Heading 10

ARMANO

Calibration Technology

ARMANO Messtechnik GmbH

barotec® KALIBRIERTECHNIK

What is barotec® Kalibriertechnik?

The instruments of barotec® Kalibriertechnik (barotec® Calibration Technology) were developed for customers whose demands for accuracy, flexibility and speed are as high as our own standards. We thoroughly focused on applying proven and industrial mature technology, which meets all requirements from laboratory calibration to calibration in the series production.

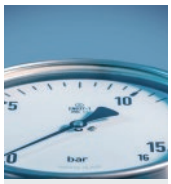
For the selection and assembling of the appropriate solution, the engineers and technicians of ARMANO Messtechnik GmbH can look back upon more than 120 years of tradition in the construction of measuring instruments.

In this brochure, you will find a selection of pressure measuring instruments especially for the calibration technology.

Your instrument is not listed here?
Jointly, we will find a suitable solution for your application.
Do not hesitate to contact us!

Model Overview	4
Calibration	5
Primary Standards	6
Precision Standards	8
Test Benches	11
Software	14
Accessories	15

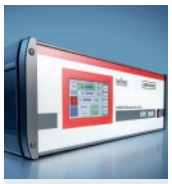
Our Products at a Glance



Mechanical Pressure Measurement

Electronic Pressure Measurement

Chemical Seal Mounting



Calibration Technology

Mechanical Temperature Measurement

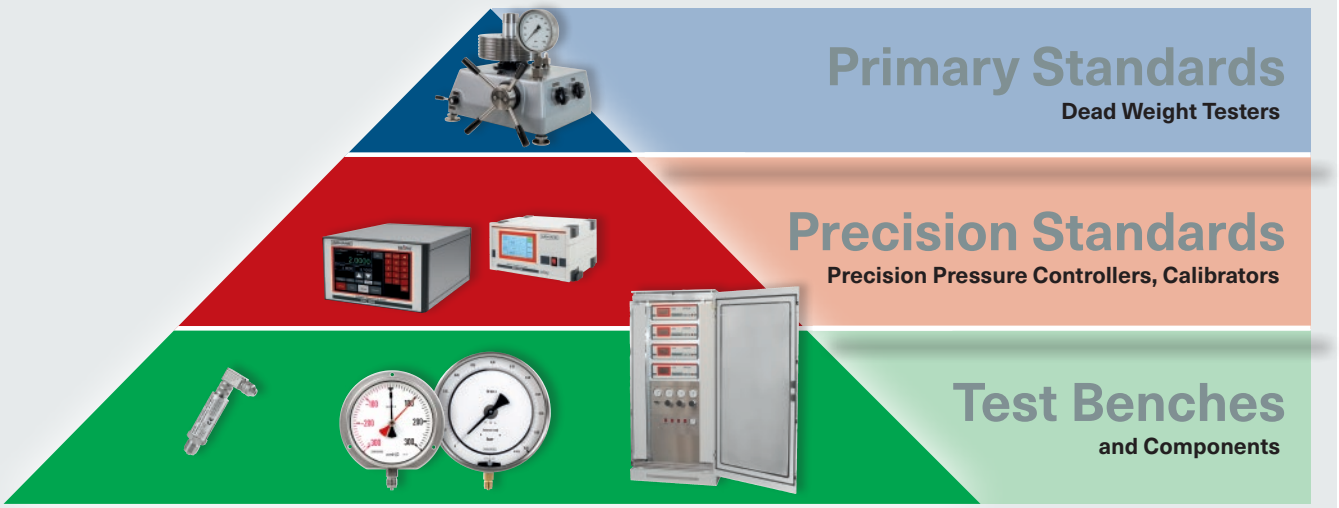
Electrical Temperature Measurement

Thermowells & Accessories

Our Pyramid of Calibration Technology

Precision is our Passion

For the precise, reproducible and comparable pressure measurement in laboratories or for high-quality industrial applications, the traceability of measuring instruments, test devices and standards to SI units is necessary. Here it is the customer's choice which range to cover. With the instruments on test bench level, the necessary calibration of the used pressure measuring instruments can be carried out, e.g. in periodic intervals. Calibrations of the test devices can be accomplished with the standards and transfer standards on the precision level and the primary level.



