸系统
- 测试装置的快速连接件
- 带加载钟的活塞缸系统
- 装载盒中的基础砝码组
- 装载盒中的扩展砝码组 (视量程而定)
- 按标准重力 (9.80665 m/s²) 制造的砝码组
- 1 升 (仅限液压型号) 或 0.25 升 (限于带分离器的型号) 的操作液体
- 操作说明书 (德语及英语)
- 工厂校准证书

选件

- 具有 0.008 % 的更高准确度的系统
- 使用 ConTect 快速连接器连接活塞/缸系统
- 活塞/缸系统装载盒
- 按当地重力制造的砝码组
- DKD/DAkS 校准证书

尺寸



图纸显示包含可选 ConTect 快速连接器的 CPB 5000 型气动高压底座。气动低压型号和液压型号在尺寸上并无区别。

7.砝码表

下表显示一组砝码中每个量程的砝码块数量，及其标称质量值和由之产生的标称压力。

如果未在参考条件（环境温度 20°C，气压 1013 mbar，相对湿度 40%）下操作设备，必须考虑第 2.3 节所提及的修正。

7.1 液压型号

量程 [bar]	0.2 ... 60		0.2 ...100		1 ...250		1 ..400		2 ...600		2 ...1,000	
	数量	每块标称压力 bar	数量	每块标称压力 bar	数量	每块标称压力 bar	数量	每块标称压力 bar	数量	每块标称压力 bar	数量	每块标称压力 bar
活塞	1	0.2	1	0.2	1	1	1	1	1	2	1	2
加载钟	1	1.6	1	1.6	1	8	1	8	1	16	1	16
铝制承载盘	1	0.1	1	0.1	1	0.5	1	0.5	1	1	1	1
4 kg 砝码	6	8	11	8	5	40	11	40	6	80	11	80
2 kg 砝码	2	4	2	4	2	20	2	20	2	40	2	40
1 kg 砝码	1	2	1	2	1	10	1	10	1	20	1	20
0.5 kg 砝码	1	1	1	1	1	5	1	5	1	10	1	10
0.2 kg 砝码	1	0.4	1	0.4	1	2	1	2	1	4	1	4
0.1 kg 砝码	1	0.2	1	0.2	1	1	1	1	1	2	1	2
0.05 kg 砝码	1	0.1	1	0.1	1	0.5	1	0.5	1	1	1	1

量程 [psi]	2.9 ... 1,000		14.5 ... 5,000		29 ... 10,000		29 ... 14,500	
	数量	每块标称压力 psi	数量	每块标称压力 psi	数量	每块标称压力 psi	数量	每块标称压力 psi
活塞	1	2.9	1	14.5	1	29	1	29
加载钟	1	23.1	1	115.5	1	231	1	231
铝制承载盘	1	1.1	1	5.5	1	11	1	11
3.5 kg 砝码	9	100	9	500	9	1000	14	1000
1.4 kg 砝码	1	40	1	200	1	400	1	400
1 kg 砝码	1	30	1	150	1	300	1	300
0.7 kg 砝码	2	20	2	100	2	200	2	200
0.35 kg 砝码	1	10	1	50	1	100	1	100
0.175 kg 砝码	1	5	1	25	1	50	1	50
0.14 kg 砝码	1	4	1	20	1	40	1	40
0.07 kg 砝码	1	2	1	10	1	20	1	20

7.2 气动型号

量程 [bar]	-0.03 ... -1		0.03 ... 2		0.2 ... 10		0.4 ... 50		0.4 ... 100	
	数量	每块标称 压力 bar	数量	每块标称 压力 bar	数量	每块标称 压力 bar	数量	每块标称 压力 bar	数量	每块标称 压力 bar
活塞	1	0.03	1	0.03	1	0.2	1	0.4	1	0.4
加载钟	-	-	1	0.16	1	0.8	1	4	1	4
铝制承载盘	1	0.07	1	0.01	1	0.05	1	0.25	1	0.25
2 kg 砝码	-	-	-	-	-	-	-	-	5	10
1 kg 砝码	-	-	9	0.2	9	1	9	5	9	5
0.5 kg 砝码	8	0.1	1	0.1	1	0.5	1	2.5	1	2.5
0.25 kg 砝码	1	0.05	-	-	-	-	-	-	-	-
0.2 kg 砝码	-	-	1	0.04	1	0.2	1	1	1	1
0.12 kg 砝码	-	-	1	0.024	1	0.12	1	0.6	1	0.6
0.1 kg 砝码	2	0.02	1	0.02	1	0.1	1	0.5	1	0.5
0.07 kg 砝码	-	-	1	0.014	1	0.07	1	0.35	1	0.35
0.05 kg 砝码	1	0.01	1	0.01	1	0.05	1	0.25	1	0.25

