



Contents

1.	Information on This Operating Instruction	1
1.1	Pictographs Used	2
1.2	Exclusion of Liability	2
2.	Safety Instructions	2
3.	Device Description	4
3.1	Scope of Application	4
3.2	Intended Use	4
3.3	Configuration and Function	4
4.	Technical Data	5
5.	Installation	6
5.1	Mechanical Connection	6
5.2	Installation Conditions	6
5.3	Heat Dissipation from the Process Before Commissioning	7
5.4	Before Commissioning	7
6.	Menu Navigation	7
6.1	Measuring Mode	7
6.2	Minimum/Maximum Value Memory	8
6.2.1	Maximum Value Memory	8
6.2.2	Minimum Value Memory	8
6.3	Parametrisation Mode	8
6.3.1	Submenu Measuring Rate	8
6.3.2	Submenu Unit	9
6.3.3	Info Menu	9
6.4	Error Indication	9
7.	Maintenance/Cleaning, Storage and Transport	9
8.	Dismounting and Disposal	10
9.	CE Conformity	10
10.	Declaration of Conformity	11

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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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.
- During operation, the mounting parts can become very hot.



DANGER! Risk of burns!

- Please ensure that the process is unpressurised before installing or removing the mounting part. Otherwise, there is a risk that hot, corrosive, toxic or explosive substances leak.



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

- Never install a version for mounting into thermowells without a thermowell into a process, which is pressurised or by other means critical. These versions do not seal the process!
- Degree of protection according to DIN EN 60 529: 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 dismantling 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 medium temperature has to be within the specifications of the device.
- Ensure that construction type and materials of the thermometer 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. Use thermowells for easy installation and removal.



IMPORTANT! The instrument contains a lithium battery.

- When handled properly, lithium batteries are safe. If, however, used incorrectly or misused, the following consequences may arise:
 - Leaking of battery fluid
 - Escaping of gas
 - Fire
 - Explosion

 Please observe the following warnings for safe operations:

- Ensure that the battery terminals are in the correct position.
- Do never short-circuit the batteries.
- Do never cause the batteries to overheat.
- Do not use batteries that show signs of damage.
- Do never attempt to recharge the batteries.
- Do never deeply discharge the batteries.
- Do never attempt to open the batteries.
- Dispose of the batteries properly (⇒ chapter 8 “Dismounting and Disposal”).

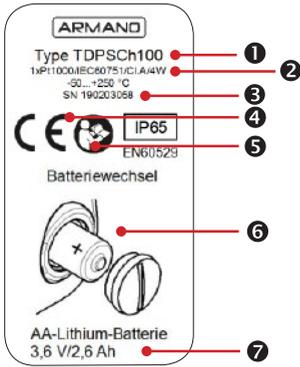
Operating Instructions

Digital Thermometers TDP... – LILLYplus

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 thermometers are used for standard industrial temperature measurement. They are generally manufactured in accordance with the standards DIN EN 60 751 and DIN EN 61 515. Further information on the instruments can be found in the data sheets 8302 and 8322.

Nameplate:



- 1 Model
- 2 Sensor characteristics
(number x measuring element/accuracy class/
connection method/lower limit of measuring range/
upper limit of measuring range)
- 3 Serial number (the first four numbers represent
the year of manufacture, followed by the week of
manufacture)
- 4 Symbol "CE"
- 5 Symbol "Please regard manual"
- 6 Symbol "Battery replacement"
- 7 Battery type

3.1 Scope of Application

The manual is valid for digital thermometer models LILLYplus. Information, which is not given in this manual, can be found in the respective product data sheets if necessary.

3.2 Intended Use

Our digital thermometers are suitable for the temperature measurement in liquids or gases. Applications that are not explicitly listed as according to regulations, are improper to intended purpose!

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.

3.3 Configuration and Function

Digital thermometers consist of a temperature sensor (also referred to as stem, immersion tube, sensor probe etc.), which is composed of a closed tubular body, with a measuring resistor appropriately embedded in its tip.

The temperature-dependent change in resistance of the platinum is used as measuring effect and can be metrologically processed as a resistance signal. Depending on the construction type and the used measuring element, temperatures of $-99.9\text{ }^{\circ}\text{C}$ up to $+500\text{ }^{\circ}\text{C}$ ($-147.82\text{ }^{\circ}\text{F}$ up to $+932\text{ }^{\circ}\text{F}$) can be measured with digital thermometers.

