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1. Information on This Operating Instruction

- The manual is aimed at specialists and semi-skilled personnel.
- Please read the instructions carefully before carrying out any operation and keep the specified order.
- Thoroughly read and understand the information in chapter 2 “Safety Instructions”.

If you have any problems or questions, please contact your supplier or contact us directly at:

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Am Gewerbepark 9 • 08344 Grünhain-Beierfeld
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1.1 Pictographs Used

In this manual, pictographs are used as hazard warnings.

Particular information, instructions and restrictions designed for the prevention of personal or substantial property damage:

WARNING! Is used to warn you against an imminent danger that may result in personal injury or death.

IMPORTANT! Is used to warn you against a possibly hazardous situation that may result in personal, property or environmental damage.

CAUTION! Is used to draw your attention to important recommendations to be observed. Disregarding them may result in property damage.

DANGER! Indicates a potentially hazardous situation, which may result from hot surfaces. Disregarding the safety instructions may result in severe burns.

DANGER OF EXPLOSION! Indicates a potentially hazardous situation, which may result from existing explosive gases and dusts. Disregarding the safety instructions may result in explosions.

Passages in the text containing **explanations, information or advice** are highlighted with this pictograph.

The following symbol highlights
actions you have to conduct
or
instructions that have to be strictly observed.

1.2 Exclusion of Liability

We accept no liability for any damage or malfunction resulting from incorrect installation, inappropriate use of the device or failure to follow the instructions in this manual.

2. Safety Instructions

IMPORTANT! Disregarding the respective regulations may result in severe personal injuries and / or property damage.

Please read this operating instruction thoroughly before installing the device.
Disregarding the containing warnings, especially the safety instructions, may result in danger for people, the environment, and the device and the system it is connected to.
The instrument corresponds with the state of engineering at the time of printing. This concerns the accuracy, the operating mode and the safe operation of the device.
In order to guarantee that the device operates safely, the operator must act competently and be conscious of safety issues.
The ARMANO Messtechnik GmbH provides support for the use of its products either personally or via relevant literature. The customer verifies that our product is fit for purpose based on our technical information. The customer performs customer and application specific tests to ensure that the product is suitable for the intended use. With this verification, all hazards and risks are transferred to our customers. Our warranty expires in case of inappropriate use.

Qualified personnel:

- The personnel that is charged for the installation, operation and maintenance of the instrument must hold a relevant qualification. This can be based on training or relevant tuition. The personnel must be aware of this manual and have access to it at all times.
- The electrical connection shall be carried out by a fully qualified electrician only.

General safety instructions:

- In all work, the existing national regulations for accident prevention and safety at the workplace must be complied with. Any internal regulations of the operator must also be complied with, even if these are not mentioned in this manual.
- Please ensure that the process is unpressurised before installing or removing the device. Otherwise, there is a risk that hot, corrosive, toxic or explosive substances leak.

IMPORTANT! Risk of burns, chemical burns, poisoning or explosion!

IMPORTANT! Risk of injury or material damage due to overpressure!

- Exceeding the maximum permissible overload values may lead to material failure of the digital pressure gauge. This may also cause serious damage to health.
- Ensure that the overload values are never exceeded.
- Please check if the instrument model is suitable for your application before ordering and installation.
- Degree of protection according to DIN EN 60529: Ensure that the ambient conditions at the installation location do not exceed the requirements of the specified degree of protection (⇨ chapter 4 “Technical Data”).
- Use the instrument in its perfect technical condition only. Damaged or defective instruments need to be checked immediately and replaced if necessary.
- Only use appropriate tools for mounting, connecting and dismounting the instrument.
- Nameplates or other information on the device shall neither be removed nor obliterated, since otherwise any warranty and manufacturer responsibility expires.
- In order to ensure measurement accuracy and durability of the instrument and to avoid damage, the limit values indicated in the technical data have to be observed.
- In case of visible damage or malfunctions, the instrument must be put out of operation immediately.

Special safety instructions:

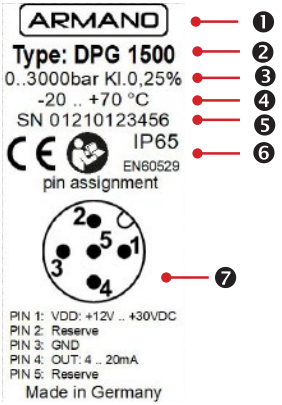
Warnings, which are specifically relevant to individual operating procedures or activities, are to be found at the beginning of the relevant sections of this operating instruction.

