



Dehydrating breather

MESSKO® MTRAB®

Operating instructions

6820378/04 EN . Version 2.5



© All rights reserved by Maschinenfabrik Reinhausen

Dissemination and reproduction of this document and use and disclosure of its content are strictly prohibited unless expressly permitted.

Infringements will result in liability for compensation. All rights reserved in the event of the granting of patents, utility models or designs.

The product may have been altered since this document was published.

We reserve the right to change the technical data, design and scope of supply.

Generally the information provided and agreements made when processing the individual quotations and orders are binding.

The original operating instructions were written in German.

Table of contents

1	Introduction.....	7
1.1	Manufacturer.....	7
1.2	Completeness.....	7
1.3	Subject to change without notice	7
1.4	Safekeeping.....	7
1.5	Notation conventions	8
1.5.1	Hazard communication system	8
1.5.2	Information system.....	9
1.5.3	Instruction system	9
1.5.4	Typographic conventions	10
2	Safety.....	11
2.1	General safety information.....	11
2.2	Appropriate use	11
2.3	Inappropriate use.....	12
2.4	Fundamental safety instructions	12
2.5	Personnel qualification.....	14
2.6	Personal protective equipment	15
3	Product description.....	16
3.1	Scope of delivery	16
3.2	Design/versions	17
3.3	Function description.....	18
3.4	Terminal box.....	19
3.5	Controller for silica gel heating	21
3.6	Status LEDs.....	21
3.7	Self-monitoring function.....	22
3.8	Outputs	22
3.9	Filter heater (HT version) (optional).....	22
3.10	NFC and Bluetooth® (optional)	23

Table of contents

3.11	Test button.....	23
3.12	Safety markings and nameplate	24
4	Packaging, transport and storage	25
4.1	Purpose	25
4.2	Suitability, structure and production.....	25
4.3	Markings	25
4.4	Transportation, receipt and handling of shipments.....	25
4.5	Storage of shipments.....	27
4.6	Further transport.....	27
4.7	Unpacking.....	27
5	Mounting	31
5.1	Installation recommendations.....	31
5.2	Checking the connecting flange on the transformer	33
5.3	Preparing the device.....	34
5.4	Mounting the device on the counterflange.....	37
5.4.1	Attaching the lifting gear.....	38
5.4.2	Inserting the flange gasket.....	40
5.4.3	Screwing on the flanges.....	41
5.4.4	Aligning the device	45
5.4.5	Tightening the double screw connection.....	45
5.4.6	Removing the lifting gear again.....	47
5.5	Removing the red protective cap	47
6	Electrical connection	49
6.1	Electromagnetic compatibility	49
6.1.1	Wiring requirement of installation site	49
6.1.2	Wiring requirement of operating site	50
6.2	Supply voltage	50
6.3	Cable recommendation.....	51

Table of contents

6.4	Routing and preparing the cable.....	52
6.5	Connecting the supply voltage.....	56
6.6	Connecting the regeneration signaling relay	57
6.7	Connecting the device error signaling relay.....	58
6.8	Connecting analog outputs	59
6.9	Connecting the RS485 interface and configuring Modbus (optional) . 61	
6.9.1	4-conductor full duplex	61
6.9.2	2-conductor half duplex.....	63
6.9.3	Notes on connecting to the MR sensor bus	64
6.9.4	MESSKO® MTRAB® 2.5	67
6.9.5	Modbus settings	69
6.10	Closing the terminal box	70
6.11	Additional device grounding.....	72
6.12	Dielectric test	73
6.13	Ground test.....	74
7	Commissioning.....	75
7.1	Device self test during commissioning.....	76
7.2	Adjusting Modbus settings.....	77
7.3	Establishing a connection with the app (optional with NFC and Bluetooth®).....	77
8	Operation.....	80
8.1	Gamma controller (DB200G only)	82
9	Error messages and troubleshooting.....	84
9.1	Error messages	86
9.2	Status messages	88
9.3	Fuse.....	89
9.4	Replacing the battery (CR2032)	91

Table of contents

9.5	Contaminated silica gel.....	92
10	Maintenance, inspection and care	94
10.1	Maintenance	94
10.2	Inspection	94
10.3	Test button.....	95
10.3.1	Quick test	96
10.3.2	Long test	99
10.4	MSET MTRAB® data logger software (optional).....	101
10.5	Care	101
11	Disposal.....	103
11.1	SVHC information in accordance with the REACH regulation.....	103
12	Technical data.....	104
12.1	Technical data	104
12.2	Application table	111
13	Dimensional drawings	113
13.1	SED_6653712_000_00	114
13.2	SED_6356077_00_000_2	115
13.3	SED_6367297_00_000_2	116
13.4	SED_6600056_000_00	117
13.5	SED_6600296_000_00	118
13.6	SED_6368543_00_000_2	119
13.7	SED_6356099_00_000_2	120
14	Appendix	121
14.1	Modbus RTU.....	121
14.2	RS485 communication settings	123
	Glossary	124

This technical document contains detailed descriptions on the safe and proper installation, connection, commissioning and monitoring of the product.

This technical document is intended solely for specially trained and authorized personnel.