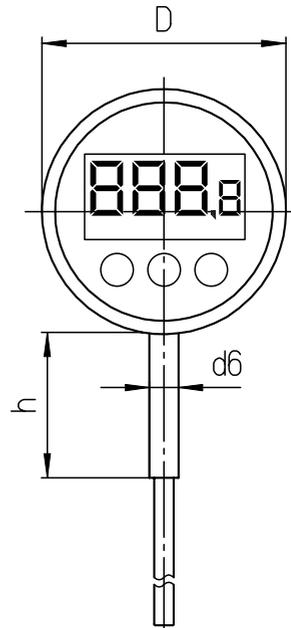


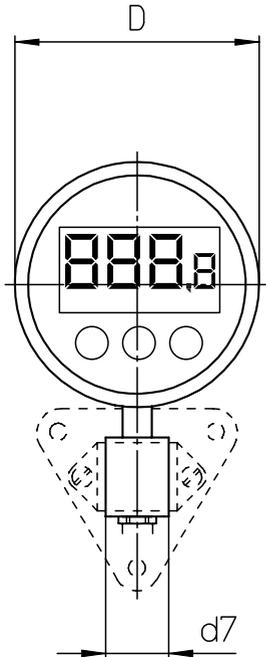
Figure 3.3-1: TDPCh 100

Operating Instructions

Digital Thermometers TDP... – LILLYplus

4. Technical Data

The battery-operated digital thermometer models LILLYplus consist of an easy-to-read LC display and a platinum resistance thermometer that are built into a robust thermometer standard case made of stainless steel. They can be manufactured with the same construction types (according to DIN EN 13 190) as mechanical thermometers. They can be applied as an alternative to mechanical thermometers if these reach their limits due to difficult installation conditions, vibrations or accuracy requirements. Due to the high accuracy, the instruments of the LILLYplus series are also suitable as an alternative for mercury-in-glass thermometers.



Measuring element	platinum measuring resistor Pt1000 according to DIN EN 60 751 in 4-wire connection
Measuring ranges	-50.0 / +250.0 °C -99.9 / +500.0 °C resolution 0.1 K
Unit	switchable °C / °F
Ambient temperature ranges	operation and storage: -20 °C to +70 °C
Accuracy	±0.1 % FS ±1 digit
Measuring rate	adjustable from 1 s to 30 s
Display	LC display digit height 25 mm (0.98")
Battery	AA, 2600 mAh (Li-SoCl ₂), 3.6 V included in the scope of delivery, replaceable by the customer battery life > 1 year, depending on application (with a set measuring rate of ≥ 10 s)
Error monitoring	battery voltage, sensor short circuit, sensor break
Temperature sensor	material: stainless steel 316Ti (1.4571) max. static operating pressure: 25 bar stem models: E1, E3, E4, E4.1, E5 or E6 stem Ø dF: 6, 8 or 10 mm (0.24, 0.31 or 0.39") stem length L: max. 2.50 m (8.2')
Case	with bayonet ring, stainless steel 1.4301, with pressure equalising element
Nominal case size	100 mm (4")
Degree of protection (DIN EN 60 529)	IP65

Figure 3.3-2: TDPKCh 100

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 process temperature within the measuring range?
- Does the process connection comply with the requirements?

5.1 Mechanical Connection

The mechanical connection of the thermometers is carried out according to the general technical rules for the selected connection type.



When screwing in the thermometer, do not exert any force on the case, plug connector, etc., but only on the designated elements of the connection type (e.g. wrench flats of thread connections).

For sealing the process or the thermowell installed with cylindrical screw fittings (e.g. G 1/2), gaskets made of appropriate material must be used. Conical screw fittings (e.g. 1/2" NPT) seal in the thread due to their cone-shaped geometry – if necessary by using additional appropriate sealants, e.g. PTFE tape (Please observe the operating temperature!).

Sealing material has to be replaced after being dismounted.

5.2 Installation Conditions

The installation situation may have a significant influence on the accuracy of the temperature sensor. A reasonable compromise between demands on measuring accuracy and mechanical strength should always be found.

The mass of the thermometer mounting part should be kept to a minimum in order to avoid installation errors. However, thermometer thermowells are highly-stressed components, which, due to the lateral inflow at high temperatures and pressures, not only undergo a bending moment but are also subjected to vibration. If these are within the range of the natural frequency of the thermowell, it can easily result in an overload. This can be prevented beforehand by carrying out a thermowell calculation.

Temperature sensors should be optimally installed in a way that the medium flows against the tip of the thermowell to achieve a better thermal transfer (⇒ figure 5.2-1). Otherwise, an adverse dead flow zone could be created on the tip of the thermowell.