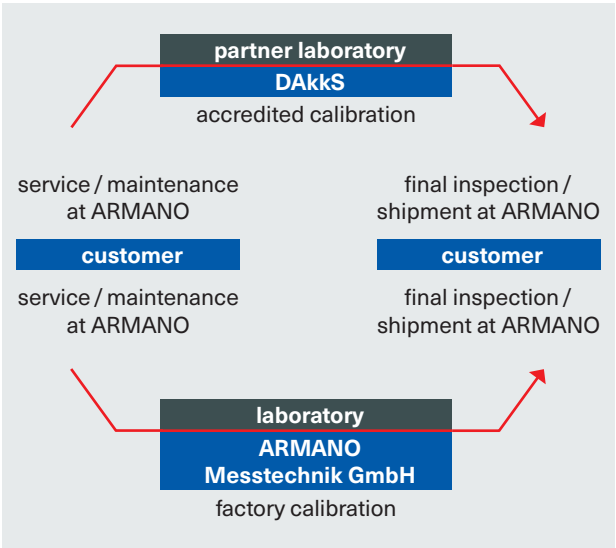
Certificates and Approvals

Our company is certified according to the highest quality standards and our product portfolio meets the highest quality demands. We do not only manufacture according to product-specific instrument standards, we also offer versions with special approvals for application areas with specific requirements.
The ARMANO Messtechnik GmbH is certified according to DIN EN ISO 9001.

Calibration Services

As manufacturer of precision pressure measuring instruments, we are your qualified partner for the calibration of your pressure standard. In addition to professional cleaning, maintenance and calibration, we also repair and alter your pressure standard.
For factory and ISO calibrations, our calibration laboratories in Wesel and Beierfeld are equipped with a wide range of primary standards, which are all traceable to national standards. Accredited calibrations are performed by corresponding partner laboratories on behalf of us.

Management of Factory and Accredited Calibrations



Factory Calibration

Dead Weight Testers

Dead weight testers are suitable for qualified testing, adjusting and calibrating of pressure measuring instruments. The main components are measuring system, set of weights, pressure generation, valve unit and pressure adjustment as well as a horizontally adjustable protective case. The measuring system consists of a fine lapped piston / cylinder pair.
The effective cross-section of the measuring piston is the pressurised area A of the definition p = F / A. With its weight force, the stainless steel set of weights generates the force F = m • g. Due to the fatigue-proof consistency of the set of weights, a reference of extremely high stability and reliability is guaranteed.

» Accuracy better 0.01 %

» Pressure ranges 0.3 mbar to 2500 bar

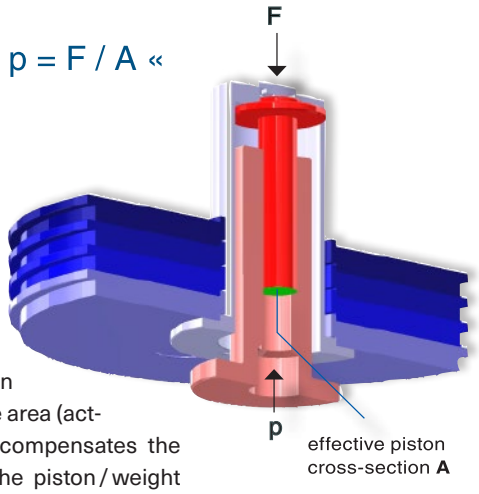
» Applications

- reference
- comparison standard
- calibration services
- gauging offices
- laboratories

		Portable Version	Pneumatic Version		
Model		**PD 1**	**PD 6**	**PD 10**	**PD 25**
Accuracy	factory calibration[1]	standard ±0.05 % enhanced ±0.02 %	standard ±0.05 %	standard ±0.05 %	standard ±0.05 %
	calibration certificate[2]	±0.01 %	±0.02 %	±0.02 %	±0.02 %
Medium[3]		air	air	air	air
Sealing liquid / lubrication		– / –	special oil / special oil	special oil / special oil	special oil / special oil
Nominal piston cross-section		2 cm²	2 cm²	1 cm²	1 cm²
Basic load		0.03 bar	0.05 bar	0.1 bar	0.1 bar
Main measuring range[4]	from	0.1 bar	0.6 bar	1 bar	1 bar
	to	1 bar	6 bar	10 bar	25 bar
Required initial pressure air		–	6 bar	10 bar	25 bar
Standard connection		male G ½ LH with clamping sleeve for G ½ right and M 20x1.5 right, incl. double sealing			
Option		special connections upon request			
Data sheet		10311	10312	10313	10313

