



## Calibration Technology

## Pressure

**NEW!**  
higher  
accuracies



## 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 100 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!

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## Our Products at a Glance



**Mechanical  
Pressure  
Measurement**



**Electronic  
Pressure  
Measurement**



**Chemical Seal  
Mounting**



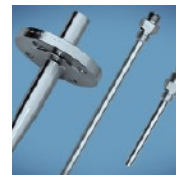
**Calibration  
Technology**



**Mechanical  
Temperature  
Measurement**



**Electrical  
Temperature  
Measurement**



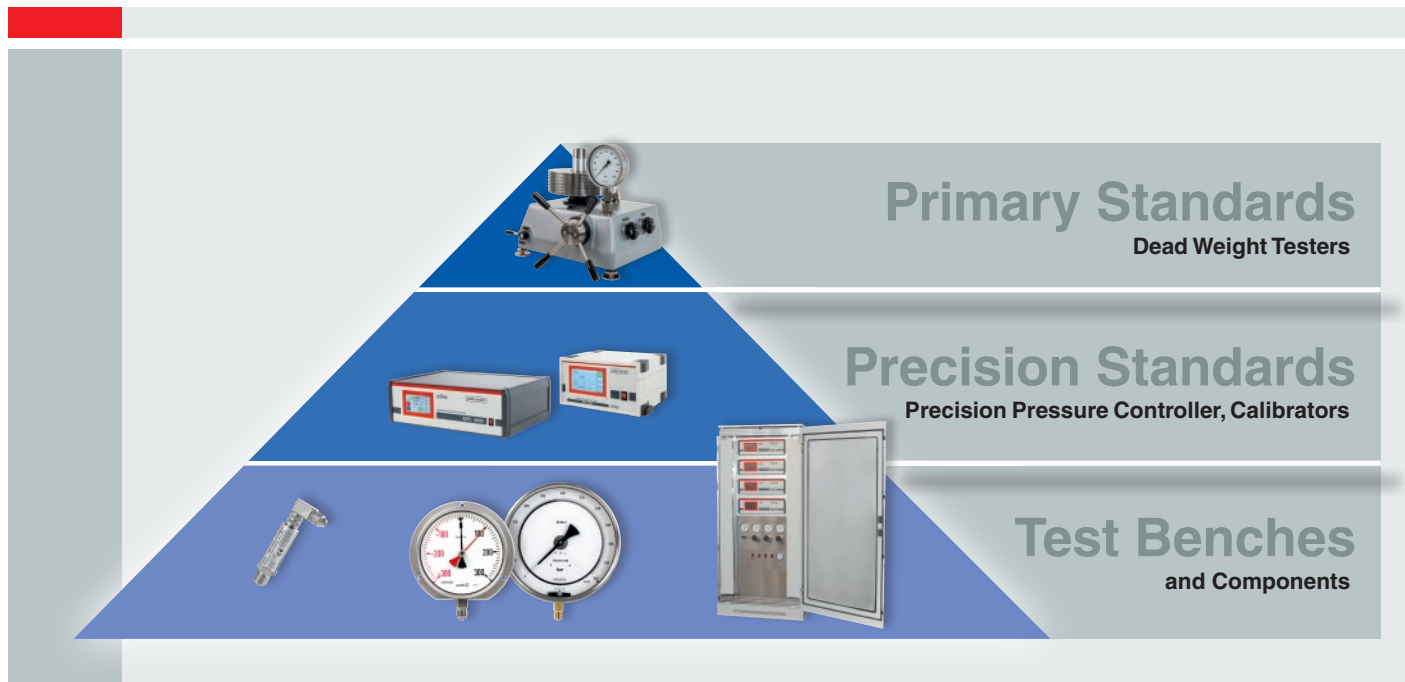
**Thermowells  
& Accessories**

## Our Pyramid of Calibration Technology

### Precision is our Passion

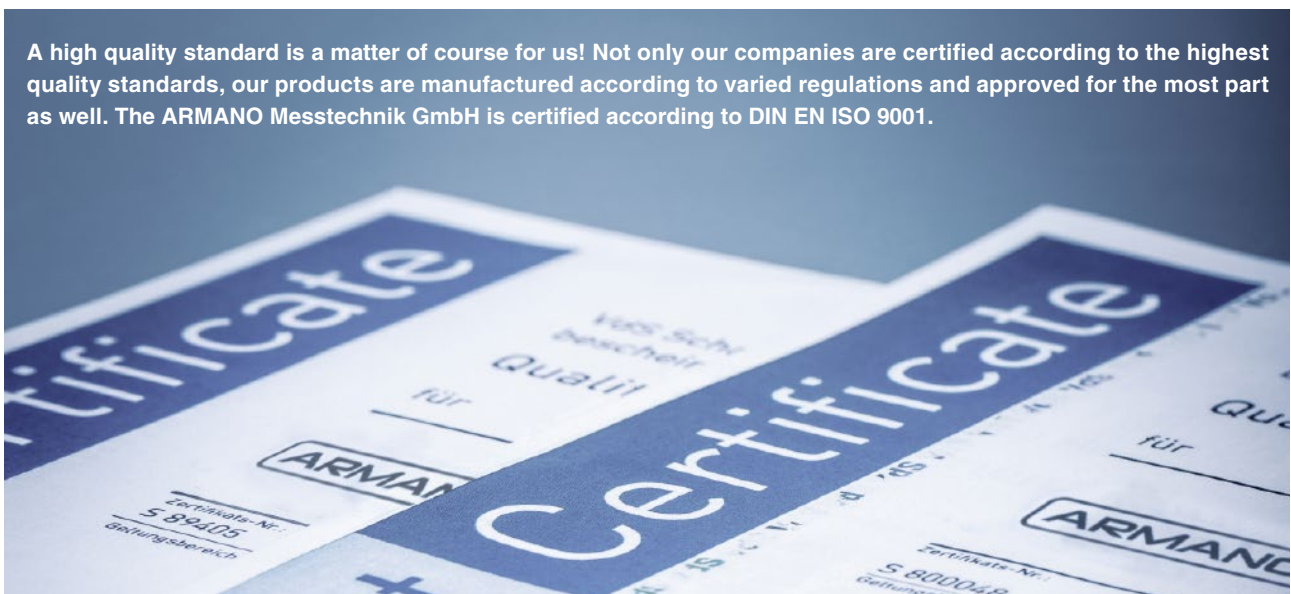