- The operating pressures of the digital pressure gauge have to be within the specifications of the device.
- Ensure that construction type and materials of the digital pressure gauge are resistant regarding application conditions and medium.
- Minimise external mechanical influences, such as oscillations, vibrations and shocks, by an appropriate installation.
- Reduce the influence of vapour, abrasive / aggressive media, dust and soot or others by selecting a suitable installation location.
- Avoid direct sunlight and immediate vicinity to hot objects as far as possible.
- Avoid strong electromagnetic fields.
- Modifications or other technical changes of the instrument by the customer are not permitted. Otherwise, you will lose your warranty.

3. Device Description

The present document describes the standard version. For the application in environments with increased safety requirements (e.g. potentially explosive areas), special devices might be necessary. Our digital pressure gauges are used for standard industrial pressure measurement.
Further information on the instruments can be found in the data sheets 9651 and 9652.

Nameplate:
The nameplate is placed on the case of the instrument. It contains the most important technical data and information.



❶ Manufacturer
❷ Model
❸ Pressure range and accuracy class
❹ Operating temperature range
❺ Serial number (YY = year of manufacture; WW = week of manufacture)
❻ Symbols “CE” and “Please regard manual”, degree of protection (DIN EN 60529)
❼ Pin assignment

3.1 Scope of Application

The manual is valid for digital pressure gauges of the type series LILLYpress PLUS. Information, which is not given in this manual, can be found in the respective product data sheets if necessary.

3.2 Intended Use

Digital pressure gauge models DPG 1500 and 1510 are used for measuring, checking, adjusting and calibrating pressures and pressure measuring equipment in the specified measuring range.
Do not use the devices beyond its specification or contrary to the operating instructions.
The operational safety of the device supplied is only guaranteed by intended use. The specified limit values (⇨ chapter 4 “Technical Data”) must not be exceeded. This particularly applies for the adherence to the permissible full scale value and the permissible temperature range.

3.3 Configuration and Function

Due to their advanced technology, the digital pressure gauges of the LILLYpress PLUS series are electronic pressure measuring instruments designed to supersede the classic mechanical pressure gauges and to open up new areas of application.

The advantages of the electronic devices are:
- simple switching between pressure units (alternative unit)
- increased measurement accuracy
- longer service life
- better long-term stability (especially in high-pressure ranges)
- higher vibration and shock resistance (robustness)
- indication of the device temperature close to the sensor (°C or °F)

The instruments can fully replace the mechanical pressure gauge models RCh 100 – 3.
For the digital pressure gauge, all dimensions relevant to the user (case diameter and distance from the centre of the device to the sealing surface) have been designed identically.
In addition to the 5-digit indication for the measured value, the large, high-contrast graphic display also has a temperature and a bargraph indication.
The digital pressure gauge LILLYpress PLUS is also equipped with a MIN / MAX value memory.

The device is encased EMC-safe in a proven bayonet ring case made of stainless steel (IP65) with atmospheric pressure compensation.

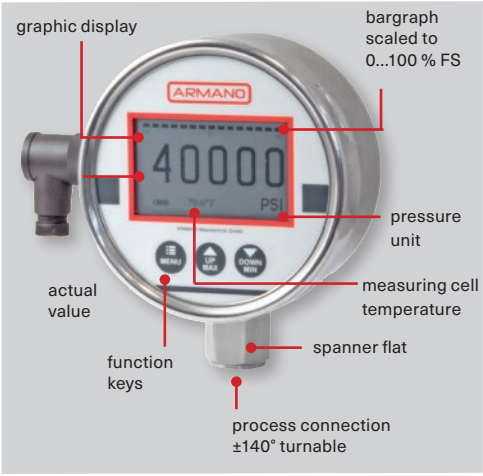


Figure 3.3-1: components

Versions:
The models DPG 1500 and DPG 1510 are available with external supply and analogue output 4...20 mA.

All versions can be combined with installation options typical for pressure gauges, i.e.

option
–Fr: front flange for panel mounting
–Rh: back flange for surface mounting
–Mgh: gauge holder bracket acc. to DIN 16281

4. Technical Data

The technical data of the particular instrument models can be found in the data sheets. The data sheets contain all relevant information such as the assignment of the permissible overload and burst pressure to the nominal pressure range, available process connection threads, dimensional data, etc.