[1] in the main measuring range, the accuracy refers to the measured value
[2] versions with smaller measurement uncertainty than our standard instruments are only available with calibration certificates DIN EN ISO / IEC 17025 of accredited laboratories

» p = F / A «



In order to simplify the handling, the weights are already standardised to the specific determined piston surface area and the local gravitation at the installation site. The set of weights is available discreetly graduated in different pressure units (bar, Pa, psi). Piston and weights are kept rotating with a motor while floating in order to minimise the influence of static friction of piston and cylinder and therefore to guarantee a sensitive discrimination threshold.

An integrated spindle pump is used to generate and adjust the pressure. For some models, additional hand pumps are integrated for pressure generation. A ball-bearing star handle is used for the precise adjustment of the pressure (except for model PD 1). Depending on the test volumes, the external connection of an initial pressure is necessary, especially for increasing pressures. These initial pressures as well as the ventilation and decoupling of measuring system and test item are operated by the integrated valve unit.

All components are long-lasting and securely mounted in a rugged case. The case is equipped with a circular level, which allows for precise horizontal alignment by turning the 3 feet. Hence, the weight force acts exactly perpendicular to the piston surface area in direction of gravitation, just as it was carried out at the calibration of the instrument itself.

Functional Principle of a Dead Weight Tester

The weight-loaded piston is pressed down by the local gravitation of the weights. From below the test pressure, which is generated and adjusted by a spindle pump or hand pump, acts towards the piston surface area. This test pressure is increased until the hydraulic or pneumatic force of the medium on the piston surface area (acting from below) compensates the weight force of the piston / weight system and the equilibrium of forces is reached. During this state of equilibrium, the piston floats freely in the cylinder.

Dead weight testers functionally create the causal connection between force and surface area concerning the definition of the physical quantity “pressure”.

When the piston is floating freely, an equilibrium between pressure p and weight force F of the loaded weights is reached over the piston surface area A. The pressure at the measuring system during this state of floating is, based on its causality, a high-precision and reliably reproducible reference for control and calibration of pressure measuring instruments.

Higher weights float at higher pressures, lower weights already at lower pressures. The pressure within the dead weight tester can be varied by the adjusting mechanism in a way that the measuring piston with the loaded weights is in a state of floating (equilibrium p = F / A).

Hydraulic Version				High Pressure Version
PD 60	**PD 100**	**PD 600**	**PD 1000**	**PD 2500**
standard ±0.05 %	standard ±0.05 %	standard ±0.05 % enhanced ±0.02 %	standard ±0.05 % enhanced ±0.02 %	standard ±0.05 % enhanced ±0.02 %
±0.02 %	±0.02 %	±0.015 %	±0.015 %	±0.015 %
special oil	special oil	special oil	special oil	special oil
– / –	– / –	– / special oil	– / special oil	– / special oil
0.5 cm^2	0.5 cm^2	0.05 cm^2	0.05 cm^2	0.02 cm^2
0.25 bar	0.25 bar	10 bar	10 bar	25 bar
10 bar	10 bar	100 bar	100 bar	250 bar
60 bar	100 bar	600 bar	1000 bar	2500 bar
6 bar	6 bar	6 bar	6 bar	6 bar
male G ½ LH with clamping sleeve for G ½ right and M 20x1.5 right, incl. double sealing				high-pressure connection ⅜" HPF-M 20x1.5 with 2 adapters for G ½ and M 20x1.5 (union nut)
special connections upon request				
10315	10315	10316	10316	10317

[3] option separating element, see accessories
[4] other pressure ranges upon request

Precision Pressure Controller / Calibrator DPC 3800

Automatic Controllers

The modular controller DPC 3800 is equipped with up to three precision sensors and an optional barometric reference. The instrument is operated intuitively via touchscreen. Due to a measurement uncertainty of 0.01 % of the entire measuring chain and its control stability of 0.003 %, this instrument is perfectly suited for the automatic calibration of pressure measuring instruments.