For the precise, repeatable and comparable pressure measurement in laboratories or for high-quality industrial applications the traceability of measuring instruments, test devices and standards to SI units is necessary. Here it is the customer's choice which range to cover. With the instruments on test

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

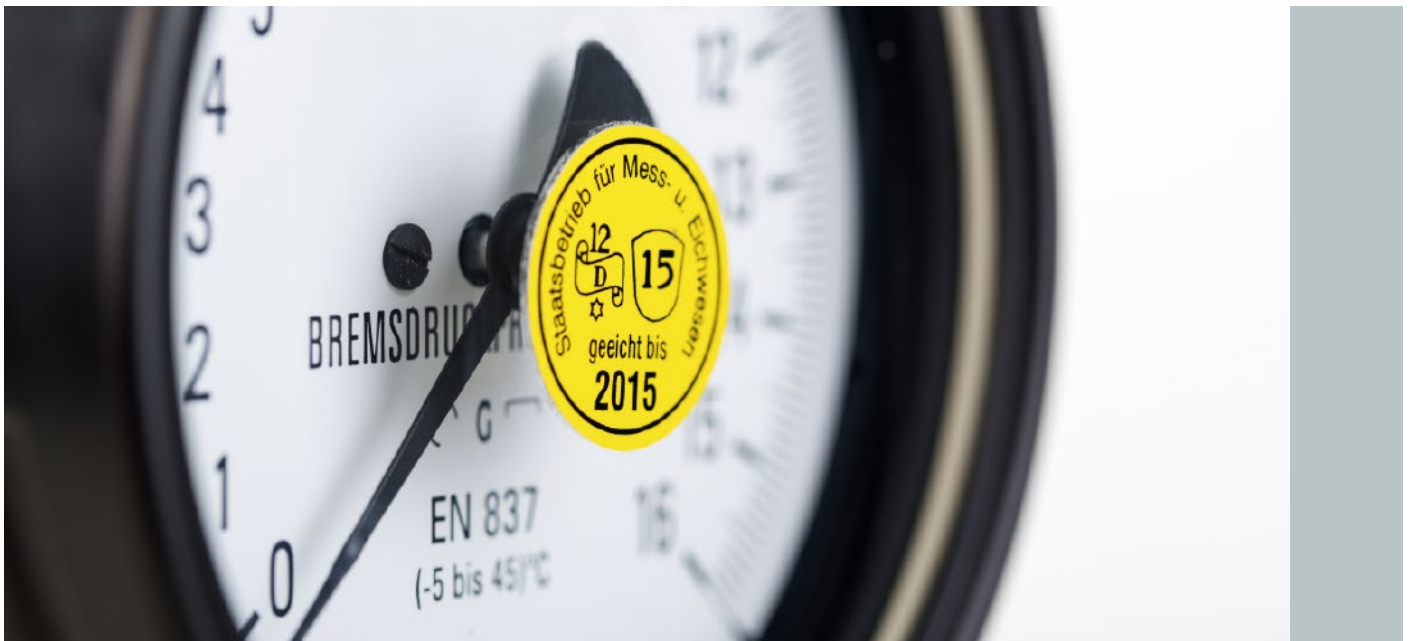
A high quality standard is a matter of course for us! Not only our companies are certified according to the highest quality standards, our products are manufactured according to varied regulations and approved for the most part as well. The ARMANO Messtechnik GmbH is certified according to DIN EN ISO 9001.



