

# Primary standard pressure balance Series CPB6000



WIKA data sheet CT 32.01

## Applications

- High-precision primary standard
- Reference instrument for factory and calibration laboratories for the testing, adjustment and calibration of pressure measuring instruments
- Cross-float measurement for determining the effective area of a piston-cylinder system
- Complete, stand-alone system, also suitable for on-site use

## Special features

- Total measurement uncertainty to 0.002 % of reading, depending on model
- COFRAC calibration certificate included as standard
- Available up to 1,000 bar (14,500 psi) pneumatic and 5,000 bar (72,500 psi) hydraulic
- 15 different piston-cylinder sizes available



Primary standard pressure balance, model CPB6000-HL

## Description

### Reference primary standards

Pressure balances are high-precision fundamental pressure standards that define the derived unit of pressure directly from the fundamental units of mass, length and time following the formula  $p = F/A$ .

The direct measurement of the pressure with a pressure balance, combined with the know-how of Desgranges & Huot, guarantees the best metrological specifications on the market.

- High-quality piston-cylinder systems (high floating time and long-term stability)
- Cast aluminium case and robust components (minimum maintenance and overhaul services)

This type of pressure balance has been successfully tested by national institutes, calibration laboratories and in many industrial applications.

### Functionality

There are five variants in the CPB6000 product family, which reflect a concerted long-term effort to offer the user a broad range of choice in selecting a standard suited best to current and future requirements.

The pressure balances of the CPB6000 series are applicable in a very wide variety of pressure calibration and measurement tasks. Appropriate configurations are available for use in primary standards laboratories and as reference instruments on the shop floor.

## The instrument base

The instrument base for the CPB6000 series is available in five variants:

### CPB6000-PL (pneumatic - low pressure)

This is a pressure standard operated with pure gas for high-precision metrology applications. This pressure balance uses very large area piston-cylinder systems to measure low gas pressure up to 20 bar (290 psi) with very high resolution down to 0.01 Pa.

### CPB6000-PX (pneumatic - high pressure)

This is a gas\*-operated pressure balance with liquid-lubricated piston-cylinder systems covering a range of 0.2 ... 800 bar (2.9 ... 11,600 psi) in the standard version (optionally also 1,000 bar (14,500 psi)).

Model CPB6000-PX is intended for use with any non-corrosive gas as the test medium. Their use is simpler and faster than only gas-lubricated pressure balances or the combination of oil-operated pressure balances and separators. Liquid lubrication eliminates the operational problems associated with gas-operated pistons without compromising metrological performance.

\*CPB6000-PX is also available for oxygen-compatible applications

### CPB6000-HL (hydraulic - range up to 1,500 bar (21,750 psi))

This is an oil-operated pressure balance for the range of 0.2 ... 1,500 bar (290 ... 21,750 psi). The model CPB6000-HL is intended for use with oil as the pressure transmission medium. Oil operation is the fastest and easiest way to use pressure balances. The possibility to separate oil/air or oil/water using a separator with a sight glass enables calibrations using other media. The model CPB6000-HL can drive dividers and multipliers, making it an excellent starting point in the configuration of an overall calibration system from vacuum to 10,000 bar (145,000 psi).

### CPB6000-HX (hydraulic – range up to 5,000 bar (72,500 psi))

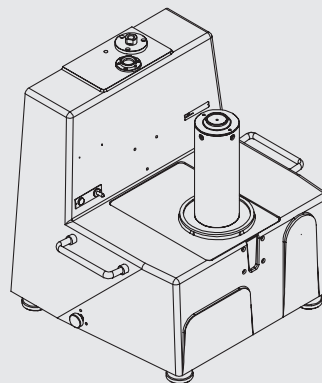
This oil-operated pressure balance operates on the same working principle as model CPB6000-HL, with the exception that model CPB6000-HX has a 5:1 pressure intensifier, enabling it to cover the range from 5 ... 5,000 bar (72.5 ... 72,500 psi).

### CPB6000-HS (hydraulic with built-in separator)

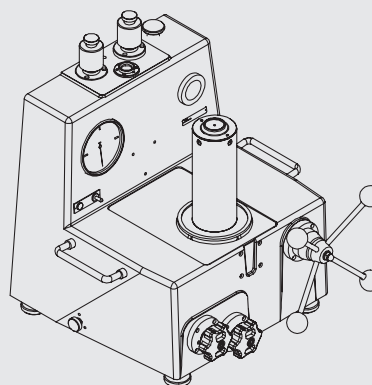
This is an oil-operated pressure balance (same functional principle as model CPB6000-HL) to cover ranges up to 1,000 bar (14,500 psi). These instruments are fitted with an oil/water or oil/gas separator, whereby, in an oil pressure balance, it is possible to operate with gas or water. The model CPB6000-HS has been specifically developed for gas companies performing pipeline testing.

As a further variant of the CPB6000-HS, a model with built-in variable volume is available. This pressure balance can perform hydraulic and pneumatic calibrations using a single instrument.

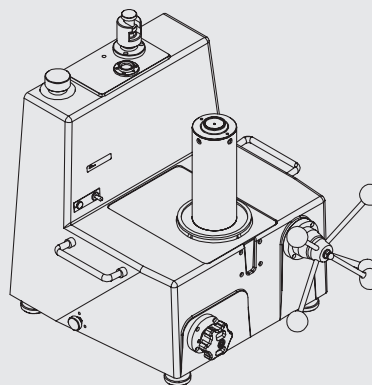
Model CPB6000-PL



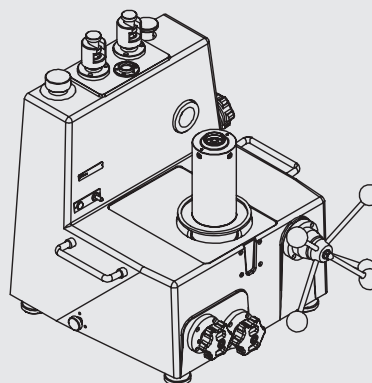
Model CPB6000-PX



Models CPB6000-HL and CPB6000-HX



Model CPB6000-HS



## General assembly

### A pressure balance designed for high accuracy, long service life and optimum safety

Every individual component of the CPB6000 pressure balances series has been thoroughly evaluated to assure that their use is practical, safe and reliable over many years of operation. Controls are built-in to a compact, specially designed light alloy case that protects the operator from pressurized components and provides a rigid and stable base for the mounting of piston-cylinder systems and mass set.

Each model is presented as a complete, self-contained instrument that requires minimal bench space and is easily movable.

Components such as valves, volume adjusters, pumps and reservoirs have been designed, manufactured and tested to the stringent requirements of use in a high-precision pressure standard.

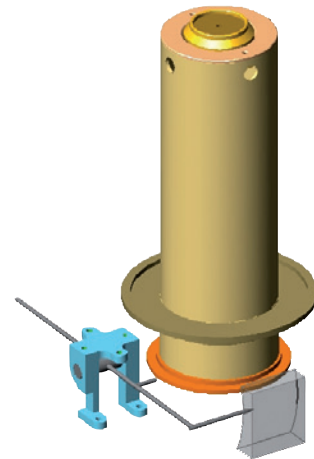
Dead volumes are kept to an absolute minimum. Internal tubing are  $\frac{1}{4}$ " O.D. seamless stainless steel and threaded fittings are used throughout. All tubing connects to a sump, in which liquid and solid impurities coming from the test item drop out, can be purged periodically.