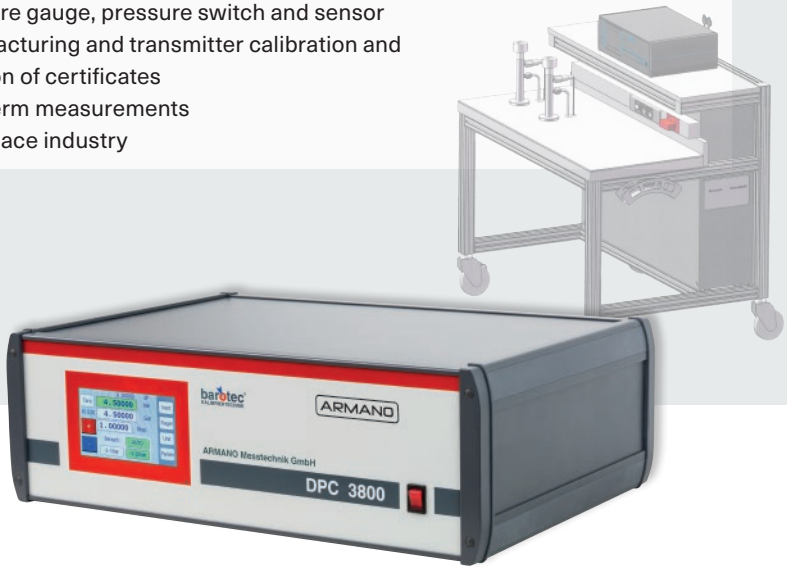
» Measurement uncertainty 0.01 %

» Pressure ranges 0 – 30 mbar to 0 – 1000 bar
(gauge, absolute and differential pressure)

» Medium gas, water or oil

» Applications

- calibration laboratories
- service industries and calibration services
- laboratories for research and development
- pressure gauge, pressure switch and sensor manufacturing and transmitter calibration and creation of certificates
- long-term measurements
- aerospace industry

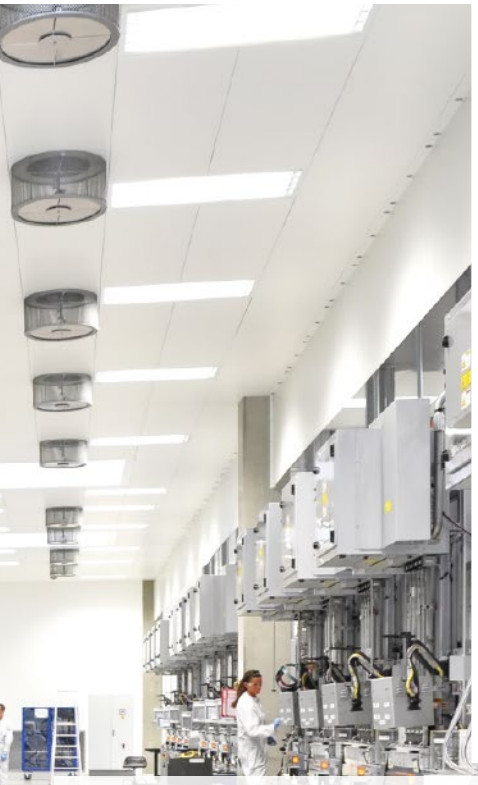


	Up to Three Pressure Ranges	Up to Three Pressure Ranges	Water as Medium Possible
Model	**DPC 3800**	**DPC 3800 HDG**	**DPC 3800 HD**
Accuracy	better 0.01 %	better 0.01 %	better 0.01 %
Medium	gas	gas	water, oil
Pressure range: - gauge - absolute - differential	 −1 / +1 bar to −1 / +100 bar 0 – 1 bar to 0 – 100 bar ±30 mbar to ±300 mbar	0 – 100 bar to 0 – 220 bar	0 – 400 bar to 0 – 1000 bar
Data sheet	10461	10463	10462

Precision Pressure Controller / Calibrator Series DPC 4800

Automatic Pressure Controllers for the Medium Gas

The successor to our DPC 3800 series offers improved accuracy with improved features and reduced space requirements. Up to 3 different pressure ranges and an optional barometric sensor can be combined in one device. The instrument is operated intuitively via touchscreen on the device itself or conveniently from a connected PC in the network. Depending on the measuring task, different versions are available, from the all-round device DPC 4800 A to the precision version DPC 4800 P. The series offers measurement uncertainties from 0.02 % FS + 0.02 % rdg up to 0.006 % FS + 0.003 % rdg of the entire measuring chain with control accuracies from 0.015 % up to 0.005 % – ideal for the automatic calibration of pressure measuring devices.