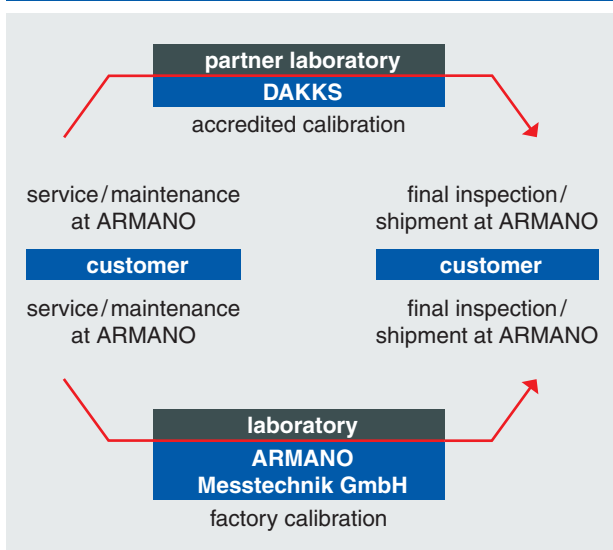
## Calibration Services

As manufacturer of precision pressure measuring instruments, we are your qualified partner for the calibration of your pressure standards. 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  $F = m \cdot g$ . 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 Range « 0.03 to 2,500 bar
- » Application «
  - ◆ Reference
  - ◆ Comparison standard
  - ◆ Calibration services
  - ◆ Gauging offices
  - ◆ Laboratories

**NEW!**  
higher  
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		Portable Version	Pneumatic Version		
Model		PD 1	PD 6	PD 10	PD 25
Accuracy	factory calibration	class 0.05 class 0.02	class 0.05	class 0.05	class 0.05
	calibration certificate <sup>1)</sup>	class 0.01	class 0.02	class 0.02	class 0.02
Medium <sup>2)</sup>		air	air	air	air
Sealing liquid/lubrication		—/—	special oil/special oil	special oil/special oil	special oil/special oil
Nominal piston cross-section		2 cm <sup>2</sup>	2 cm <sup>2</sup>	1 cm <sup>2</sup>	1 cm <sup>2</sup>
Basic load		0.03 bar	0.05 bar	0.1 bar	0.1 bar
Main measuring range <sup>3)</sup>	from	0.1 bar	0.6 bar	0.6 bar	0.6 bar
	to	1 bar	6 bar	10 bar	25 bar
Required admission pressure air		—	6 bar	10 bar	25 bar
Standard connection		male G ½ LH with clamping sleeve on G ½ right or M20x1.5 right, incl. double sealing			
Option		special connections upon request			
Data sheet		10311	10312	10313	10313

<sup>1)</sup> Versions with minor measurement inaccuracy than our standard instruments are only available with calibration certificates DIN EN ISO / IEC 17 025 of accredited laboratories.