The connection technology between the standard and the test item are made by leak-free hand-tightened quick connectors that use a pressure-activated seal. All controls are easily accessible and clearly labelled. The standard's reference level is identified by a label on the front of the case. A platinum resistance thermometer is built-in to each instrument to monitor piston temperature.

#### Piston displacement and position monitoring

When the standard is used with the mass carrier for the mass set, the piston position is monitored and displayed by a pointer. This is fitted onto the end of a lever on a fulcrum. The lever's movement multiplies the indication of the piston's movement by a factor of 4. The operator is aware of the precise piston position and displacement at all times, without having to directly observe mass position relative to a marked reference point.

As an option, electronic monitoring of piston position and displacement is available. Piston position is displayed on an analogue meter (with 5 or 25 times multiplication) on the front panel of a separate electronic module which can be placed at a location remote from the standard.



#### Piston displacement and position monitoring

##### Piston rotation

For a piston-cylinder system to perform its role effectively, the piston must rotate in the cylinder. Piston rotation is maintained by means of a motor, an oval drive and drive pulley fitted with a rotation pin. Due to the oval drive, the pulley is alternately accelerating and decelerating. The piston only receives an impulse when it has slowed down enough of the rotation pin to catch it. The piston is almost always rotating completely freely at the optimum mean speed (around 30 U/min.).

The drive motor is a squirrel cage motor that can be left on all times. The automatic rotation system is set to rotate the piston in a counter clockwise direction. Piston and cylinder manufacturing techniques result in piston-cylinder systems upon which the direction of rotation has no significant effect. If rotation by hand is desired the rotation pin can easily be removed.

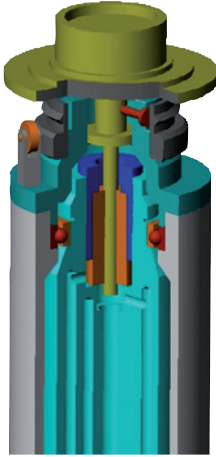
##### Piston orientation

In order of the force acting on the piston to be properly calculated the piston must be vertical. For this reason, each instrument is provided with a precision level and levelling feet.

## Assembly of the piston-cylinder system

### Protecting the piston

In order to avoid risk of interference with the piston's vertical mobility, the masses must be loaded directly onto the piston.



### Assembly of the piston-cylinder system

This is accomplished by loading the masses onto a mass carrier that rests directly on a plate into which the piston is fitted. When the piston is floating, the piston and the masses are completely free and there is no possibility of unintended friction or interference with their free movement.

When the piston is at the bottom of its stroke the piston plate rests on the drive pulley and rotates with it. When the piston is at the top of its stroke, the piston plate's movement is arrested by three travel limit pins that are set into the pulley. In either position, even if the motor is on and the piston is rotating, there is no friction point.

Maximum mass can be loaded with no pressure applied or maximum pressure can be applied with no masses without risk of damage to the instrument or injury to the operator.

### Lubrication mode

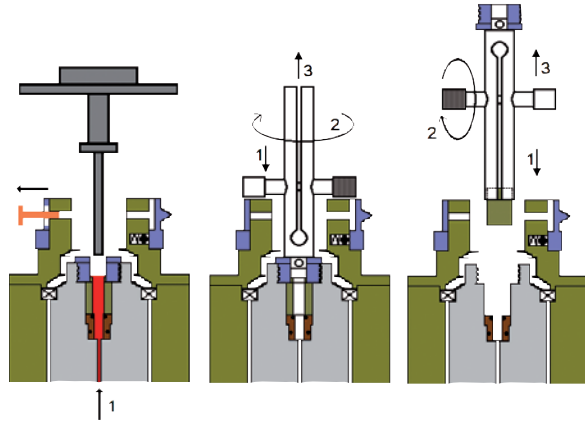
There are two main types of measuring arrangements:

- Free deformation mode
- "Re-entrant" mode

The "Re-entrant" measuring arrangement accepts piston-cylinder systems with nominal diameter of 1.6 ... 11.2 mm (0.06 ... 0.44 in). The maximum working pressure of this measuring arrangement is 1,500 bar (21,750 psi). However, the "free deformation" measuring arrangement accepts pistons of 1.6 ... 5 mm (0.06 ... 0.2 in) and can be operated up to 5,000 bar (72,500 psi) with the CPB6000-HX pressure balance.

### Interchangeability of piston-cylinder systems

Numerous interchangeable piston-cylinder systems are available for each CPB6000 model, making it possible to cover multiple ranges with a single instrument. In all cases, changing the piston-cylinder systems requires no major disassembly work. The only tool used is a special tool supplied with the standard. The maximum time required to change a piston-cylinder system is less than 1 minute.



### Exchanging the piston-cylinder system

### Kn conversion factor

#### What is the Kn factor?

All piston-cylinder systems and mass sets for the CPB6000 pressure balance series are designed for a nominal mass-force conversion coefficient,  $K_n$ . The nominal effective area of such a piston-cylinder size is such that, under standard conditions, the piston with a mass of 1 kg will generate a pressure equivalent to the  $K_n$  value.

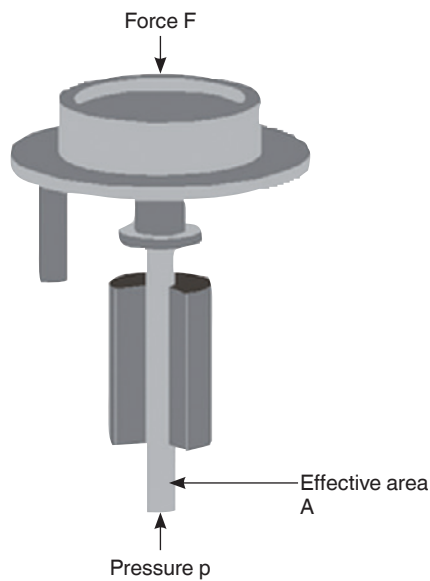
All mass values, including the mass of the piston and of the mass carrier with masses loaded are adjusted to be a whole number or fraction of 1 kg.

The nominal pressure defined for any model CPB6000 is calculated as  $K_n$  multiplied by the mass loaded in kg. Corrections are applied to  $K_n$  to calculate the pressure defined within the accuracy tolerance of the model CPB6000 used.

The use of  $K_n$  and whole number masses in no way affects the traditional pressure equation or the factors that affect a pressure measurement made with a pressure balance.  $K_n$  is the basis of a coherent relationship between mass, effective area and pressure throughout the CPB6000 series. It is intended as a tool that reduces operator confusion and errors by simplifying the calculation of mass sets and measured pressures.

### The piston cylinder - "heart of the system"

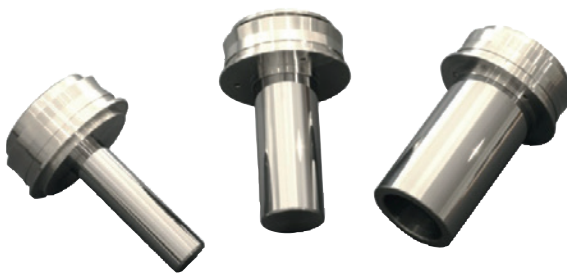
The piston-cylinder system is the heart of the pressure balance and the key to its performance.