» Measurement uncertainty 0.02 % up to 0.006 %

» Pressure ranges 0 – 30 mbar to 0 – 230 bar
(gauge, absolute and differential pressure sensors available)

» Medium gas

» Applications
- transfer standard for calibration laboratories
- high-precision pressure source and pressure reference for the construction of test benches
- actuator and reference in modern PLC topologies
- laboratories for research and development
- production means in pressure gauge, pressure switch and sensor manufacturing
- tool for transmitter calibration and creation of certificates
- long-term measurements

» Features
- controlling and measuring test pressures with a single device
- up to 3 precision sensors can be actuated automatically (automatic selection of the pressure range)
- customised configurations of the pressure controller available
- very high measuring rate
- large colour touchscreen, LED backlight
- modern interfaces for PLC automation environments
- easily calibrated
- fully digital measuring instrument
- automatic creation of test certificates via full version calibration software DynaCal

Model	DPC 4800 A “all-rounder”	DPC 4800 A+ “all-rounder plus”	DPC 4800 P “precision”
Accuracy	0.02 % FS + 0.02 % rdg	0.008 % FS + 0.006 % rdg	0.006 % FS + 0.003 % rdg
Control accuracy	0.015 %	0.008 %	0.005 %
Pressure range: - gauge - absolute - differential	 –1 / +1 bar to –1 / +230 bar 0 – 1 bar to 0 – 100 bar ±30 mbar to ±300 mbar[1)]		
Data sheet	10465		

[1)] accuracy 0.03 % FS

Precision Pressure Indicator

The modular pressure indicator DPG 3600 is equipped with up to two precision sensors and a barometric reference. A colour touchscreen and intuitive navigation ensure very easy operation. Due to an optionally certified measurement uncertainty of 0.01 %, differential pressure of ±0.03 % of the entire measuring chain, it is primarily used as transfer / working standard for testing and calibrating various pressure measuring instruments.

» Measurement uncertainty better 0.01 %

» Pressure ranges 0 – 30 mbar to 0 – 5000 bar
(gauge, absolute and differential pressure)

» Applications
- laboratories for factory calibration
- service industries and calibration services
- laboratories for research and development
- pressure gauge, pressure switch and sensor production or transmitter calibration and creation of certificates
- long-term measurements / data log

» Features
- up to two separate, internal precision sensors available
- modular construction
- fully digital measuring instrument
- automatic generation of test certificates via optional calibration software DynaCal

Model	DPG 3600	DPG 3600 HD
Accuracy	better ±0.01 % FS	better ±0.04 % FS[1)]
Medium	gaseous or liquid	gaseous or liquid
Pressure range: - gauge - absolute - differential	 –1 / +1 bar to –1 / +1000 bar 0 – 1 bar to 0 – 1000 bar ±30 mbar to ±300 mbar	0 – 1600 bar to 0 – 5000 bar
Data sheet	10261	10262

[1)] from 2500 bar 0.1 % FS

Pressure Transmitter

Model	DIGPTMv
Accuracy	better ±0.05 %
Medium	gaseous or liquid
Pressure range: - gauge - absolute	 –1 / +3 bar to 0 – 100 bar 0 – 4 bar to 0 – 100 bar others upon request
Data sheet	9860.2

Model	DIGPTM
Accuracy	better ±0.05 %
Medium	gaseous or liquid
Pressure range: - gauge	 0 – 160 bar to 0 – 1000 bar
Data sheet	9860