<sup>2)</sup> Option separating element, see accessories

<sup>3)</sup> Other pressure ranges upon request



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 discretely 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 PD1). Depending on the test volumes, the external connection of an admission pressure is necessary, especially for increasing pressures. These admission 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

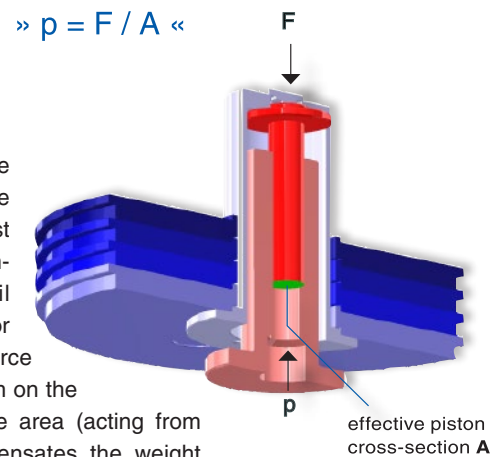
and the equilibrium of forces is reached. During this state of equilibrium, the piston floats freely in the cylinder.

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
class 0.05	class 0.05	class 0.05 class 0.02	class 0.05 class 0.02	class 0.05 class 0.02
class 0.02	class 0.02	class 0.015	class 0.015	class 0.015
special oil	special oil	special oil	special oil	special oil
–/–	–/–	–/special oil	–/special oil	–/special oil
0.5 cm <sup>2</sup>	0.5 cm <sup>2</sup>	0.05 cm <sup>2</sup>	0.05 cm <sup>2</sup>	0.02 cm <sup>2</sup>
0.25 bar	0.25 bar	10 bar	10 bar	25 bar
6 bar	6 bar	60 bar	60 bar	250 bar
60 bar	100 bar	600 bar	1,000 bar	2,500 bar
6 bar	6 bar	6 bar	6 bar	6 bar
male G ½ LH with clamping sleeve on G ½ right or M20x1.5 right, incl. double sealing special connections upon request				
10315	10315	10316	10316	10317

# 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 % FS of the entire measuring




chain and its control stability of 0.003 % FS, this instrument is perfectly suited for the automatic calibration of pressure measuring instruments.

- » Accuracy « better 0.01 %
- » Pressure Range « 0 – 30 mbar to 0 – 1,000 bar  
(gauge, absolute and differential pressure)
- » Application «
  - ◆ 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 measurement
  - ◆ Aerospace industry



### Operation Via Touchscreen



			
	Up to Three Pressure Ranges	Up to Three Pressure Ranges	Water as Medium Possible
Model	Precision Pressure Controller/Calibrator DPC 3800	Precision Pressure Controller/Calibrator DPC 3800 HDG	Precision Pressure Controller/Calibrator DPC 3800 HD
Accuracy	better 0.01 %	better 0.01 %	better 0.01 %
Medium	gas	gas	water, oil
Pressure ranges	gauge pressure: –1 / +1 bar to –1 / +100 bar (–30 inHg / +15 psi to –30 inHg / +1,500 psi) absolute pressure: 0 – 1 bar to 0 – 100 bar (0 – 15 psi to 0 – 1,500 psi) differential pressure: ±30 mbar to ±300 mbar (±1 inHg to ±10 inHg)	gauge pressure: 0 – 100 bar to 0 – 220 bar (0 – 1,500 psi to 0 – 3,000 psi)	gauge pressure: 0 – 400 bar to 0 – 1,000 bar (0 – 5,000 psi to 0 – 15,000 psi)
Specialty	<ul style="list-style-type: none"> <li>• customer-specific configurations of the pressure controller</li> <li>• very high measuring rate</li> <li>• colour touchscreen, LED backlight</li> <li>• easily calibrated</li> </ul>		
	<ul style="list-style-type: none"> <li>• modular construction</li> <li>• fully digital measuring instrument</li> <li>• automatic generation of test certificates via optional calibration software DynaCal</li> </ul>		
Data sheet	10461	10463	10462





### Options DPC 3800

The DPC 3800 has 4 switching outputs that can be used for options. Furthermore, up to four precision sensors can be actuated.

#### Option M

The following features were integrated:

- ◆ On and off switch for a vacuum pump
- ◆ Internal separation of regulator and test item
- ◆ An additional ventilation valve for the test item side

This option is suited, for example, for pressure gauge adjustment.

#### Option Standby

A valve uncouples the regulator and the precision sensors from the test item connection. This option is required in order to operate several DPC pressure controllers in parallel.

#### Option Rack

(Only in combination with Option Standby)

With this option, several DPC pressure controllers can be combined in one controller unit. Sensors, e.g. barometers, can also be mirrored to connected DPC pressure controllers.