The basic principle of piston-cylinder systems is  $p = F/A$

### Multiple sizes

There are 15 different sizes of CPB6000 piston cylinders in diameter ranges between 1.6 ... 35.3 mm (0.06 ... 1.39 in). These size ranges include the largest and the smallest diameters that are available for high-precision pressure balances. The benefit is that, from a wide range of sizes, it is possible to select the one which is suited best for the desired pressure range and further requirements. Small diameters provide a high pressure to mass ratio which saves the user from having to manipulate excessive amounts of masses and helps to miniaturize the overall system.



### Different piston-cylinder systems

#### Materials and machining

In most cases, both piston and cylinder are made of tungsten carbide which is both extremely hard and wear-resistant. Tungsten carbide has an E modulus of approx.  $6 \times 10^{11} \text{ N/m}^2$  and a linear thermal expansion coefficient of  $4.5 \times 10^{-6}/^\circ\text{C}$ . Deformation due to pressure is very low and the effect of temperature is small.

The homogeneity of tungsten carbide permits ultra-precise finishing of the piston-cylinder system. Deviation from ideal geometry is generally less than 0.1 micron (4 micro inches). The radial clearance between piston and cylinder can be controlled very closely and varied from about 0.2 ... 1 micron (8 ... 40 micro inches) depending on the clearance required to achieve optimum performance. The smaller diameter pistons are also available in special tool steel with minimal effect on performance, since the most active element is the cylinder, which is always in tungsten carbide.

#### Operating modes

There are three types of CPB6000 piston-cylinder systems. The largest diameter (lowest range) piston-cylinder systems are intended for pneumatic operation and are used with gas lubrication in the space between the piston and the cylinder in the model CPB6000-PL. Piston-cylinder systems of  $K_n = 1 \text{ bar/kg}$  and above exist in two versions: Version 1 is intended for pneumatic operation with liquid lubrication with model CPB6000-PX pressure balances. Version 2 is intended for hydraulic operation with the model CPB6000-HL and CPB6000-HX pressure balances. The piston-cylinder systems for pneumatic operation with liquid lubrication have a groove set into the inner bore to which liquid is supplied through two radial holes.

All piston types and piston plate assemblies for the CPB6000 instruments are tuned to a mass of 200 g.

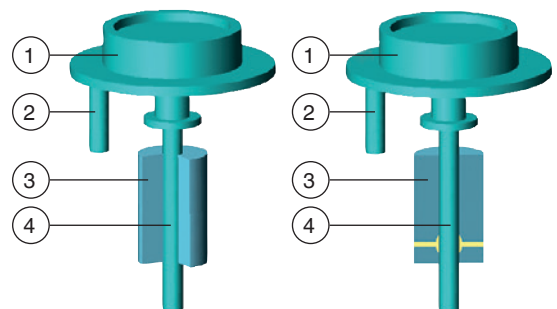


Fig. left: Oil-operated piston-cylinder system  
Fig. right: Gas-operated, liquid-lubricated piston-cylinder system

- ① Piston head
- ② Rotation pin
- ③ Cylinder
- ④ Piston



## The mass set

Nine different mass sets are available for the CPB6000 series, in ranges from 20 ... 100 kg. The masses are machined out of 304L non-magnetic stainless steel. All individual masses are whole numbers or fractions of 1 kg and are adjusted to their nominal values within the tolerance of their accuracy class. The different accuracy classes are so defined as is needed to achieve specific accurate nominal values under pressure. Each mass set is supplied in a sturdy and appropriate cabinet that can be easily transported.

### The kilogram

The unit of masses used is always the kilogram because the kilogram is the SI unit and the national and international standard for mass from which all other masses units are derived. The kilogram also offers the convenience of being based on the decimal system, which facilitates mass totalling and data reduction.

### Adjustment and interchangeability

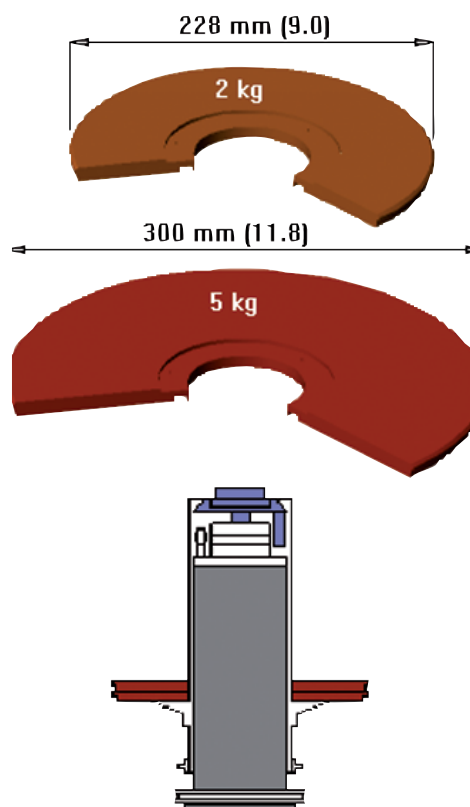
Adjusting each mass to its nominal value within the tolerance of its accuracy class allows complete mass interchangeability within one set as well as among different sets. Piston-cylinder systems are not married to specific mass sets. The masses do not need to be loaded in a prescribed sequence. Furthermore, it is not necessary to calculate the masses in a complex way using different mass values for each mass. Whole number masses are much easier to verify and recalibrate than odd values. The advantages of adjusted masses are great and their use never significantly compromises the accuracy ultimately achieved under pressure.

### Mass set configuration

All mass sets include a number of main masses of 2 or 5 kg as well as 1 kg and fractions of a kilogram down to 0.01 g. All pistons have a mass of 200 g and all mass carriers have a mass of 800 g. The minimum load is thus 200 g and the piston loaded with the mass carrier have a mass of 1 kg. A 5, 4, 2, 1 progression of mass values is used, making it possible to load any value desired with a resolution of down to 0.01 g at any point in the range. Each mass is identified with the mass set serial number as well as with an individual number within the set.

### Mass loading

The 5, 2 and 1 kg masses are discs with a central hole which are loaded onto a mass carrier. The smaller mass loads are loaded onto the piston plate. The majority of the load is therefore below the centre of gravity of the piston and the entire load is well centred on the vertical axis of the piston-cylinder system.



### Main masses of the CPB6000 mass sets

#### Standard composition and custom sets

The composition of the standard CPB6000 mass sets does not include the piston assembly (200 g) and the mass carrier (800 g). Individual masses can be added to a mass set at any time. If so desired, a unique custom mass set may be composed from standard masses.

#### Reference mass sets

Reference mass sets made up of solid polished masses of the same shape and materials as CPB6000 masses can be supplied. These are convenient as in-house standards for local verification or recalibration of CPB6000 mass sets.