Capsule Gauge

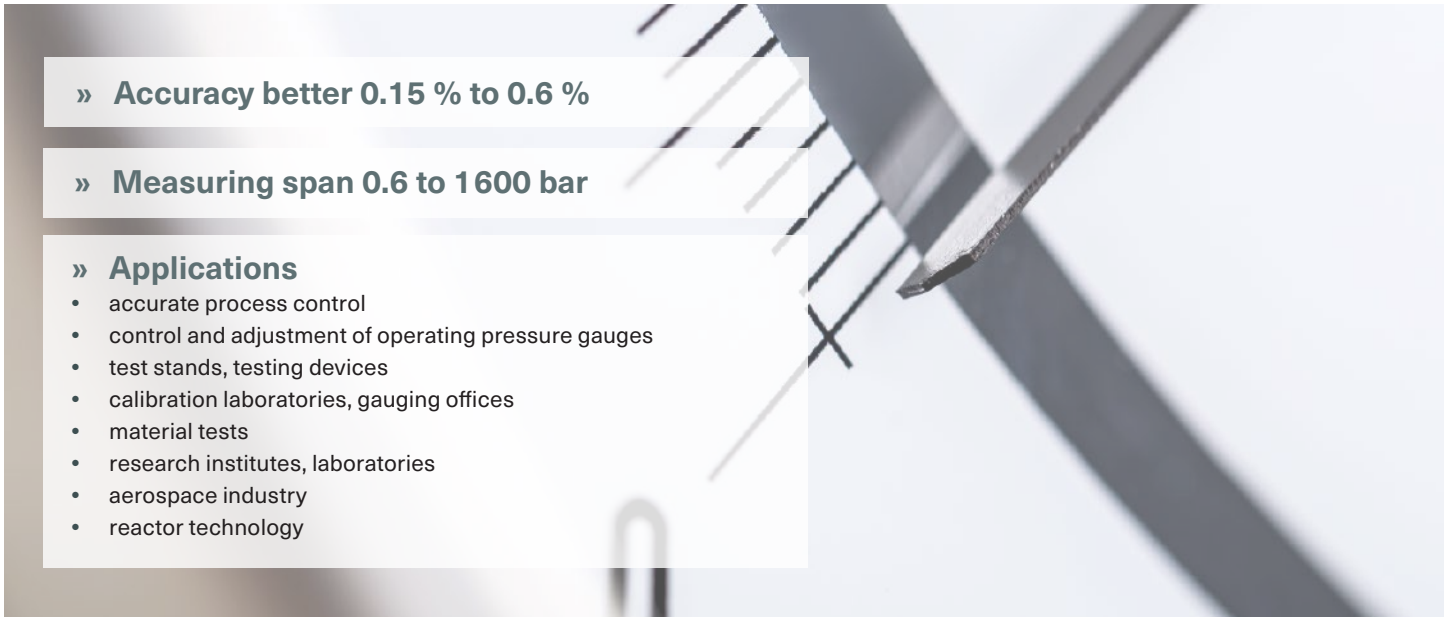
with integrated pressure transmitter DMU

Model	KPCh 100 – 3
Accuracy	better ±0.1 %
Medium	non-corrosive gas
Pressure range: - gauge	 0 – 40 mbar to 0 – 600 mbar
Data sheet	9632

» Features
- no temperature-related additional error in the calibrated temperature range
- ALL-IN-ONE: pressure, temperature, analogue output 2-wire 4...20 mA with NAMUR alarm conditions, RS-485 interface for linking up to max. 254 transmitters, 2-channel precision pressure switch, spin-down measuring range scaling, possibility of offset correction, software low-pass, software package USSCOM

Test Gauges

Bourdon tube test gauges are suitable as reference devices in a pressure range from vacuum up to 1600 bar overpressure and guarantee accuracies of up to ±0.15 %.
Since these devices are independent from electrical supply, they are, in connection with pressure generators of the type series P, PH and PS, not only ideally suited for laboratory applications but also for mobile calibration and inspection tasks.
Bourdon tube test gauges are manufactured based on well-proven technologies with highest precision and with high-quality components. Measuring elements made of special materials, adjusting mechanisms with extremely low friction, mirror scales with fine division marks and knife-edge pointers for parallax-free reading of the pressure are used. An externally adjustable zero adjustment is available for highest demands.

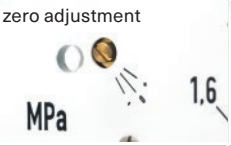
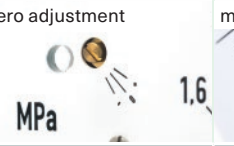


» Accuracy better 0.15 % to 0.6 %

» Measuring span 0.6 to 1600 bar

» Applications

- accurate process control
- control and adjustment of operating pressure gauges
- test stands, testing devices
- calibration laboratories, gauging offices
- material tests
- research institutes, laboratories
- aerospace industry
- reactor technology