1.1 Manufacturer

Maschinenfabrik Reinhausen GmbH
Falkensteinstrasse 8
93059 Regensburg
Germany

Tel.: +49 941 4090-0

E-mail: sales@reinhausen.com

Internet: www.reinhausen.com

MR Reinhausen customer portal: <https://portal.reinhausen.com>

Further information on the product and copies of this technical file are available from this address if required.

1.2 Completeness

This technical document is incomplete without the following documentation:

- Quick guide
- Order confirmation

1.3 Subject to change without notice

The information contained in this technical file comprises the technical specifications approved at the time of printing. Significant modifications will be included in a new edition of the technical file.

The document number and version number of this technical file are shown in the footer.

1.4 Safekeeping

Keep this technical file and all supporting documents ready at hand and accessible for future use at all times.

1 Introduction

1.5 Notation conventions

This section contains an overview of the symbols and textual emphasis used.

1.5.1 Hazard communication system

Warnings in this technical file are displayed as follows.

1.5.1.1 Warning relating to section

Warnings relating to sections refer to entire chapters or sections, sub-sections or several paragraphs within this technical document. Warnings relating to sections have the following format:

WARNING




Type of danger!

Source of the danger and its consequences.

- ▶ Action
- ▶ Action

1.5.1.2 Embedded warning information

Embedded warnings refer to a particular part within a section. These warnings apply to smaller units of information than the warnings relating to sections. Embedded warnings use the following format:

 **DANGER!** Instruction for avoiding a dangerous situation.

1.5.1.3 Signal words

Depending on the product, the following signal words are used:

Signal word	Meaning
DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Signal word	Meaning
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates measures to be taken to prevent damage to property.

Table 1: Signal words in warning notices

1.5.2 Information system

Information is designed to simplify and improve understanding of particular procedures. In this technical file it is laid out as follows:



Important information.

1.5.3 Instruction system

This technical file contains single-step and multi-step instructions.

Single-step instructions

Instructions which consist of only a single process step are structured as follows:

Aim of action

✓ Requirements (optional).

▶ Step 1 of 1.

⇒ Result of step (optional).

⇒ Result of action (optional).

Multi-step instructions

Instructions which consist of several process steps are structured as follows:

Aim of action

✓ Requirements (optional).

1. Step 1.

⇒ Result of step (optional).

1 Introduction

2. Step 2.

⇒ Result of step (optional).

⇒ Result of action (optional).

1.5.4 Typographic conventions

Typographic convention	Purpose	Example
UPPERCASE	Operating controls, switches	ON/OFF
[Brackets]	PC keyboard	[Ctrl] + [Alt]
Bold	Software operating controls	Press Continue button
...>...>...	Menu paths	Parameter > Control parameter
<i>Italics</i>	System messages, error messages, signals	<i>Function monitoring</i> alarm triggered
[▶ Number of pages]	Cross reference	[▶ Page 41].
<u>Dotted underscore</u>	Glossary entry, abbreviations, definitions, etc.	<u>Glossary entry</u> .

Table 2: Typographic conventions used in this technical file

This technical document contains detailed descriptions on the safe and proper installation, connection, commissioning and monitoring of the product.

- Read this technical document through carefully to familiarize yourself with the product.
- This technical document is a part of the product.
- Read and observe the safety instructions provided in this chapter in particular.
- Observe the warnings in this technical document in order to avoid function-related dangers.
- The product is manufactured on the basis of state-of-the-art technology. Nevertheless, risks to life and limb of the user or impairment of the product and other material assets may occur during use due to function-related dangers.

2.1 General safety information

All persons responsible for the assembly and commissioning of the device must have sufficient specialist training.

Improper operation or misuse may lead to:

- Serious injury or death
- Damage to the device and other property of the user
- A reduction in the efficient functioning of the equipment

2.2 Appropriate use

The maintenance-free MESSKO® MTRAB® dehydrating breather is used in oil-insulated transformers, reactors and tap changers for dehydrating the air sucked into oil conservators.

The product is designed solely for use in stationary large-scale systems.

If used as intended, in compliance with the requirements and conditions specified in this technical document and observing the warning notices in this technical document and attached to the product, the product does not pose a risk of injury or damage to property or the environment. This applies throughout the service life of the product, from delivery, installation and operation to removal and disposal.

2 Safety

The following is considered intended use:

- Operate the product in accordance with this technical document, the agreed-upon delivery conditions and the technical data.
- Ensure that all necessary work is performed by qualified personnel only.
- Only use the devices supplied for the intended purpose and in accordance with the specifications in this technical document.
- Observe the notices in this technical document regarding electromagnetic compatibility and the technical data.

2.3 Inappropriate use

Use is considered inappropriate if the product is used other than as described in the "Appropriate use" section.

Maschinenfabrik Reinhausen GmbH assumes no liability for damage resulting from unauthorized or improper modification of the product. Improper modifications to the product without consulting Maschinenfabrik Reinhausen GmbH can lead to personal injury, damage to property and malfunctions.

2.4 Fundamental safety instructions

To prevent accidents, malfunctions and damage as well as unacceptable adverse effects on the environment, those responsible for transport, installation, operation, maintenance and disposal of the product or parts of the product must ensure the following:

Personal protective equipment

Loosely worn or unsuitable clothing increases the danger of becoming trapped or caught up in rotating parts and the danger of getting caught on protruding parts. This results in danger to life and limb.