Mass set combinations with the quantity of weights					
Weights	Mass set				
	40 kg	50 kg	60 kg	80 kg	100 kg
5 kg	-	8	10	14	18
4 kg	-	1	1	1	1
2 kg	19	2	2	2	2
1 kg	1	1	1	1	1
0.5 kg	1	1	1	1	1
0.2 kg	2	2	2	2	2
0.1 kg	1	1	1	1	1

### Pressure profile

The configuration of the mass sets allows a binary progression

- First measuring point: piston
- Second measuring point: piston + mass carrier
- Then any point up to full scale with a resolution of 100 mg

## CPB6000 variants and available pressure ranges

### Pneumatic pressure balance for pure gas, model CPB6000-PL

Pressure range: up to 20 bar (290 psi)

Mass set: up to 100 kg

Available pressure ranges in bar						
Piston-cylinder system Kn	First measuring point [bar]	Complete mass set in kg				
		40	50	60	80	100
		Maximum pressure in bar				
0.1 bar/kg	0.05	4	5	6	8	10
0.2 bar/kg	0.1	8	10	12	16	20

Correspondence mass [kg] / pressure [bar]											
Piston-cylinder system Kn	First measuring point [bar]	Individual weight in kg							Piston	Mass carrier	Unit
		5	4	2	1	0.5	0.2	0.1			
0.1 bar/kg	0.05	0.5	0.4	0.2	0.1	0.05	0.02	0.01	0.05	0.15	bar
0.2 bar/kg	0.1	1	0.8	0.4	0.2	0.1	0.04	0.02	0.1	0.3	bar

## Pneumatic pressure balance with oil lubrication, model CPB6000-PX

Pressure range: up to 1,000 bar (14,500 psi)

Mass set: up to 80 kg

Available pressure ranges in bar					
Piston-cylinder system Kn	First measuring point [bar]	Complete mass set in kg			
		40	50	60	80
		Maximum pressure in bar			
1 bar/kg	0.2	40	50	60	80
2 bar/kg	0.4	80	100	120	160
5 bar/kg	1	200	250	300	400
10 bar/kg	2	400	500	600	800
20 bar/kg	4	800	1,000	-	-

Correspondence mass [kg] / pressure [bar]											
Piston-cylinder system Kn	First measuring point [bar]	Individual weight in kg							Piston	Mass carrier	Unit
		5	4	2	1	0.5	0.2	0.1			
1 bar/kg	0.2	5	4	2	1	0.5	0.2	0.1	0.2	0.8	bar
2 bar/kg	0.4	10	8	4	2	1	0.4	0.2	0.4	1.6	bar
5 bar/kg	1	25	20	10	5	2.5	1	0.5	1	4	bar
10 bar/kg	2	50	40	20	10	5	2	1	2	8	bar
20 bar/kg	4	100	80	40	20	10	4	2	4	16	bar

Available pressure ranges in psi					
Piston-cylinder system Kn	First measuring point [psi]	Complete mass set in kg			
		40	50	60	80
		Maximum pressure in psi			
50 psi/kg	10	2,000	2,500	3,000	4,000
100 psi/kg	20	4,000	5,000	6,000	8,000
200 psi/kg	40	8,000	10,000	12,000	-

Correspondence mass [kg] / pressure [psi]											
Piston-cylinder system Kn	First measuring point [psi]	Individual weight in kg							Piston	Mass carrier	Unit
		5	4	2	1	0.5	0.2	0.1			
50 psi/kg	10	250	200	100	50	25	10	5	10	40	psi
100 psi/kg	20	500	400	200	100	50	20	10	20	80	psi
200 psi/kg	40	1,000	800	400	200	100	40	20	40	160	psi



## Hydraulic pressure balances, models CPB6000-HL and CPB6000-HX

### Model CPB6000-HL

Pressure range: up to 1,500 bar (21,750 psi)

Mass set: up to 100 kg

### Model CPB6000-HX

Pressure range: up to 5,000 bar (72,500 psi)

Mass set: up to 100 kg

Available pressure ranges in bar						
Piston-cylinder system Kn	First measuring point [bar]	Complete mass set in kg				
		40	50	60	80	100
		Maximum pressure in bar				
5 bar/kg	1	200	250	300	400	500
10 bar/kg	2	400	500	600	800	1,000
20 bar/kg	4	800	1,000	1,200	1,600	2,000
50 bar/kg	10	2,000	2,500	3,000	4,000	5,000

Correspondence mass [kg] / pressure [bar]												
Piston-cylinder system Kn	First measuring point [bar]	Individual weight in kg							Piston	Mass carrier	Unit	
		5	4	2	1	0.5	0.2	0.1				
5 bar/kg	1	25	20	10	5	2.5	1	0.5	1	4	bar	
10 bar/kg	2	50	40	20	10	5	2	1	2	8	bar	
20 bar/kg	4	100	80	40	20	10	4	2	4	16	bar	
50 bar/kg	10	250	200	100	50	25	10	5	10	40	bar	

Available pressure ranges in psi						
Piston-cylinder system Kn	First measuring point [psi]	Complete mass set in kg				
		40	50	60	80	100
		Maximum pressure in psi				
100 psi/kg	20	4,000	5,000	6,000	8,000	10,000
200 psi/kg	40	8,000	10,000	12,000	16,000	20,000
250 psi/kg	50	10,000	12,500	15,000	20,000	25,000
300 psi/kg	60	12,000	15,000	18,000	24,000	30,000
500 psi/kg	100	20,000	25,000	30,000	40,000	50,000

Correspondence mass [kg] / pressure [psi]												
Piston-cylinder system Kn	First measuring point [psi]	Individual weight in kg							Piston	Mass carrier	Unit	
		5	4	2	1	0.5	0.2	0.1				
100 psi/kg	20	500	400	200	100	50	20	10	20	80	psi	
200 psi/kg	40	1,000	800	400	200	100	40	20	40	160	psi	
250 psi/kg	50	1,250	1,000	500	250	125	50	25	50	200	psi	
300 psi/kg	60	1,500	1,200	600	300	150	60	30	60	240	psi	
500 psi/kg	100	2,500	2,000	1,000	500	250	100	50	100	400	psi	

## Hydraulic pressure balance with integrated oil/water separator, model CPB6000-HS

Especially designed for pipeline testing

Pressure range: up to 1,000 bar (14,500 psi)

Mass set: up to 80 kg

Available pressure ranges in bar					
Piston-cylinder system Kn	First measuring point [bar]	Complete mass set in kg			
		40	50	60	80
		Maximum pressure in bar			
5 bar/kg	1	200	250	300	400
10 bar/kg	2	400	500	600	800
20 bar/kg	4	800	1,000	-	-

Correspondence mass [kg] / pressure [bar]											
Piston-cylinder system Kn	First measuring point [bar]	Individual weight in kg							Piston	Mass carrier	Unit
		5	4	2	1	0.5	0.2	0.1			
5 bar/kg	1	25	20	10	5	2.5	1	0.5	1	4	bar
10 bar/kg	2	50	40	20	10	5	2	1	2	8	bar
20 bar/kg	4	100	80	40	20	10	4	2	4	16	bar

### Available on demand

- CPB6000 series with integrated oil/water separator (for hydraulic and pneumatic calibrations with a single pressure balance)
- Other piston-cylinder assemblies for CPB6000 hydraulic series: 1 bar/kg and 2 bar/kg ("Re-entrant" measuring arrangement)