#### Option Vac

With this option, a 24 V signal can be actuated, in order to switch a vacuum pump on or off, for example.

### » Application «

- ◆ Test benches in the aerospace industry
- ◆ Sensor production
- ◆ Master system for A-laboratories

## Rack System Based on DPC 3800

### All-automatic According to Customer Specifications

Racks and special systems are solutions, which are developed by our engineers and technicians for customer-

specific applications. Examples for this are calibration benches for high and maximum pressure ranges or systems for the

series production of sensors. The first step here is to determine the requirements by in-depth contact. Based on this, a recommendation is compiled. The implementation takes place at one of our German sites. If required, a system-specific training can be conducted there.

Up to 16 Pressure Ranges	
Model	Rack System DPC 3800 RK
Accuracy	better 0.01 %
Medium	air, water
Pressure ranges	gauge pressure: -1 / +1 bar to 0 – 1,000 bar (-30 inHg / +15 psi to 0 – 15,000 psi) absolute pressure: 0 – 1 bar to 0 – 100 bar (0 – 15 psi to 0 – 1,500 psi) differential pressure: ±30 mbar to ±300 mbar (±1 inHg to ±10 inHg)
Specialty	• customer-specific configurations of the pressure controller
Data sheet	–



## 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 inaccuracy of 0.01 % FS, differential pressure

of  $\pm 0.03$  % FS of the entire measuring chain, it is primarily used as transfer/working standard for the testing and calibration of diverse pressure measuring instruments.

» Accuracy « better 0.01 %

» Pressure Range « 0 – 30 mbar to 0 – 5,000 bar (gauge, absolute and differential pressure)

» Application «



- ◆ 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 measurement/data login

	With Touchscreen Operation		With Piezoresistive Measuring Cell		With Integrated DMU
Model	Digital Precision Pressure Indicator DPG 3600	DPG 3600 HD	Pressure Transmitter DIGPTM	DIGPTM HD005	Capsule Gauge for Low Pressure KPCh 100–3
Accuracy	better $\pm 0.01$ %	better $\pm 0.04$ % <sup>1)</sup>	better $\pm 0.05$ %	better $\pm 0.05$ %	better $\pm 0.1$ %
Medium	gaseous or liquid		gaseous or liquid		non-corrosive gas
Pressure ranges	gauge pressure: –1/+1 bar to –1/+1,000 bar (–30 inHg / 15 psi to –30 inHg / +15,000 psi) absolute pressure: 0 – 1 bar to 0 – 1,000 bar, (0 – 15 psi to 0 – 15,000 psi) differential pressure: $\pm 30$ mbar to $\pm 300$ mbar ( $\pm 1$ inHg to $\pm 10$ inHg)		gauge pressure: –1 / +3 bar to 0 – 100 bar absolute pressure: 0 – 4 bar to 0 – 100 bar others upon request		gauge pressure: 0 – 40 mbar to 0 – 600 mbar
Specialties	<ul style="list-style-type: none"> <li>up to two separate, internal precision sensors possible</li> <li>modular construction</li> <li>fully digital measuring instrument</li> <li>automatic generation of test certificates via optional calibration software DynaCal</li> </ul>		<ul style="list-style-type: none"> <li>no temperature-related additional error in the calibrated temperature range</li> <li>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-lowpass, software package USSCOM</li> </ul>		
Data sheet	10261	10262	9860.2	T09-000-054	T06-000-008

<sup>1)</sup> From 2,500 bar 0.1 % FS

## Test Gauges

Bourdon tube test gauges are suitable as reference devices in a pressure range from vacuum up to 1,600 bar overpressure and guarantee accuracies of up to  $\pm 0.15\%$ .

Since these devices are independent from electrical supply, they are, in connection with pressure generators of the model 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 point adjustment is available for highest standards.