	DIN EN 837-1	**former DIN 16005**	**GOST MI 2102-90**	**GOST**	**ASME B40.100**
Model	**RFCh 100**	**RFCh 250 – 1**	**MO 250**	**MO 160**	**RFCh 160 – 3**
Accuracy	±0.6 %	±0.25 %	±0.15 % and 0.25 %	±0.4 %	Grade 2A and Grade 3A
Medium	gaseous or liquid	gaseous or liquid	gaseous or liquid	gaseous or liquid	gaseous or liquid
Wetted parts	– 1 brass – 3 stainless steel 316L	– 1 brass – 3 stainless steel 316L	– 1 brass	– 1 brass	– 3 stainless steel 316L
Pressure range	0 – 0.6 bar to 0 – 600 bar[1)] 0 – 0.6 bar to 0 – 1600 bar[1)]	0 – 0.6 bar to 0 – 600 bar[1)] 0 – 0.6 bar to 0 – 1600 bar[1)]	0 – 0.1 MPa to 0 – 60 MPa[1)]	0 – 0.1 MPa to 0 – 60 MPa[1)]	3A 0 psi – 10000 psi 2A 0 psi – 30000 psi
Features	optional case filling from span 2.5 bar	zero adjustment mirror scale	zero adjustment  MPa 1,6	zero adjustment  MPa 1,6	mirror scale
Data sheet	2201	2201	T02-000-002	T02-000-001	2201

[1)] vacuum and compound ranges also available

Portable Pressure Generation

Comparison Pumps Oil and Gas

Comparison pumps are pressure generators and used for comparative measurements. They are suitable for testing and adjusting pressure measuring instruments with pressure ranges from –1 to +2500 bar.

Plate Version

» Pressure range –1 / +600 bar

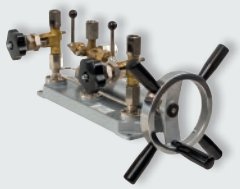
A spindle pump with handwheel (plate version) or star handle (case version) serves to build up the pressure and to regulate the test pressure. The test item and the reference device are connected to the comparison pump with stop valves via clamping sleeves.

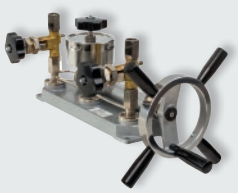
PH 60-P is the suitable model for gaseous media and for pressure ranges up to 60 bar. It is additionally provided with a double stop valve for external pressure connection or vacuum connection, and for bleeding the system.

Our models PS are designed for liquid media and are available with pressure ranges 60, 600, 1000, and 2500 bar. These versions are equipped with a reservoir for the medium.

Comparison pumps for liquid media are installed on a basic plate (code letter -P) and for pressure ranges 600, 1000 and 2500 bar they are mounted into a case similar to a case for dead weight testers (code letter -G).

Comparison pumps in a case are better suited for continuous operations, e.g. in test shops, than those mounted on a plate. The case versions are also provided with filters to avoid contamination of the pump pipe system.





		Pneumatic Version	Hydraulic Version	
Model		**PH 60-P**	**PS 60-P**	**PS 600-P**
Construction type		plate version	plate version	plate version
Medium	standard	dry, clean, non-corrosive gas	acid-free, thin oil	
	special versions	dry, clean, non-corrosive gas[1)]	distilled water[1)]	
p_{min} (operating volume ≤ 0.1 litre)		–0.5 bar (without external vacuum supply)	0 bar	0 bar
p_{max} (operating volume ≤ 0.1 litre)		4 bar (without external pressure supply)	60 bar	600 bar
Required initial pressure		–1 / +60 bar (for higher pressure ranges)	–	–
Standard connection		2x male G ½ LH, each with 2 clamping sleeves for G ½ right and M 20x1.5 right, incl. double sealing		
Option		special connections upon request		
Data sheet		10151	10155	10155

[1)] for special version for oxygen: wetted parts free of grease and oil

For a quick and easy filling of the system, an external compressed air supply (up to max. 10 bar) is required for the case version comparison pumps. As special version with oxygen, the instruments are available up to a maximum pressure of 1000 bar.

Hand test pumps are equipped with a pump handle system for approximate pressurisation, the additional fine adjustment mechanism allows for the precise adjustment of the test pressure. The available pressure range ranges from −0.95 bar up to +700 bar.