## Specifications Series CPB6000

Model	CPB6000-PL	CPB6000-PX	CPB6000-HL	CPB6000-HX	CPB6000-HS
<b>Pressure transmission medium</b>	Dry clean air or nitrogen		Hydraulic fluid: Sebacate as standard		Univis J13
<b>Lubricant</b>	Dry clean air or nitrogen	Drosera™ oil or Krytox™ if oxygen compatibility required	Hydraulic fluid: Sebacate as standard		Univis J13
<b>Material</b>					
Piston	Tungsten carbide; for 50 bar/kg and 500 psi/kg from special stainless steel				
Cylinder	Tungsten carbide				
Mass set	304L non-magnetic stainless steel				
Mass carrier	304L non-magnetic stainless steel				
<b>Weight</b>					
Base	18 kg (39.7 lbs)	27 kg (59.5 lbs)	26 kg (57.3 lbs)	33 kg (72.8 lbs)	27 kg (59.5 lbs)
100 kg mass set + piston-cylinder system	134 kg (295.5 lbs)				
80 kg mass set + piston-cylinder system	114 kg (251.4 lbs)				
60 kg mass set + piston-cylinder system	89 kg (196.2 lbs)				
50 kg mass set + piston-cylinder system	71 kg (156.6 lbs), with 5 kg (11 lbs) main masses				
40 kg mass set + piston-cylinder system	52 kg (114.7 lbs), with 2 kg (4.4 lbs) main masses				
<b>Dimensions (W x D x H)</b>	410 x 420 x 460 mm (16.2 x 16.5 x 18,1 in)	410 x 500 x 510 mm (16.2 x 19.7 x 20.1 in)			

<b>Precision</b>		
Typical precision of reading <sup>1)</sup> (in 1.0E <sup>-6</sup> x P (ppm))	Piston-cylinder system	Usable medium
5	0.1 bar/kg or 0.01 MPa/kg	Pure gas
5	0.2 bar/kg or 0.02 MPa/kg	Pure gas
10	1 bar/kg or 0.1 MPa/kg	Gas, oil-lubricated
10	20 psi/kg	Gas, oil-lubricated
10 / 5	2 bar/kg or 0.2 MPa/kg	Gas, oil-lubricated
10 / 5	50 psi/kg	Gas, oil-lubricated
5	5 bar/kg or 0.5 MPa/kg	Gas, oil-lubricated
5	100 psi/kg	Gas, oil-lubricated
10 / 5	10 bar/kg or 1 MPa/kg	Gas, oil-lubricated
10 / 5	200 psi/kg	Gas, oil-lubricated
10	250 psi/kg	Oil only
10	20 bar/kg or 2 MPa/kg	Oil only
10	300 psi/kg	Oil only
15	500 psi/kg	Oil only
15	50 bar/kg or 5 MPa/kg	Oil only

<sup>1)</sup> Precision is the result of  $\sqrt{(\text{Repeatability}^2 + \text{Resolution}^2 + \text{Linearity}^2 + \text{Hysteresis}^2)}$  and is expressed in % of reading

## CE conformity and certificates

### CE conformity

Pressure equipment directive	97/23/EC (module A)
<b>Certificate</b>	
Calibration	COFRAC calibration certificate Option: LNE/PTB calibration certificate
Recommended recalibration interval	5 years (dependent on conditions of use)

## Transport dimensions for complete instrument

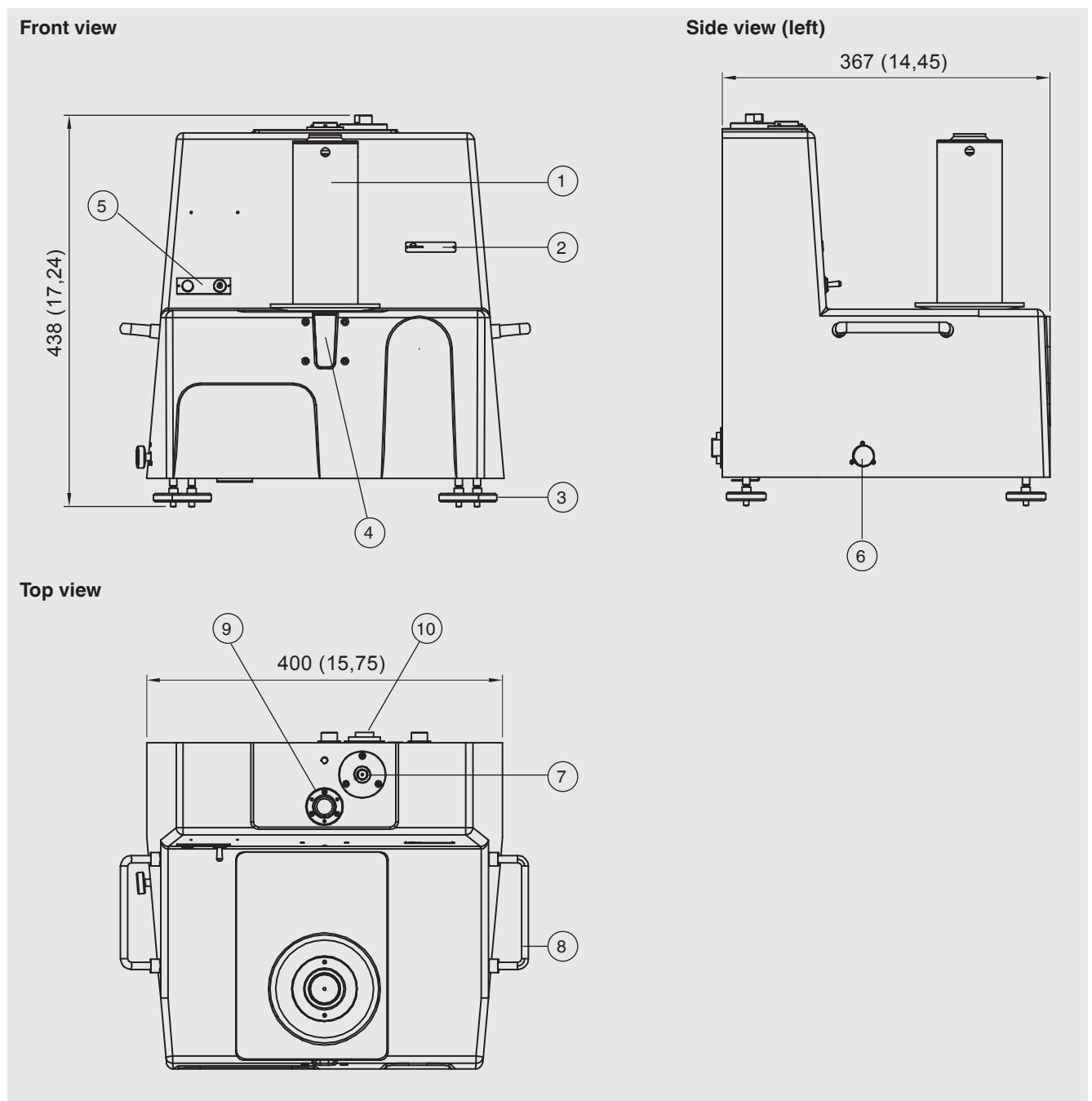
The complete instrument, in its standard version and standard scope of delivery, consists of one package for the instrument base and up to three packages for the mass sets with the following dimensions and weights, depending on the version.