Models	DPG 1500	DPG 1510
Supply	12...30 V DC	12...30 V DC
Measuring range	1600 to 3 000 bar 20000 to 40 000 psi	2.5 to 1000 bar 30 to 15000 psi
Option vac. measurement	vacuum-proof	✓
Type of pressure	gauge	gauge / absolute
Accuracy	0.25 % FS / (0.1 % FS)[1)]	0.1 % FS (0.05 % FS)[1)]
Wetted parts	1.4542 1.4548	1.4435, 1.4571 FKM (PN > 160 bar)
Bargraph indication	✓	✓
Sensor temp. indication	✓	✓
Analogue output 4...20 mA	✓	✓
Pressure units	mbar, bar, psi, kPa / MPa, kp/cm²	mbar, bar, psi, kPa / MPa, kp/cm²
Temperature units	°C, °F	°C, °F
IP (DIN EN 60529)	IP65	IP65
Measuring cell	thin film sensor	piezoresistive
Software low-pass	✓	✓
Data sheet	9651	9652

5. Installation

Prior to mounting, please check the following aspects:
- Are the goods undamaged and complete?
- Do the goods match the shipping documents?
- Is the instrument suitable for the case of application?
- Is the maximum possible process pressure within the measuring range of the device to be installed?
- Does the process connection comply with the requirements?
- Pay attention to adequate protection against weather.
- Avoid direct sunlight.
- Avoid proximity to heat sources.
- Note the degree of protection according to DIN EN 60529 (⇨ chapter 4 “Technical Data”)
- Operation and control shall only be carried out by authorised personnel.
- Take appropriate precautions to protect the device from damage.

[1)] limited temperature range 0 – 50 °C (32 – 122 °F), no turn-down

IMPORTANT! Mounting and dismounting of the device shall only be carried out in an unpressurised state!

5.1 Mechanical Connection

The mechanical connection of the digital pressure gauge is carried out according to the general technical rules for the selected connection type.
The process connection for digital pressure gauges of the LILLYpress PLUS type series can be selected from a wide range of optionally available connections. This variety is limited by the maximum permissible pressure load capability of the threads in accordance with DIN EN 837 and DIN 16001.

Please regard the maximum permissible pressure load capability when selecting the process connection!

For gauge pressure measurement, please tare the device according to chapter 7 before installation.
When screwing in the digital pressure gauge, do not exert any force on the case, plug connector, etc.! Apply the required tightening torque only via the spanner flat of the process connection provided for this purpose!
The sealing surfaces and threads of the process connections have to be clean and undamaged!

For sealing the process with cylindrical screw fittings (e.g. G½"), gaskets made of appropriate material must be used. Conical screw fittings (e.g. ½" NPT) seal in the thread due to their cone-shaped geometry – if necessary by using additional appropriate sealants, e.g. PTFE tape.
Sealing material has to be replaced after being dismounted.

5.2 Electrical Connection

The device must only be installed by qualified personnel. Qualified personnel are those persons, who are acquainted with mounting and commissioning electrical measuring devices and who have qualifications such as: qualified electrician or electrically instructed person.

During installation, regard the integrity of cables, plug connectors, insulators, live parts and make sure to maintain the required degree of protection.

Please ensure that
- all fittings were fastened with the required tightening torque.
- the applied sealing inserts in the screwed cable glands match the used cable diameters.
- the core cross-sections match the terminals.
- short circuits are avoided.

The electrical connection is made via an M12 circular plug connector with the following wiring diagram:

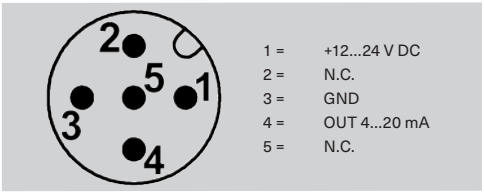


Figure 5.2-1: pin assignment

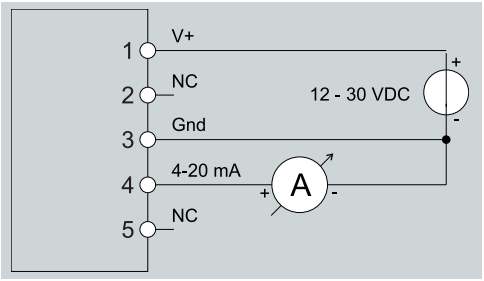


Figure 5.2-2: wiring diagram

5.3 Alignment

After mounting, carefully align the front panel by rotating the housing relative to the process connection. If you encounter a noticeable, hard resistance when turning the device, align it in the opposite direction. The process connection can be rotated approx. 280° relative to the device.