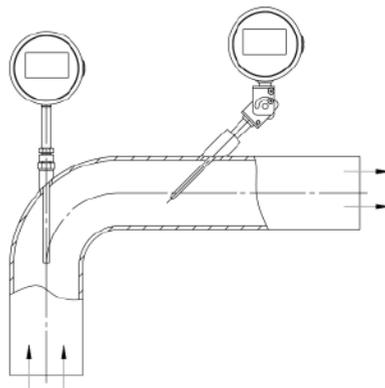


Figure 5.2-1: position of installation and flow direction

Furthermore, the installation length should be regarded. Install the temperature sensor in a way that at least 5 times the diameter of the stem is completely immersed in the medium. Measuring errors do occur if the stem is not fully immersed in the medium.

A 1:5 ratio between sensor diameter and installation length results in an installation error of 1 % (e.g. d1=Ø9, U1=45) (⇒ figure 5.2-2).

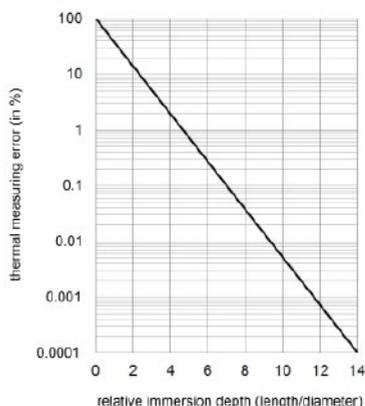


Figure 5.2-2: installation error depending on the immersion depth

Please regard the temperature distribution of the medium at the installation location of the thermometer. Avoid measurements too close to walls of large vessels or in dead spaces of pipes if this does not correspond to the actual measurement task. When using thermowells, the thermal contact resistance between outside wall of the stem and inner wall of the thermowell can be reduced by means of a thermal contact agent.

Avoid the installation in pipe sections with flow turbulences. If possible, maintain an installation clearance of 10 times the pipe diameter from pipe bends, valves, gate valves, tapers or others.

5.3 Heat Dissipation from the Process

The values for the operating temperature range, indicated in the data sheets, are based on the temperature resistance of the temperature sensor. The maximum permissible temperatures of the other thermometer components are indicated as maximum permissible ambient temperatures. The user has to ensure that those values are not exceeded, also in regard to the heat dissipation from the process.

For the electrical thermometers, this is usually achieved by extending the neck tube.

5.4 Before Commissioning



The device is supplied with an insulating disc. Please remove it prior to commissioning!

6. Menu Navigation

6.1 Measuring Mode

If you do not press any button and there is no error, the thermometer is in the measuring mode. It measures the temperature and indicates it in the display. After initialising, the instrument is in the measuring mode. If the thermometer is in a submenu of the operator guidance and no button is pressed within 10 sec, the display returns to the measuring mode.

The following inputs are possible in the measuring mode:



Pressing the button **"MENU"** for less than 15 sec:

- The device changes into the parametrisation mode.
⇒ chapter 6.3 "Parametrisation Mode"

Pressing the button **"MENU"** for more than 15 sec:

- The device is reset.
Please regard: In this case, the information on the minimum and maximum value memory will be deleted.



Pressing the button **"UP/MAX"** for less than 3 sec:

- The device indicates the current content of the maximum value memory.
⇒ chapter 6.2 "Minimum/Maximum Value Memory"

Pressing the button **"UP/MAX"** for more than 3 sec:

- Resets the content of the maximum value memory to the current measured value.
⇒ chapter 6.2 "Minimum/Maximum Value Memory"



Pressing the button **"DOWN/MIN"** for less than 3 sec:

- The device indicates the current content of the minimum value memory.
⇒ chapter 6.2 "Minimum/Maximum Value Memory"

Pressing the button **"DOWN/MIN"** for more than 3 sec:

- Resets the content of the minimum value memory to the current measured value.
⇒ chapter 6.2 "Minimum/Maximum Value Memory"

6.2 Minimum/Maximum Value Memory

The instrument is equipped with a minimum/maximum value storage. There, both the lowest and the highest measured value is stored. To receive significant values from the memories, it is recommended to reset the memories before the process to be measured enters a critical phase (e.g. prior to feeding a furnace with a new product batch).

6.2.1 Maximum Value Memory



By pressing the button “**UP/MAX**” in the measuring mode for less than 3 sec, the content of the maximum value memory is indicated in the display. Additionally, the notification **MAX** is indicated in the info area in the bottom section of the display.

By pressing the button “**UP/MAX**” in the measuring mode for more than 3 sec, the content of the maximum value memory can be reset to the current measured value. After pressing the button for 3 seconds, the following query appears in the display:

RESET MAX?
YES / NO

Confirm by pressing the button “**UP/MAX**” ⇒ **YES** and the maximum value memory is reset.