- All necessary devices and personal protective equipment required for the specific task, such as a hard hat, safety footwear, etc. must be worn. Observe the "Personal protective equipment" [► Section 2.6, Page 15] section.
- Never wear damaged personal protective equipment.
- Never wear rings, necklaces or other jewelry.
- If you have long hair, wear a hairnet.

Work area

Untidy and poorly lit work areas can lead to accidents.

- Keep the work area clean and tidy.
- Make sure that the work area is well lit.
- Observe the applicable laws for accident prevention in the relevant country.

Explosion protection

Highly flammable or explosive gases, vapors and dusts can cause serious explosions and fire.

- Do not install or operate the product in areas where a risk of explosion is present.

Safety markings

Warning signs and safety information plates are safety markings on the product. They are an important aspect of the safety concept. Safety markings are depicted and described in the chapter "Product description".

- Observe all safety markings on the product.
- Make sure all safety markings on the product remain intact and legible.
- Replace safety markings that are damaged or missing.

Ambient conditions

To ensure reliable and safe operation, the product must only be operated under the ambient conditions specified in the technical data.

- Observe the specified operating conditions and requirements for the installation location.

Modifications and conversions

Unauthorized or inappropriate changes to the product may lead to personal injury, material damage and operational faults.

- Only modify the product after consultation with the manufacturer.

2 Safety

Spare parts

Spare parts not approved by the manufacturer may lead to physical injury and damage to the product.

- Only use spare parts approved by the manufacturer.
- Contact the manufacturer.

Working during operation

You must only operate the product when it is in a sound operational condition. Otherwise it poses a danger to life and limb.

- Regularly check the operational reliability of safety equipment.
- Perform the inspection tasks described in this technical document regularly.

2.5 Personnel qualification

The person responsible for assembly, commissioning, operation and inspection must have the following qualifications.

Electrically skilled person

The electrically skilled person has a technical qualification and therefore has the required knowledge and experience, and is also conversant with the applicable standards and regulations. The electrically skilled person is also proficient in the following:

- Can identify potential dangers independently and is able to avoid them.
- Is able to perform work on electrical systems.
- Is specially trained for the working environment in which (s)he works.
- Must satisfy the requirements of the applicable statutory regulations for accident prevention.

Technical Service

We strongly recommend having repairs and retrofitting carried out by our Technical Service department. This ensures that all work is performed correctly. If repair work is not carried out by our Technical Service department, please ensure that the personnel who carry out the repairs are trained and authorized to do so by Maschinenfabrik Reinhausen GmbH.

Maschinenfabrik Reinhausen GmbH

Technical Service
P.O. Box 12 03 60
93025 Regensburg
Germany

Phone: +49 941 4090-0

E-mail: service@reinhausen.com

Internet: www.reinhausen.com

2.6 Personal protective equipment

Personal protective equipment must be worn during work to minimize risks to health.

- Always wear the personal protective equipment required for the job at hand.
- Never wear damaged personal protective equipment.
- Observe information about personal protective equipment provided in the work area.

Protective clothing	Close-fitting work clothing with a low tearing strength, with tight sleeves and with no protruding parts. It mainly serves to protect the wearer against being caught by moving machine parts.
Safety shoes	To protect against falling heavy objects and slipping on slippery surfaces.
Safety glasses	To protect the eyes from flying parts and splashing liquids.
Visor	To protect the face from flying parts and splashing liquids or other dangerous substances.
Hard hat	To protect from falling and flying parts and materials.
Hearing protection	To protect against hearing damage.
Protective gloves	To protect against mechanical, thermal and electrical hazards.

Table 3: Personal protective equipment

3 Product description

This chapter contains an overview of the design and function of the product.

The dehydrating breather is mounted using a "flange" as standard with the option of 2 side "mounting rods" on the pipe for venting and dehydrating the oil conservator.

3.1 Scope of delivery

The following components are included in the delivery:

- Dehydrating breather
- DIN flange including mounting kit and gasket or 4-hole circular flange or 2-hole RM flange for DB100 (all optional)
- Operating instructions
- Quick guide