6. Function Keys, Menu Structure and Parameterisation

6.1 Function Keys MENU, UP/MAX, DOWN/MIN

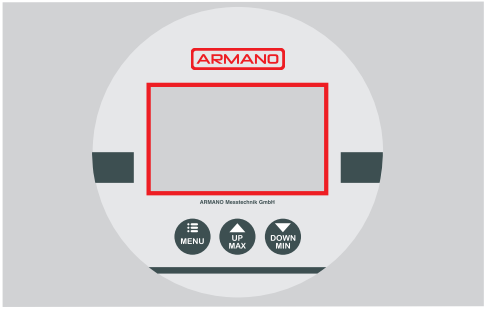


Figure 6.1-1: membrane keypad

MENU — press briefly:
wake-up from STANDBY-MODE,
access MENU, SELECTION function
and ENTER function (confirmation)

UP MAX — press briefly:
scroll up
indication of the MAX memory

press and hold:
RESET the MAX memory after confirmation
with UP MAX

DOWN MIN — press briefly:
scroll down
indication of the MIN memory

press and hold:
RESET the MIN memory after confirmation
with UP MAX

6.2 Menu Structure

UP MAX — select the required submenus with the buttons **UP** and **DOWN**

DOWN MIN

MENU — press the button **MENU** to enter the respective submenu

```
SETUP
--------
INFO        device information: revision number, serial
            number, pressure range
UNIT        switch between available pressure and
            temperature units
EXTRA       measuring rate, software low-pass filter,
            power save function (standby mode),
            indication of the measured value
ZERO        TARE, offset correction zero point
            (must always be carried out in an
            unpressurised state!)
EXIT        takes you back to the measuring mode

INFO
--------
REV         software version
SERIAL      serial number / device number
MR LO       lower measuring range limit (in bar)
MR HI       upper measuring range limit (in bar)
MENU        takes you back to the measuring mode

UNIT
--------
UNIT PRESSURE       switch between alternative
                    pressure units: mbar, bar, psi,
                    kPa, MPa, kp/cm²
UNIT TEMPERATURE    switch between alternative
                    temperature units: °C, °F
EXIT                takes you back to the measur-
                    ing mode

EXTRA
--------
MEAS.RATE   set the measuring rate between
            0.5 sec...30 sec (rest time between
            individual measurements in seconds)
SOFT TP     averaging the last xxx individual meas-
            ured values (max. 250)
STANDBY     time until the device returns to sleep
            mode (display off) in 10 min steps;
            OFF = permanent display – the device
            never returns to standby mode
RESOLUTION  decimal places of the measured value
            indication: X  X.X  X.XX  X.XXX
EXIT        takes you back to the measuring
            mode
```

6.3 Parameterisation

A correct parameterisation of the device is the basis for precise measurement.

First, select the required units for the pressure measurement (UNIT PRESSURE) and the temperature measurement (UNIT TEMPERATURE).

The number of the desired decimal places can be set via the menu item RESOLUTION. Please select here wisely according to the rule "only as accurately as required"! If measured values cannot be displayed on the 5-digit indication including all set decimal places, the device automatically shortens the number of decimal places. If the measured values return to displayable values, the device automatically increases the number of decimal places up to the set value.

Example:
Your measuring range is 0 – 1600 bar and you set three decimal places. In this case, the device will display the three decimal places up to 99.999 bar, only two decimal places up to 999.99 bar and only one above that. If the value falls below 10 bar, so that an indication with four decimal places would be possible, the device will still only display the set three decimal places.

For highly pulsating pressure curves, smoothing is possible by means of a software-based low pass filter. The variable SOFT TP determines how many values are averaged. This variable should be as small as possible, otherwise the response behaviour of the device becomes very slow.

If the minimum and maximum values shall be recorded during the measuring period, the memory contents have to be reset (RESET) before the start of each measurement according to chapter 6.1 while the device is unpressurised.

6.4 Parameterisation of the Analogue Output

The instrument models DPG 1500 and 1510 are additionally equipped with an analogue output 4...20 mA. This analogue output is designed as 3-wire connection, the output current has to be measured against earth (GND).

Scaling current output LRV and URV
The variables LRV (lower range value) and URV (upper range value) allow a turn-down of the current output within the measuring range between MR_LO and MR_HI.

The following applies:
MR_LO ≤ LRV < URV ≤ MR_HI

The values MR_LO and MR_HI CANNOT be changed.
The bargraph is always scaled to the analogue output range of 4...20 mA, i.e. from LRV to URV.