### » Accuracy «

better 0.15 % to 0.6 %

### » Measuring Span «

0.6 to 1,600 bar

### » Application «

- ◆ 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

<b>EN 837-1</b>	<b>Former DIN 16005</b>	<b>GOST MI 2102-90</b>	<b>GOST</b>	<b>ASME B40.100</b>
<b>Test Gauge RFCh 100</b>	<b>Test Gauge RFCh 250 – 1</b>	<b>Test Gauge MO 250</b>	<b>Test Gauge MO 160</b>	<b>Test Gauge RFCh 160 – 3</b>
$\pm 0.6\%$	$\pm 0.25\%$	$\pm 0.15\%$ and $0.25\%$	$\pm 0.4\%$	Grade 2A and Grade 3A
gaseous or liquid	gaseous or liquid	gaseous or liquid	gaseous or liquid	gaseous or liquid
– 1 <sup>1)</sup> 0 – 0.6 bar to 0 – 600 bar <sup>3)</sup>	– 1 <sup>1)</sup> 0 – 0.6 bar to 0 – 600 bar <sup>3)</sup>	– 1 <sup>1)</sup> 0 – 0.1 MPa to 0 – 60 MPa <sup>3)</sup>	– 1 <sup>1)</sup> 0 – 0.1 MPa to 0 – 60 MPa <sup>3)</sup>	3A 0 – 10,000 psi 2A 0 – 30,000 psi
– 3 <sup>2)</sup> 0 – 0.6 bar to 0 – 1,600 bar <sup>3)</sup>	– 3 <sup>2)</sup> 0 – 0.6 bar to 0 – 1,600 bar <sup>3)</sup>			
optional case filling from span 2.5 bar	zero point adjustment 	zero point adjustment 	zero point adjustment 	mirror scale 
2201	2201	T02-000-002	T02-000-001	2201

<sup>1)</sup> Wetted parts copper alloy

<sup>2)</sup> Wetted parts stainless steel

<sup>3)</sup> 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 +2,500 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, 1,000, and 2,500 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, 1,000 and 2,500 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.

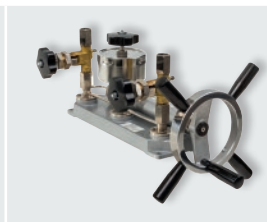
#### Plate Version



» Pressure Range « –1 to +600 bar



**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 <sup>1)</sup>	distilled water <sup>1)</sup>	
p <sub>min</sub> (operating volume ≤0.1 litre)		–0.5 bar (without external vacuum supply)	0 bar	0 bar
p <sub>max</sub> (operating volume ≤0.1 litre)		4 bar (without external pressure supply)	60 bar	600 bar
Required admission pressure		–1 / +60 bar (for higher pressure ranges)	–	–
Standard connection		2 connections male G ½ LH, each with 2 clamping sleeves on G ½ right or M20x1.5 right, incl. double sealing		
Option		special connections upon request		
Data sheet		10151	10155	10155

<sup>1)</sup> 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 1,000 bar.

### Case Version



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.

### Hand Test Pumps



### 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 <sup>1)</sup>		–
0 bar	0 bar	0 bar
600 bar	1,000 bar	2,500 bar
6 bar	6 bar	6 bar
2 connections male G ½ LH, each with 2 clamping sleeves on G ½ right or M20x1.5 right, incl. double sealing special connections upon request		
10156	10156	10157

<sup>1)</sup> For special version for oxygen: wetted parts free of grease and oil



### Pneumatic Version

### Hydraulic Version

BHP 40 + Reference D2	BHP 700 + Reference D2
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



## Digital Display

### 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 regulation 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 have the opportunity to adjust all connected transmitters model DIGPTM according to your requirements, to administer the switching behaviour and to depict the meas-

ured 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.



Cross-linkability with RS 485  
(up to 254 interfaces possible)

Indication digital value of the  
measurand

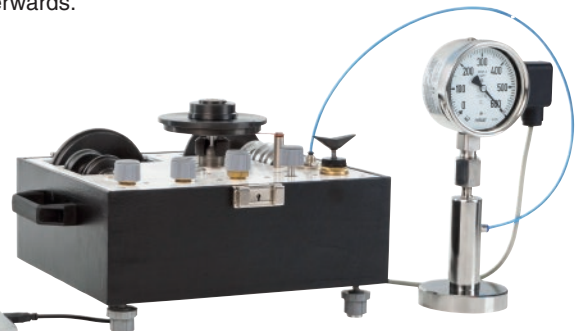
Activation and deactivation of  
the switches 1 and 2

Pressure units changeover,  
sensor-, temperature- and  
power indication

Configuration backup and  
restore



Menus are self-explanatory  
and have tooltips



## Accessories

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



No matter which requirements and requests you have concerning the adaption of your test item to our calibration technology – together with our technicians we will find the 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 industry and pharmaceutical industry.

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.