3.2 Design/versions

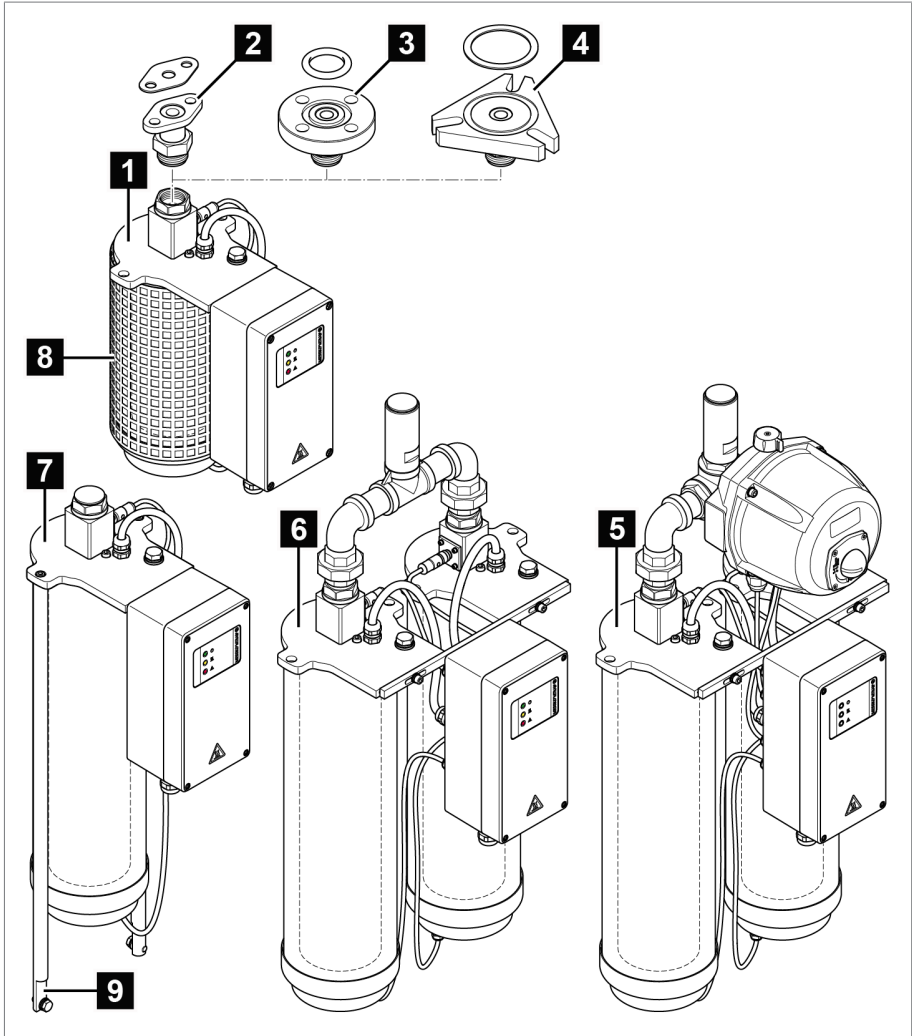


Figure 1: Design

1 DB100

2 2-hole RM flange*)

3 4-hole circular flange*)

4 DIN flange*)

5 DB200G (not as an offshore version, not with NFC and Bluetooth®)

6 DB200D

3 Product description

7 DB200

8 Protective grate (optional)

9 Additional fastening points on the side (optional)

*) For details, see the technical data and dimensional drawings

3.3 Function description

The dehydrating breather is used in oil-insulated transformers, reactors or tap changers for dehydrating the air sucked into oil conservators.

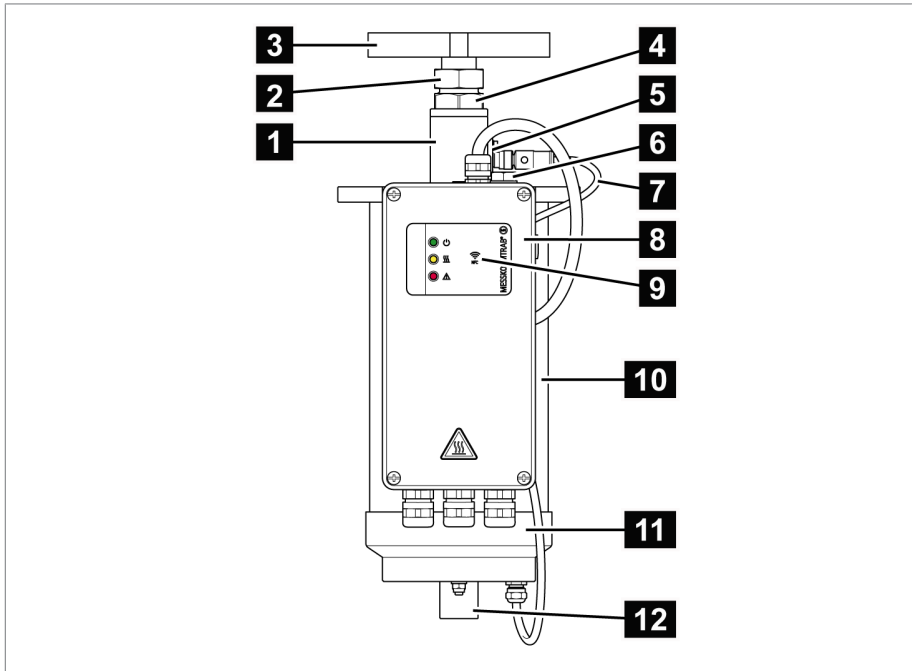


Figure 2: Overview

1 Upper air spout

2 Lock nut

3 Mounting flange (configurable)

4 Nut

5 Temperature and humidity sensor

6 Grounding screw

7 Sensor cable and cable protection (optional)

8 Terminal box (lacquer color configurable)

3 Product description

9 Position of the NFC antenna (optionally with NFC and Bluetooth®)	10 Desiccant container
11 Lower metal flange	12 Dust protection tube with insect protection grille (optional) or with filter heating (optional HT version)

For illustrations of the various designs, see Dimensional drawings.