Example:
Upon delivery, an instrument with the measuring range 0 – 10 bar has the following setting:
MR_LO = LRV = 0 bar and
MR_HI = URV = 10 bar.

This means, the output current
at 0 bar = 4 mA and
at 10 bar = 20 mA.

If the device shall be used with a smaller measuring span than MR_LO to MR_HI, often a so-called turn-down of the output signal is required. This is achieved by adjusting the variables LRV and URV.

If, for example, the aforementioned device shall only be used in the range of 2 bar to 8 bar and shall provide its nominal output signal of 4 to 20 mA output current in the range of 2 bar to 8 bar, set the variable LRV to 2.000 bar and URV to 8.000 bar in the menu EXTRA ⇨ LRV/URV.
The set point for LRV can be edited in the submenu LRV, the set point for URV can be edited in the submenu URV.
With the editor, you can also switch the sign from + to – and back.

You can edit digit by digit from left to right using the **UP** or **DOWN** buttons. When the correct value of the currently edited digit is selected, the cursor can be moved to the next digit by pressing the **MENU** button. Once you have completed the entry, the prompt SET LRV? or SET URV? appears, which can be confirmed by pressing the **UP** button or discarded by pressing the **DOWN** button. If the entry is incorrect, use the **MENU** button (OK) to return to the variable editor and correct the entry.

By changing the values LRV and URV, the bargraph is also rescaled to the range LRV to URV.
If the pressure falls below the LRV or exceeds the URV by more than 5 %, the error notification ERR UNDERRANGE or ERR OVERRANGE appears respectively.
If the pressure falls below the LRV, the output current continues linearly with falling pressure below 4 mA down to a value of 3.8 mA, then there is a jump to static 3.5 mA (NAMUR) – the error notification ERR UNDERRANGE appears.
If the pressure exceeds the URV, the output current continues linearly with increasing pressure above 20 mA up to a value of 20.5 mA, then there is a jump to static 21 mA (NAMUR) – the error notification ERR OVERRANGE appears.

In case of turn-down, please make sure to choose the values for LRV and URV wisely!
The accuracy of the device always refers to the nominal span from MR_LO to MR_HI and is reduced with increasing turn-down factor!

7. Measuring Process

Before starting a measurement, allow the device to adjust to the temperature at the installation location for a sufficient period of time. This is necessary to ensure the specified measurement accuracy.
After having adjusted the temperature and before measuring relative pressures, the indication must be checked for the value 0.000 (zero point) while the device is unpressurised. If necessary, tare a zero point error via the ZERO function while the device is unpressurised.

Exceeding the pressure range / indication OVERRANGE:
If the nominal pressure range is exceeded by more than 5 %, the notification OVERRANGE will flash on the display.
The alternately displayed pressure value is for information purposes only and corresponds to the actual pressure only up to about 10 % exceedance (i.e. approx. 110 % FS) – beyond that, the displayed pressure value no longer increases! When the warning OVERRANGE appears, ensure that the pressure is relieved as quickly as possible!
After overpressure has occurred, please check the device. A simple method is to check for the value of 0 bar without having it tared again while the device is unpressurised. If the value displayed deviates from the reference value by more than the permissible error class, an inspection is essential and maintenance by the manufacturer is recommended.

8. Maintenance / Cleaning, Storage and Transport

CAUTION! Material damage and loss of warranty!
Any modifications or interventions in the device, made by the customer, might damage important parts or components. Such intervention leads to the loss of any warranty and manufacturer's responsibility!
→ Never modify the device or perform any repairs yourself.

Maintenance:
- Our digital pressure gauges are maintenance-free.
- To assure the accuracy of measurement, we recommend checking and, if necessary, recalibrating the digital pressure gauges biennially. This can be carried out by the manufacturer or by qualified personnel.

Cleaning:
- Clean the device with suitable agents. Only use cleaning agents and cleaning tools that do not corrode or damage the components of the device (this especially applies to the nameplate).
- Devices that are cleaned with high pressure-, water- or steam jets require the degree of protection IP69K.

IMPORTANT! Improper transport can destroy the device and cause considerable personal and property damage.
Please inspect the transport packaging and the delivered items immediately upon their receipt to determine their integrity, completeness and conformity with the delivery documents.
The permissible ambient conditions for storage and transport can be found in the data sheet of the respective product.

Storage:
- If possible, store the instrument in its original packaging.
- Remove the packaging not until installation of the device.
- Store the instruments in a dry place, not exposed to direct sunlight.
- The storage temperature of the instruments should not fall below or exceed the permissible temperature limitations specified in the data sheets.