With the button “**DOWN/MIN**” ⇒ **NO** you return into the measuring mode and the maximum value memory remains unchanged.

6.2.2 Minimum Value Memory



By pressing the button “**DOWN/MIN**” in the measuring mode for less than 3 sec, the content of the minimum value memory is indicated in the display. Additionally, the notification **MIN** is indicated in the info area in the bottom section of the display.

By pressing the button “**DOWN/MIN**” in the measuring mode for more than 3 sec, the content of the minimum value memory can be reset to the current measured value. After pressing the button for 3 seconds, the following query appears in the display:

RESET MIN?
YES / NO

Confirm by pressing the button “**UP/MAX**” ⇒ **YES** and the minimum value memory is reset.

With the button “**DOWN/MIN**” ⇒ **NO** you return into the measuring mode and the minimum value memory remains unchanged.

6.3 Parametrisation Mode



In the parametrisation mode, the operator can make various device settings. To access the parametrisation mode, press the button “**MENU**” briefly.



The parametrisation mode has submenus you can switch between by pressing the buttons “**UP**” and “**DOWN**”.



To access into a submenu, press the button “**MENU**” briefly. To exit a submenu without making any changes, select **EXIT** or wait 10 seconds until the device returns into the measuring mode automatically.

6.3.1 Submenu Measuring Rate

Select **MEAS.RATE** with the buttons “**UP**” and “**DOWN**” and press the button “**MENU**” to access the submenu measuring rate. Here again, select the required measuring rate with the buttons “**UP**” and “**DOWN**” and confirm with the button “**MENU**”.

The following measuring rates are available:
1 sec to 30 sec



Increasing the measuring rate results in reduced battery life!

6.3.2 Submenu Unit

Select **UNIT** with the buttons “**UP**” and “**DOWN**” and press the button “**MENU**” to access the submenu unit. Here again, select the required unit with the buttons “**UP**” and “**DOWN**” and confirm with the button “**MENU**”.

The following units are available:
°C and °F

6.3.3 Info Menu

Select **INFO** with the buttons “**UP**” and “**DOWN**” to access the instrument information. Here, the software revision, the serial number, the lower limit of the measuring range and the upper limit of the measuring range are displayed.

With the measuring range values, the adjustment points are not set.

Optionally, the adjustment points can be set separately ex works.

INFO	
REV.	2.1
SERIAL	123456789
MR LO	-50.0
MR HI	+250.0

6.4 Error Indication

In case of errors, the instrument issues three different error notifications in the display.

- upper limit exceeded or sensor break
ERR OVERRANGE
- fallen below lower limit or sensor short circuit
ERR UNDERRANGE
- battery voltage too low
ERR LOW BAT



7. 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 thermometers are maintenance-free, only the battery has to be replaced if necessary. To do so, unscrew the lid of the battery compartment, replace the battery and screw on the lid again.
- To assure the accuracy of measurement, we recommend recalibrating the digital thermometers 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.

Operating Instructions

Digital Thermometers TDP... – LILLYplus

Storage:

- If possible, store the instrument in its original packaging.
- If possible, 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:



IMPORTANT! Please regard the legal requirements for the transport of lithium metal batteries.

Please send the instruments only with installed lithium metal battery.

Place the supplied insulating disc in front of the positive pole of the lithium metal battery.

- 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.

Replacement of the measuring insert:

IMPORTANT! The measuring insert cannot be replaced for these instruments.

8. 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.

Disposal of used batteries:

- Cover the poles with tape during storage and disposal to avoid short circuits.
- Dispose of used batteries properly in commercial collection boxes or at municipal collection points.

9. CE Conformity



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

EMC directive 2014/30/EU

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

10. Declaration of Conformity

EU-Konformitätserklärung

EU Declaration of Conformity

Für die nachfolgend bezeichneten Erzeugnisse

We hereby declare for the following named goods

**DIGITALTHERMOMETER
TYPEN TD..., TDP...**

***DIGITAL THERMOMETERS
Models TD..., TDP...***

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

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

Diese Erklärung gilt für alle Exemplare, die nach den Datenblättern 8301, 8302, 8321, 8322 hergestellt werden.

This declaration applies to any specimen manufactured according to the data sheets 8301, 8302, 8321, 8322.

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:

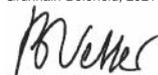
DIN EN 61326-1:2013-07

119 EU-Konformitätserklärung Digitalthermometer Typen TD..., TDP... Ausg. 04/21

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, 2021-04-13



Bernd Vetter
Geschäftsführender Gesellschafter / Managing Director

ARMANO

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