Box with base and standard accessories Dimensions: 650 x 625 x 730 mm (25.6 x 24.6 x 28.7 in)		
Instrument base	Weight	
Model	net	gross
CPB6000-PL	24 kg (52.9 lbs)	51 kg (112.5 lbs)
CPB6000-PX	33 kg (72.8 lbs)	54 kg (119.1 lbs)
CPB6000-HL	32 kg (70.6 lbs)	53 kg (116.9 lbs)
CPB6000-HX	39 kg (86.0 lbs)	59 kg (130.1 lbs)
CPB6000-HS	33 kg (72.8 lbs)	54 kg (119.1 lbs)

Mass set	Box with mass set Dimensions: 515 x 505 x 565 mm (20.3 x 19.9 x 22.5 in)		Box with mass set Dimensions: 555 x 440 x 480 mm (21.9 x 17.3 x 18.9 in)		Box with mass set Dimensions: 760 x 420 x 470 mm (29.9 x 16.5 x 18.5 in)			
	Weight		Weight		Weight			
Version	net	gross	net	gross	net	gross	net	gross
100 kg mass set	57 kg (125.7 lbs)	69 kg (152.1 lbs)	63 kg (138.9 lbs)	75 kg (165.4 lbs)	14 kg (30.9 lbs)	26 kg (57.3 lbs)	-	-
80 kg mass set	37 kg (81.6 lbs)	49 kg (108 lbs)	63 kg (138.9 lbs)	75 kg (165.4 lbs)	14 kg (30.9 lbs)	26 kg (57.3 lbs)	-	-
60 kg mass set	42 kg (92.6 lbs)	54 kg (119.1 lbs)	33 kg (72.8 lbs)	45 kg (99.2 lbs)	14 kg (30.9 lbs)	26 kg (57.3 lbs)	-	-
50 kg mass set	57 kg (125.7 lbs)	69 kg (152.1 lbs)	-	-	14 kg (30.9 lbs)	26 kg (57.3 lbs)	-	-
40 kg mass set	-	-	-	-	-	-	52 kg (114.7 lbs)	64 kg (141.1 lbs)

## Dimensions in mm (in)

### Model CPB6000-PL

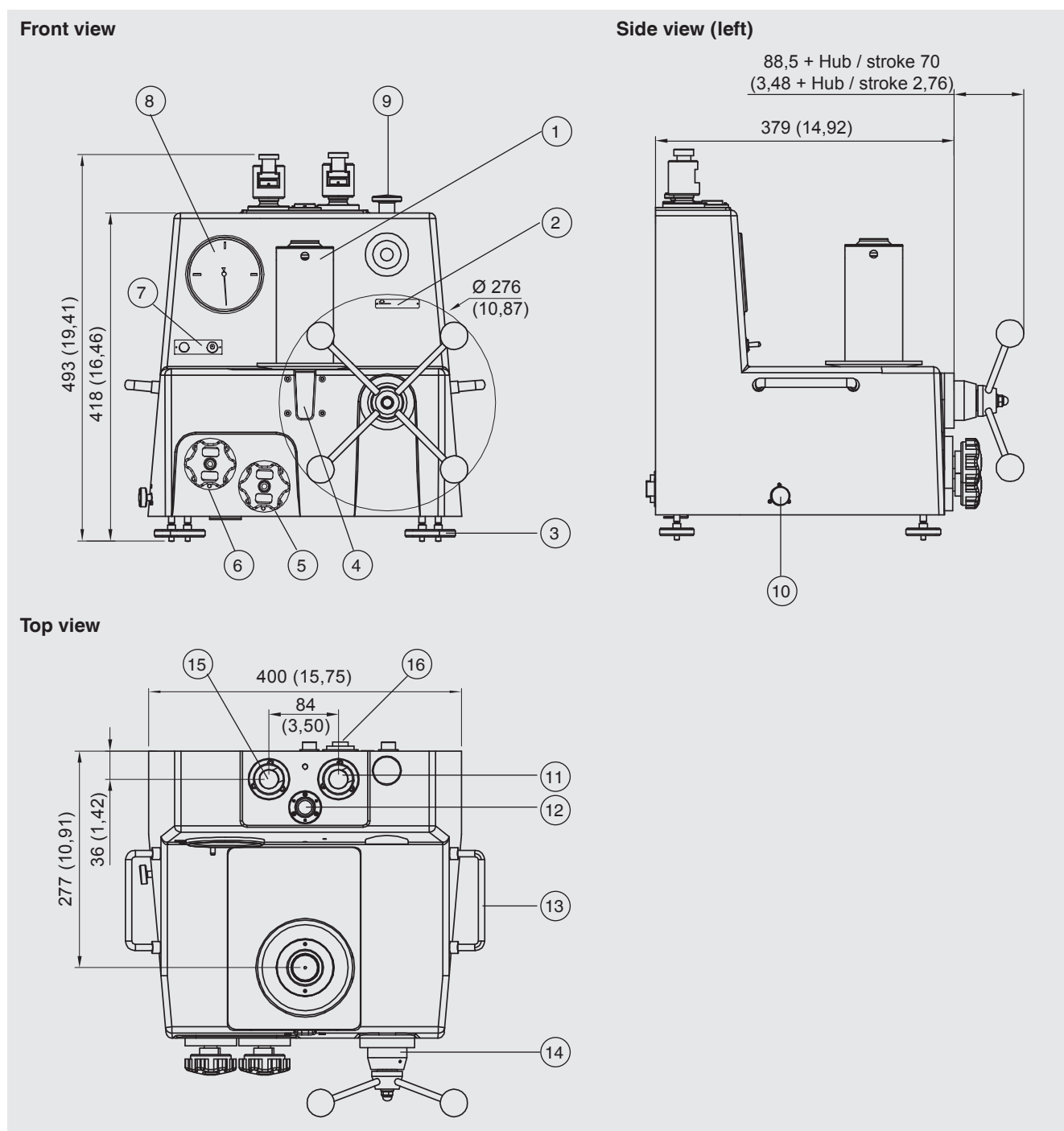


- ① Piston-cylinder system incl. mass carrier
- ② Reference level
- ③ Feet for alignment
- ④ Window for the piston position display
- ⑤ Motor on/off switch
- ⑥ Sump drain cock

- ⑦ Pressure connection
- ⑧ Carrying handle
- ⑨ Level
- ⑩ Electrical connections for piston position display, power supply and temperature sensor