Transport:
- Please use a suitable packaging for the transport (if possible, the original packaging) with adequate padding material.
- Do not throw the instruments even when packed.
- Protect the packed instruments from moisture.
- Provide relevant transportation instructions on the packaging.

9. Dismounting and Disposal

WARNING! Risk of injury!
Never remove the device from a system in operation.
Make sure that the system is switched off professionally.

Before dismounting:
Check before dismounting, whether the system
- is switched off,
- is in a safe and currentless state,
- is unpressurised and cooled down.

Disposal:
In compliance with the directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE), the device must be disposed of separately as electrical and electronic waste. Please regard legal regulations of the country of distribution.

NO DOMESTIC WASTE!
The instrument comprises various materials. It shall not be disposed of together with domestic waste.

→ Bring the device to your local recycling plant

or

→ send the device back to your supplier or to the ARMANO Messtechnik GmbH.

10. CE Conformity

CE

The CE marking of the instruments certifies the conformity with prevailing EU directives for placing products on the market within the European Union. The following directive applies:

EMC directive 2014 / 30 / EU

The corresponding declaration of conformity is enclosed or available upon request.

11. Declaration of Conformity

EU-Konformitätserklärung

EU Declaration of Conformity

Für die nachfolgend bezeichneten Erzeugnisse

We hereby declare for the following named goods

DIGITALMANOMETER
Typ DPG 300 **gemäß Datenblatt 9661**

DIGITAL PRESSURE GAUGE
Model DPG 300 ***according to data sheet 9661***

DIGITALMANOMETER
Typ DPG 400 **gemäß Datenblatt 9662**

DIGITAL PRESSURE GAUGE
Model DPG 400 ***according to data sheet 9662***

PRÄZISIONS-DIGITALMANOMETER
Typ DPG 1030 **gemäß Datenblatt 9643**

DIGITAL PRECISION PRESSURE GAUGE
Model DPG 1030 ***according to data sheet 9643***

HOCHDRUCK-DIGITALMANOMETER 4…20 mA
Typ DPG 1500 **gemäß Datenblatt 9651**

DIGITAL HIGH-PRESSURE GAUGE 4…20 mA
Model DPG 1500 ***according to data sheet 9651***

PRÄZISIONS-DIGITALMANOMETER 4…20 mA
Typ DPG 1510 **gemäß Datenblatt 9652**

DIGITAL PRECISION PRESSURE GAUGE 4…20 mA
Model DPG 1510 ***according to data sheet 9652***

wird hiermit bestätigt, dass sie den wesentlichen Schutzanforderungen entsprechen, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit (2014/30/EU) festgelegt sind.

that they meet the essential protective requirements, which have been fixed in the Directive of the European Parliament and the Council on the approximation of the laws of the Member States relating to the electromagnetic compatibility (2014/30/EU).

Zur Beurteilung der Erzeugnisse hinsichtlich elektromagnetischer Verträglichkeit wurde folgende Norm herangezogen:

The following standard has been used to assess the goods regarding their electromagnetic compatibility:

DIN EN 61326-1:2022-11

Des Weiteren fallen diese Geräte mit einem Druckmessbereich > 0,5 bar als „druckhaltende Ausrüstungsteile" unter die

Moreover, these instruments with a pressure range > 0.5 bar are, as pressure equipment parts, subject to

Druckgeräterichtlinie (2014/68/EU).

Pressure Equipment Directive (2014/68/EU).

Diese Geräte werden nach geltender guter Ingenieurpraxis ausgelegt und gefertigt.
Mit Messbereichen ab 0 – 200 bar wurden sie folgendem Konformitätsbewertungsverfahren unterzogen:

These instruments are designed and manufactured according to sound engineering practice.
Versions with pressure ranges from 0 – 200 bar are subjected to the following conformity assessment procedure:

Modul A „Interne Fertigungskontrolle"

Module A "Internal Production Control"

Soweit zutreffend erstreckt sich die CE-Kennzeichnung dann auch auf diese Richtlinie.

As far as they are concerned, the CE-marking then also applies to this directive.

Diese Erklärung wird verantwortlich für den Hersteller:
This declaration is issued under the sole responsibility of the manufacturer:

ARMANO Messtechnik GmbH
abgegeben durch / *by*
Grünhain-Beierfeld, 2023-06-12

Bernd Vetter
Geschäftsführender Gesellschafter / *Managing Director*

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137 EU-Konformitätserklärung Digitalmanometer Ausg. 06/23