3.4 Terminal box

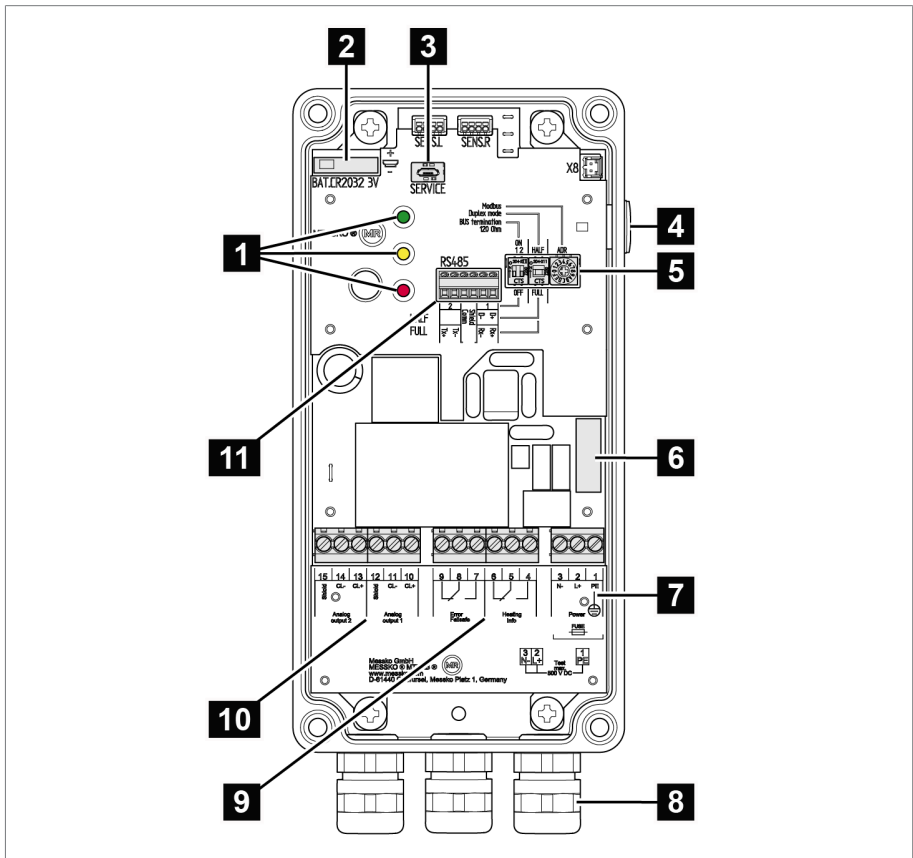


Figure 3: Terminal box

1 LEDs for status display	2 RTC buffer battery (type CR2032)
3 USB service interface	4 Test button

3 Product description

5 Modbus settings (optional)	6 Fuse
7 Supply voltage 100...127 V DC / AC 50/60 Hz 200...240 V DC / AC 50/60 Hz	8 Cable gland M20x1.5 (brass/stainless steel) or 1/2" 14NPT (brass)
9 Signaling relay	10 Analog output 1 (temperature) Analog output 2 (humidity) 0...20 mA or 4...20 mA

11 RS485 interface (optional)

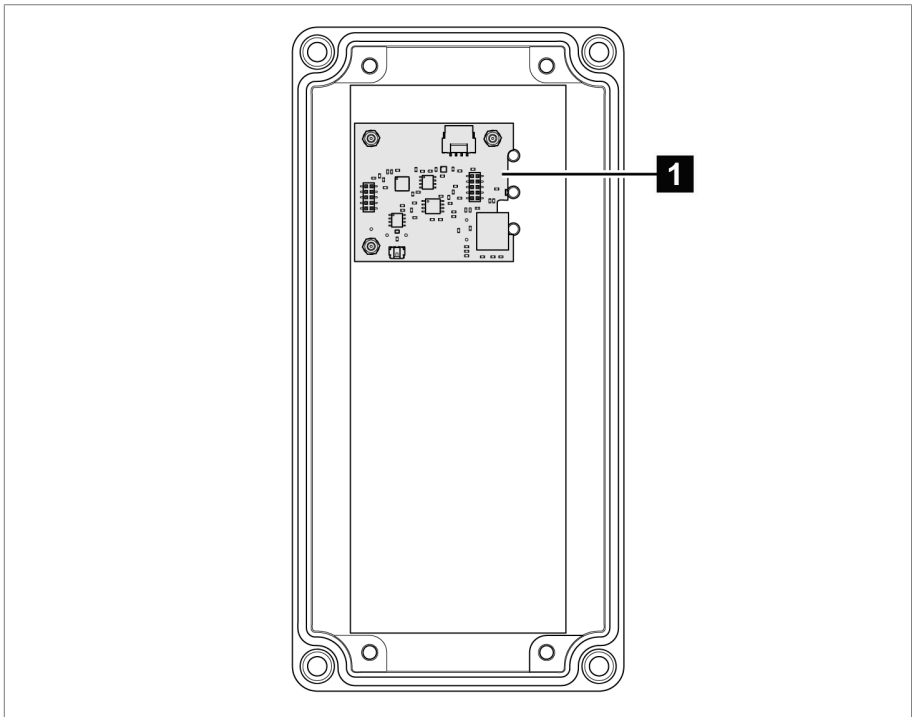


Figure 4: Cover of the terminal box with NFC and Bluetooth® extension circuit board

-
- 1 NFC and Bluetooth® extension circuit board (optionally with NFC and Bluetooth®)
-

3.5 Controller for silica gel heating

The dehydrating breather is delivered with an alpha controller, beta controller or gamma controller.