量程 [psi]	-0.435 ... -14		0.435 ... 30		2.9 ... 150		5.8 ... 500		5.8 ... 1,000		5.8 ... 1,500	
	数量	每块标称 压力 psi	数量	每块标称 压力 psi	数量	每块标称 压力 psi	数量	每块标称 压力 psi	数量	每块标称 压力 psi	数量	每块标称 压力 psi
活塞	1	0.435	1	0.435	1	2.9	1	5.8	1	5.8	1	5.8
加载钟	-	-	1	2.22	1	11.1	1	55.5	1	55.5	1	55.5
铝制承载盘	1	0.565	1	0.22	1	1.1	1	5.5	1	5.5	1	5.5
1.4 kg 砝码	-	-	5	4	5	20	-	-	5	100	8	100
1 kg 砝码	-	-	2	3	2	15	2	75	2	75	2	75
0.7 kg 砝码	4	2	4	2	4	10	4	50	4	50	9	50
0.35 kg 砝码	4	1	3	1	3	5	3	25	3	25	3	25
0.19 kg 砝码	-	-	1	0.548	1	2.74	1	13.7	1	13.7	1	13.7
0.175 kg 砝码	1	0.5	-	-	-	-	-	-	-	-	-	-
0.14 kg 砝码	-	-	1	0.4	1	2	1	10	1	10	1	10
0.12 kg 砝码	-	-	1	0.345	1	1.725	1	8.625	1	8.625	1	8.625
0.07 kg 砝码	2	0.2	1	0.2	1	1	1	5	1	5	1	5
0.035 kg 砝码	1	0.1	-	-	-	-	-	-	-	-	-	-

8 附件

CPU 5000 型校准装置

用于压力天平的紧凑工具

CPU 5000 型校准装置可计算任何压力步进所需的砝码加载。作为可选项，它还包括自动修正环境条件所需的传感器。同时提供校准变送器包。

有关规格，请参见数据表 CT 35.01。

以下型号可供选择：



说明/特性	订购号
CPU 5000 型基本系统校准装置	7261369
CPU 5000 型基本系统校准装置，包含计量扩展 ¹⁾	7322031
CPU 5000 型基本系统校准装置，包含变送器扩展 ²⁾	7432945
CPU 5000 型基本系统校准装置，包含可视化扩展 ³⁾	7433046
CPU 5000 型基本系统校准装置，包含计量和变送器扩展	12351199
CPU 5000 型基本系统校准装置，包含计量和可视化扩展	7512329
CPU 5000 型基本系统校准装置，包含变送器、计量和可视化扩展	12168025

1) 包括活塞温度（在系统中直接测量）和环境条件（温度、气压、湿度）传感器

2) 模拟变送器具备万用表功能，包括直流 24 V 的电源

3) 浮动位置无接触测量与指示传感器

其他附件

说明/特性	订购号
微调砝码（1 mg 至 50 g）	7093874
盒装快速连接器适配器套件，包含用于插入测试项连接件滚花螺母中的 G 1/4、G 3/8、1/2 NPT、1/4 NPT 和 M 20 x 1.5 螺纹插入件	2036941
盒装快速连接器 NPT 配接器套件，包含用于插入测试项连接件滚花螺母中的 1/8 NPT、1/4 NPT、3/8 NPT 和 1/2 NPT 螺纹插入件	1256362
90°角连接件，通过后方安装连接件用于测试样本	1564838
清洁剂，≤ 1,000 bar	1565389
集尘器，-1/+1000 bar，容量 0.2 升	2015820
集尘器，-1/+1000 bar，容量 0.03 升	2015714
一组 O 型圈包含 5 件 8 x 2 尺寸和 5 件 4 x 2.2 尺寸	12328562
CPB 5000 操作用液体，最大压力 4000 bar，1 升	2099882
气动型号使用的 ConTect 系统清洁组件	12485943
液压型号使用的 ConTect 系统清洁组件	12481425
测试样本专用连接件，快速连接器，可适配 ConTect 系统固定件，作为比较试压泵操作。	2152634



Herstellererklärung

Richtlinie 97 / 23 / EG
"Druckgeräterichtlinie (DGRL)"

Dokument Nr.:
7100801

Wir erklären in alleiniger Verantwortung,
dass nach- stehend genannte Produkte

Typ:
CPB5000

Beschreibung:
Kolbenmanometer

Gemäß gültigem Typenblatt
CT 31.01

mit der Richtlinie übereinstimmen und
entsprechend geltender guter
Ingenieurpraxis ausgelegt und gefertigt
werden.

制造商声明

指令 97/23/EC
“压力设备指令 (PED)”

文档号:
7100801

兹声明, 我们对以下具有产品

型号:
CPB 5000

说明:
压力天平

根据实际数据表
CT 31.01

符合以上指令并按照良好的工程实践设计
和生产负有唯一责任。

Declaration of the Manufacturer

Directive 97 / 23 / EC
"Pressure Equipment Directive (PED)"

Document No.:
7100801

We declare under our sole responsibility,
that the products

Model:
CPB5000

Description:
Pressure Balance

according to the actual data sheet
CT 31.01

Correspond with the directive and are
designed and produced in accordance
with sound engineering practice.

Déclaration du Fabricant

Directive 97 / 23 / CE
"Directive Equipements sous Pression
(DESP)"

Document N°
7100801

Nous déclarons sous notre propre
responsabilité que

Type:
CPB5000

Description:
Équilibre à Pression

selon fiche technique en vigueur
CT 31.01

correspondent à la directive et qu'ils ont
été conçus et fabriqués selon la pratique
d'ingénierie en cours

WIKAI Alexander Wiegand GmbH & Co. KG

克林根堡, 2006年2月21日

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