## Dimensions in mm (in)

### Model CPB6000-PX



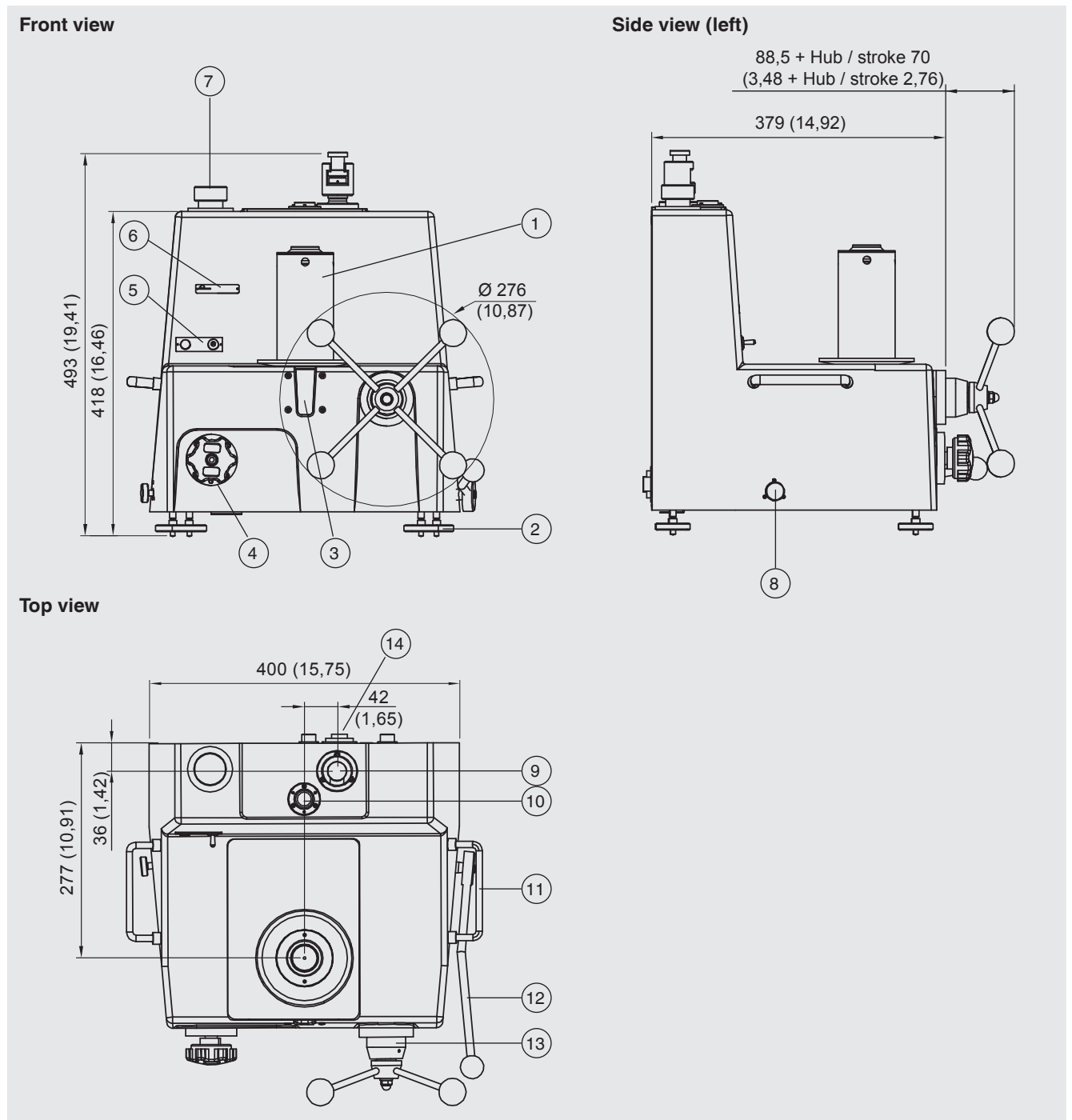
- ① Piston-cylinder system incl. mass carrier
- ② Reference level
- ③ Feet for alignment
- ④ Window for the piston position display
- ⑤ Gas outlet valve
- ⑥ Gas inlet valve
- ⑦ Motor on/off switch
- ⑧ Pressure indication

- ⑨ Reservoir cover
- ⑩ Sump drain cock
- ⑪ Test item connection
- ⑫ Level
- ⑬ Carrying handle
- ⑭ Variable volume
- ⑮ Inlet pressure connection
- ⑯ Electrical connections for piston position display, power supply and temperature sensor