The recommended application areas for the different versions of the dehydrating breather are specified in the Applications table (see [► Section 12.2, Page 111]).

3.6 Status LEDs

There are 3 LEDs **1** **2** **3** on the front of the terminal box that indicate the status of the device.

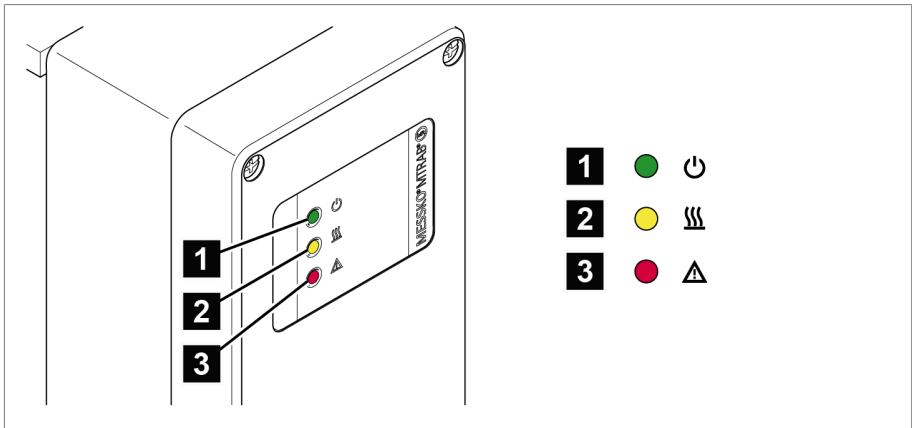


Figure 5: LEDs

-
- | | |
|---|---|
| 1 | Operating status – green LED |
| 2 | Regeneration heater – yellow LED
NFC field indicator (optionally with NFC and Bluetooth®) – blue LED |
| 3 | Device error – red LED |
-

An explanation of the various device status messages is given in the chapter Status messages [► Section 9.2, Page 88].

3 Product description

3.7 Self-monitoring function

The dehydrating breather has a self-monitoring function. If an error occurs in the device, this is indicated by the different lighting patterns of the LEDs **1** **2** **3** on the front of the terminal box, and also output by the "device error" signaling relay, position **9**. The following errors are detected:

- Supply voltage failure
- Silica gel heating error
- Sensor unit fault
- Internal error
- Ball valve failure (only with the gamma controller)

Also refer to the chapter "Error messages and troubleshooting".

3.8 Outputs

The dehydrating breather features two analog current outputs and two signaling relays for central data collection and further processing of its status.

Analog outputs (active):

Measurement of the temperature and humidity via "sensors" **5** on the upper air spout **1** (see Function description)

Analog 1 (left)	Analog 2 (right)
Temperature	Humidity

Regeneration relay output (silica gel heating):

1x changeover contact, regeneration active/inactive

Device error relay output

1x changeover contact, failsafe

3.9 Filter heater (HT version) (optional)

To ensure device functionality in low temperature environments, the stainless-steel filter is heated in the HT version. Use of the HT version is intended for applications in cold regions (ambient temperature is continuously below 0 °C for more than 20 days).

3.10 NFC and Bluetooth® (optional)

With devices with NFC and Bluetooth®, you can read off the entire data memory of the device via your smartphone. The app necessary for this, "MESSKO® MTRAB®", is available in both the App Store and the Google Play Store. This function requires GPS, NFC and Bluetooth® to be enabled on the smartphone.

The app provides the following:

- Graphical illustration of the humidity and temperature curves
- Information on the device status, e.g. a detailed status description and error description with recommendations for action
- Report generation and the ability to forward the report to MR Support
- GPS position of the location where data is being read from the device

You can use both the NFC interface and the Bluetooth® interface to connect the device to the smartphone. The NFC interface is used to read data from the device when it is switched off. In this case, you can only read off a limited amount of data covering the last 2 days (with a log interval of 20 minutes). This limited data extract includes, for example, the duration until the next regeneration and the last degree of humidity in the air during operation of the device. You can use the Bluetooth® interface with both an NFC-enabled smartphone and a smartphone without an NFC function. When the power supply to the device is active, data is transferred via an encrypted connection via Bluetooth® LE. The connection key is made available via the app.



An NFC-enabled smartphone is required to read data from a device that is not being supplied with power.



NFC and Bluetooth® are not available for the DB200G version.

3.11 Test button

The test button can be used to force a device test to be performed (Test button [► Section 10.3, Page 95]).