Case Version

» Pressure range 0 – 2500 bar

Hand Test Pumps

» Pressure range −0.95 / +700 bar

Hydraulic Version		
PS 600-G	**PS 1000-G**	**PS 2500-G**
case version	case version	case version
acid-free, thin oil		special oil
distilled water[1)]		–
0 bar	0 bar	0 bar
600 bar	1000 bar	2500 bar
6 bar	6 bar	6 bar
2x male G ½ LH, each with 2 clamping sleeves for G ½ right and M 20x1.5 right, incl. double sealing		2 high pressure connections ⅜" HPF-M 20x1.5, each with 2 adapters for G ½ and M 20x1.5
special connections upon request		
10156	10156	10157

Pneumatic Version	Hydraulic Version
BHP 40 + Reference DPG 1030	**BHP 700 + Reference DPG 1030**
hand pump	hand pump
air	distilled water, hydraulic oil
–	–
−0.95 bar	0 bar
40 bar	700 bar
–	–
reference: G ¼, test item: G ¼ with quick release fastener and pressure hose (1 m)	
upon request, e.g. without reference, with portable case	
10111	10112

[1)] for special version for oxygen: wetted parts free of grease and oil

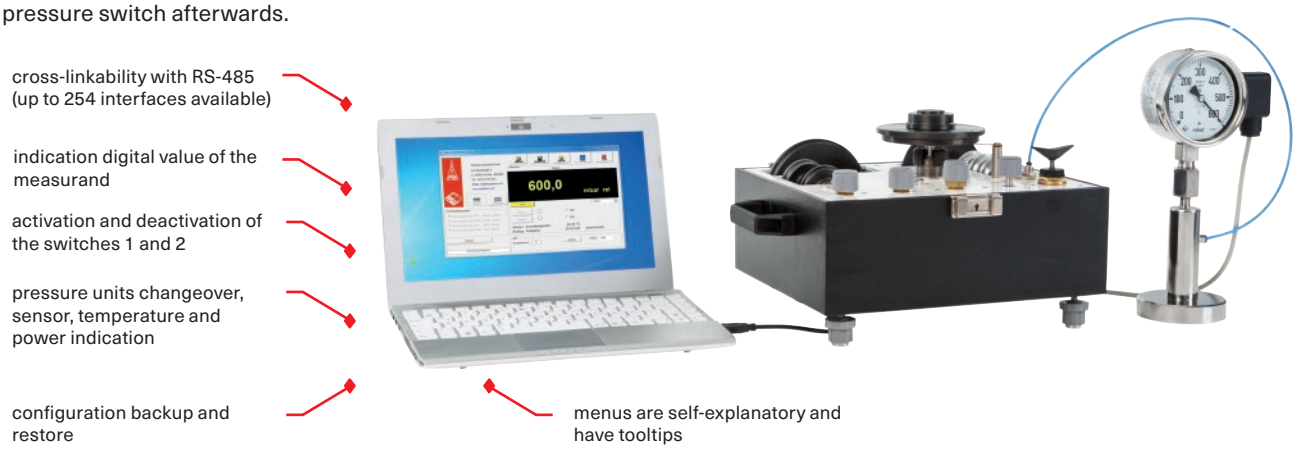
Digital Indication

All Instrument Parameters at a Glance

With the calibration software DynaCal, the efficiency of the instruments DPG and DPC is enhanced further. The software enables the complete control of the instruments and the documentation of the calibration process via PC. Thus, calibration certificates for electronic and mechanical pressure measuring instruments can be created fast and reliable.

Software USSCOM

With the RS-485 interface in connection with the software USSCOM, you can adjust all connected transmitters model DIGPTM according to your requirements, administer the switching behaviour and depict the measured values in different pressure units. The completed configuration is stored in the device, even if the transmitter is only used as 2-wire transmitter or as precision pressure switch afterwards.



Accessories

Standard? Not a Problem! – Specialty? Not a Problem either!

No matter what requirements and requests you have concerning the adaption of your test item to our calibration technology – together with our technicians we will find an ideal solution for you.
In our stock, we permanently keep the standard adapters, fittings, clamping sleeves, etc. in the materials brass, alloy steel and stainless steel. Beyond that, our machinery is ideally designed to process those materials, so that specialties are always realisable. We are capable to electrochemically polish stainless steel to meet the standards of the food and pharmaceutical industries.

In addition to this standard range, we are capable to comprehensively serve the versatile needs of the calibration services. Examples therefor are test equipment with portable case for the robust outdoor use, multiple espaliers for laboratory operations, capillary lines with welded adapter, gauge holder racks and gauge holder brackets. Our product range also includes equipment such as sealings, special pliers to open bayonet ring cases or to remove the pointer from the pointer shaft without causing any damage. Please contact us – together we solve your task.

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