## Dimensions in mm (in)

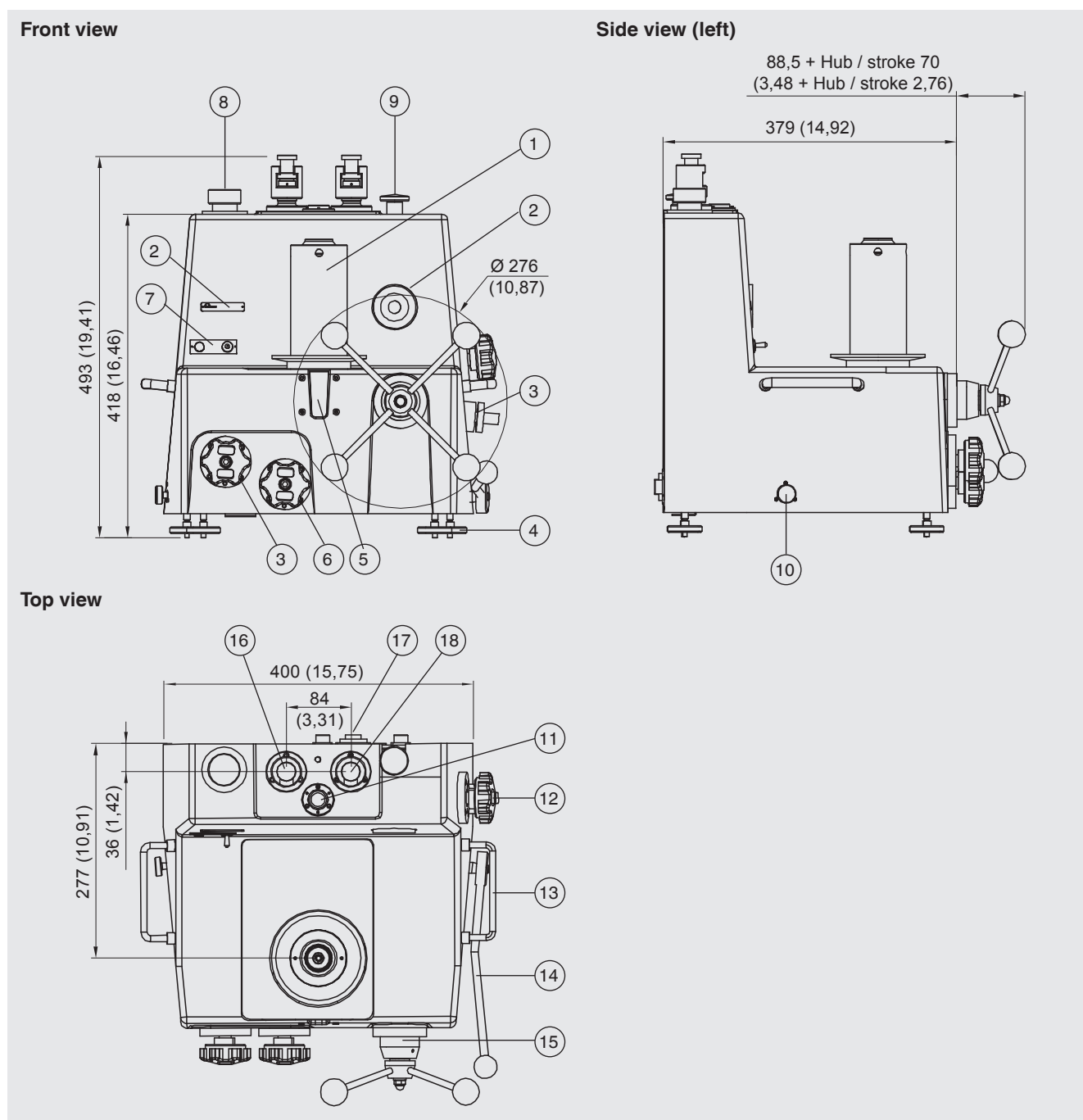
### Model CPB6000-HL



- |   |   |
|---|---|
| ① Piston-cylinder system incl. mass carrier | ⑨ Test item connection  |
| ② Feet for alignment                        | ⑩ Level   |
| ③ Window for the piston position display    | ⑪ Carrying handle   |
| ④ Shut-off valve for reservoir              | ⑫ Priming pump  |
| ⑤ Motor on/off switch                       | ⑬ Variable volume/Spindle pump  |
| ⑥ Reference level                           | ⑭ Electrical connections for piston position display, power supply and temperature sensor |
| ⑦ Oil reservoir cover                       |   |
| ⑧ Sump drain cock                           |   |

## Dimensions in mm (in)

### Models CPB6000-HX and CPB6000-HS



- |   |  |
|---|--|
| ① Piston-cylinder system incl. mass carrier   | ⑩ Sump drain cock  |
| ② Reference level   | ⑪ Level  |
| ③ Reservoir shut-off valve (-HS)<br>High-pressure shut-off valve (-HX)              | ⑫ Shut-off valve for water as test medium (-HS)<br>Reservoir shut-off valve (-HX)            |
| ④ Feet for alignment  | ⑬ Carrying handle  |
| ⑤ Window for the piston position display  | ⑭ Priming pump (only with -HX)   |
| ⑥ Shut-off valve for oil/water separator (-HS)<br>Low-pressure shut-off valve (-HX) | ⑮ Variable volume for oil  |
| ⑦ Motor on/off switch   | ⑯ Oil connection head  |
| ⑧ Oil reservoir cover (9 with -HX)  | ⑰ Electrical connections for piston position display, power supply<br>and temperature sensor |
| ⑨ Oil/Water separator cover (only with -HS)   | ⑱ Water connection head (only with -HS)  |

## Accessories and special services

There is a complete line of accessories and related equipment for use with CPB6000 pressure balances available. These include hardware such as separators, gas boosters, tubing, fittings, quick-connectors, valves and manifolds. Complete multi-function calibration systems can be configured.

All accessories have been designed and manufactured by DH/WIKA or carefully selected from qualified suppliers specifically for use in high-quality pressure calibration systems.

WIKA welcome the opportunity to address your special requirements and to help ensure that your CPB6000 pressure balance is used to greatest advantage.

## Selection criteria

The user can choose a variety of configuration possibilities for the CPB6000 series of pressure balances for the wide range of applications.

A complete pressure balance is configured by selecting a instrument base, a mass set and at least one piston-cylinder system. Masses and piston-cylinder systems determine accuracy and can be upgraded, added or changed at any time. The most important decision is the selection of the base instrument or base instruments keeping in mind that mass sets and in many cases piston-cylinder systems can be used in more than one base instrument. The general information in the previous pages can direct one towards a particular series and the detail that follows should allow the selection of the most appropriate model or combination of models.



Accessories for CPB6000

### Careful consideration of the following factors will help the decision process:

- What are the most important selection criteria: accuracy, pressure range, media, convenience of operation, ruggedness, expandability, costs, other?
- What medium is preferred in most cases and what other media may be required?
- What are the pressure ranges of the instruments to be calibrated and what pressure range(s) is (are) needed to cover them adequately? What pressure ranges may be required in the future?
- In what environment will the system be operated?
- What are the qualifications of the system operator(s)?
- What accuracy is desired? What accuracy is needed now and may be required in the future?
- Would a CPB8000 automated pressure balance or a CPD8000 (digital pressure balance) be more suitable for this application?

The DH/WIKA customer service department is at your complete disposal and will do everything possible to assist you. Please do not hesitate to ask for a visit to your facility, a demonstration or a complete offer elaboration.

## Further pressure balances within our calibration technology programme

### Primary standard pressure balance for differential pressure, model CPB6000DP

#### Measuring ranges (= static pressure + differential pressure):

Pneumatic up to 800 bar (11,600 psi)

**Accuracy:** 0.005 % of reading  
up to 0.002 % of reading (optional)

For specifications see data sheet CT 32.02



Primary standard pressure balance for differential pressure, model CPB6000DP

### Automatic pressure balance, model CPB8000

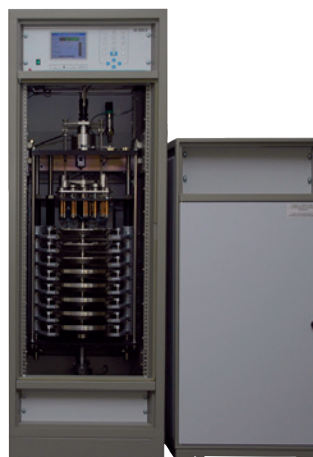
#### Measuring ranges:

Pneumatic up to 1,000 bar (14,500 psi)

Hydraulic up to 5,000 bar (72,500 psi)

**Accuracy:** 0.005 % of reading  
up to 0.003 % of reading (optional)

For specifications see data sheet CT 32.03



Automatic pressure balance, model CPB8000

### Digital pressure balance, model CPD8000

#### Measuring ranges:

Pneumatic up to 500 bar (7,250 psi)

**Accuracy:** 0.005 % of reading  
up to 0.002 % of reading (optional)

For specifications see data sheet CT 32.04



Digital pressure balance, model CPD8000

## Scope of delivery

### With pressure balance base

- 1 instrument base
- 1 spare drive belt
- 4 foot supports, P/N 37613
- 1 DH1500 threaded connection, P/N 40966
- 1 DH1500 blind plug, P/N 41009
- 1 mass carrier (long or short, depending on pressure balance model)
- 1 universal power supply unit with power cord
- 1 RTD output cable
- 1 pair of gloves
- 1 litre hydraulic fluid (depending on base type)
- 1 sealing set
- 1 mounting spanner for piston-cylinder assembly (excluding model CPB6000-PL)
- 1 DH1500 standard connector (with model CPB6000-PL, replaced by a pressure control unit)

### With piston-cylinder assembly

- Piston-cylinder assembly delivered in storage case
- COFRAC calibration certificate

### With mass set

- Mass set in series of storage boxes
- COFRAC calibration certificate for main weights
- Set of fine increment masses

## Options

- Separators
- Premium accuracy incl. LNE/PTB calibration certificate
- Pressure connections and pipes

## Ordering information

Model / Instrument version / Accuracy / Piston-cylinder system / Mass set / Terminal 5000 / Calibration for pressure balance / Additional ordering information

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