3 Product description

3.12 Safety markings and nameplate

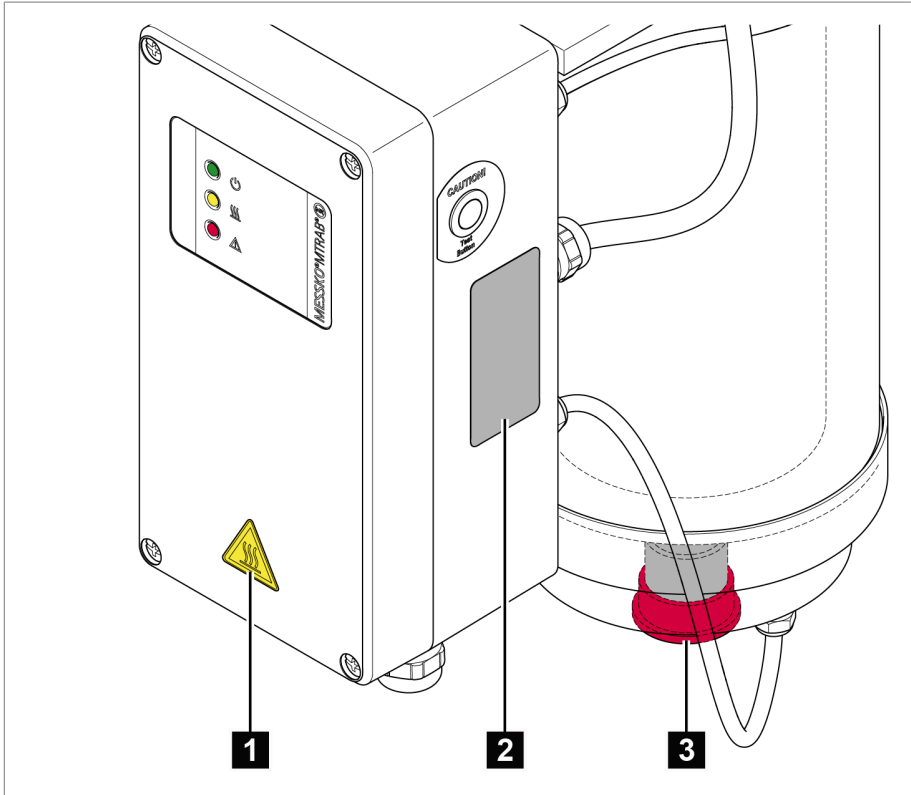


Figure 6: Safety markings

1



Risk of burns! See the chapter Operation [► Section 8, Page 80]

2



Warning symbol on the nameplate:

Danger! Observe notices in the operating instructions regarding supply voltage; see nameplate in the chapter Commissioning [► Section 7, Page 75]

3



Sticker on the dust protection tube:

Remove protective cap! See the section Removing the red protective cap [► Section 5.5, Page 47]

4 Packaging, transport and storage

4.1 Purpose

The packaging is designed to protect the packaged product during transport, loading, unloading and during periods of storage in such a way that no detrimental changes occur. The packaging must protect the goods against permitted transport stresses such as vibration, knocks and moisture (rain, snow, condensation).

The packaging also prevents the packaged goods from moving impermissibly within the packaging.

4.2 Suitability, structure and production

The goods are packaged in a sturdy cardboard box or solid wooden crate. These ensure that the shipment is secure when in the intended transportation position and that none of its parts touch the loading surface of the means of transport or touch the ground after unloading.

Inlays inside the box or crate stabilize the goods, preventing impermissible changes of position and protecting them from vibration.

4.3 Markings

The packaging bears a signature with instructions for safe transport and correct storage. The following symbols apply to the shipment of non-hazardous goods. Adherence to these symbols is mandatory.

				
Protect against moisture	Top	Fragile	Attach lifting gear here	Center of mass

Table 4: Shipping pictograms

4.4 Transportation, receipt and handling of shipments

In addition to vibrations, jolts must also be expected during transportation. In order to prevent possible damage, avoid dropping, tipping, knocking over and colliding with the product.

Should the packaging tip over or fall, damage is to be expected regardless of the weight.

4 Packaging, transport and storage

Every delivered shipment must be checked for the following by the recipient before acceptance (acknowledgment of receipt):

- Completeness based on the delivery slip
- External damage of any kind.

The checks must take place after unloading, when the box or transport container can be accessed from all sides.

Visible damage

If externally visible transport damage is detected upon receipt of the shipment, proceed as follows:

- Immediately record the transport damage found in the shipping documents and have this countersigned by the deliverer.
- In the event of severe damage, total loss or high damage costs, immediately notify the sales department at Maschinenfabrik Reinhausen GmbH and the relevant insurance company.
- After identifying damage, do not modify the condition of the shipment further and retain the packaging material until an inspection decision has been made by the transport company or the insurance company.
- Record the details of the damage on-site immediately with the transport company involved. This is essential for any claim for damages!
- If possible, photograph damage to packaging and packaged goods. This also applies to signs of corrosion on the packaged goods due to moisture (rain, snow, condensation) infiltrating the packaging.
- Make sure you also check the sealed packaging.

Hidden damage

In the event of damage that is not detected until unpacking after receipt of the shipment (hidden damage), proceed as follows:

- Make the party potentially responsible for the damage liable as soon as possible by telephone and in writing, and prepare a damage report.
- Observe the time periods applicable to such actions in the respective country. Inquire about these in good time.

With hidden damage, it is very hard to make the transportation company (or other responsible party) liable. Any insurance claims for such damage can be successful only if relevant provisions are expressly included in the insurance terms and conditions.

4 Packaging, transport and storage

4.5 Storage of shipments

When selecting and setting up the storage location, ensure the following:

- Store the product and accessories in the original packaging until installation.
- Protect stored goods against moisture (rain, flooding, water from melting snow and ice), dirt, pests such as rats, mice, termites etc. and against unauthorized access.
- Store crates and boxes on pallets, timber beams or planks as protection against ground moisture and for improved ventilation.
- Ensure that the foundation has sufficient load-bearing capacity.
- Keep entrance paths clear.
- Check the stored goods at regular intervals. Also take appropriate action after storms, heavy rain or snow etc.

4.6 Further transport

Use the original product packaging for further transport.

If you transport the product to the final installation site in a mounted state, observe the following information in order to protect the product against mechanical damage due to external influences.

Transport packaging requirements

- Select packaging suitable for the duration of transport or storage, taking the climatic conditions into consideration.
- Ensure that the packaging protects the product against transport stress such as shaking, vibrations and impacts.
- Ensure that the packaging protects the product against moisture such as rain, snow and condensation.
- Ensure that the packaging allows for sufficient air circulation in order to prevent the formation of condensation.

4.7 Unpacking

In order to remove the DB100 / DB200 dehydrating breather from the packaging, proceed as follows:

1. Remove the DB100 / DB200 from the packaging as shown in the image.

4 Packaging, transport and storage

2. Place on an open, flat surface so that the glass cylinder of the desiccant container is exposed.

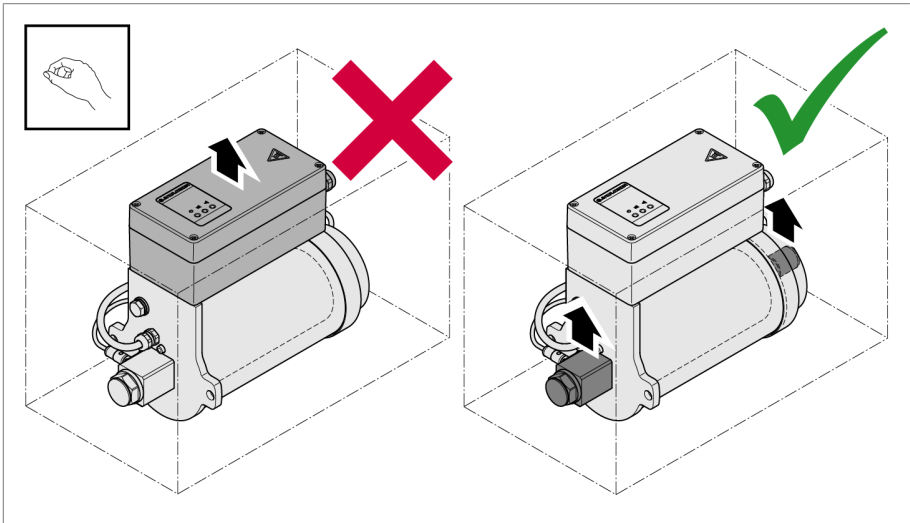


Figure 7: DB100 / DB200 removal

▲ CAUTION



Risk of injury!

Improper removal of the device from the shipping container can lead to injuries.

- ▶ Use lifting equipment or work as a pair to remove the DB200D / DB200G dehydrating breather from the transport container.
- ▶ Use lifting gear with sufficient carrying capacity.

4 Packaging, transport and storage

To remove the DB200D / DB200G dehydrating breather from the packaging, proceed as follows:

1. Grasp the connection pipe and both air exhausts on the DB200D / DB200G as shown in the image.

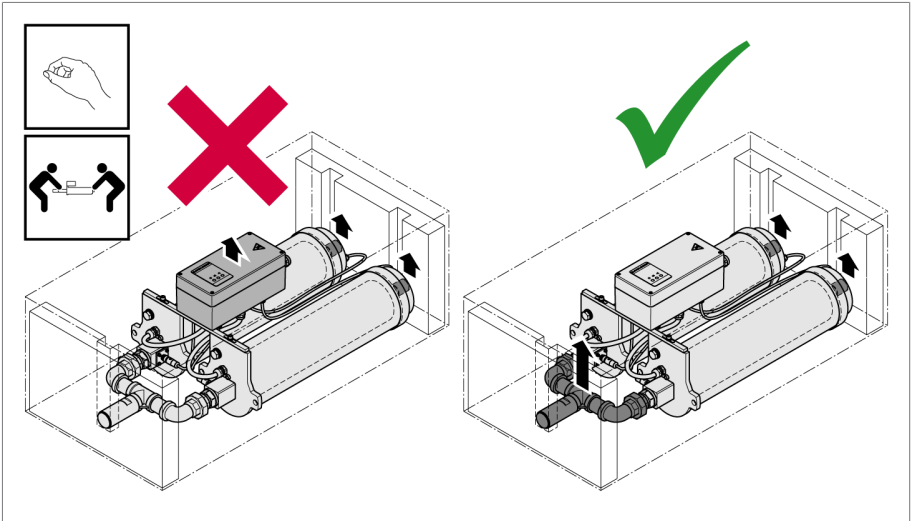


Figure 8: DB200D / DB200G removal

2. Work in pairs to remove the DB200D / DB200G from the shipping container.
3. Place the dehydrating breather on a flat surface. Ensure that the glass cylinder of the desiccant container is exposed.

NOTICE

Damage to the dehydrating breather

The device can become damaged or fall if it is set down vertically on the air exhaust.

- ▶ Do not support or set the device down on the air exhaust.
- ▶ Always set the device down horizontally.
- ▶ Hold the DB100/DB200 firmly and secure it against turning.

4 Packaging, transport and storage

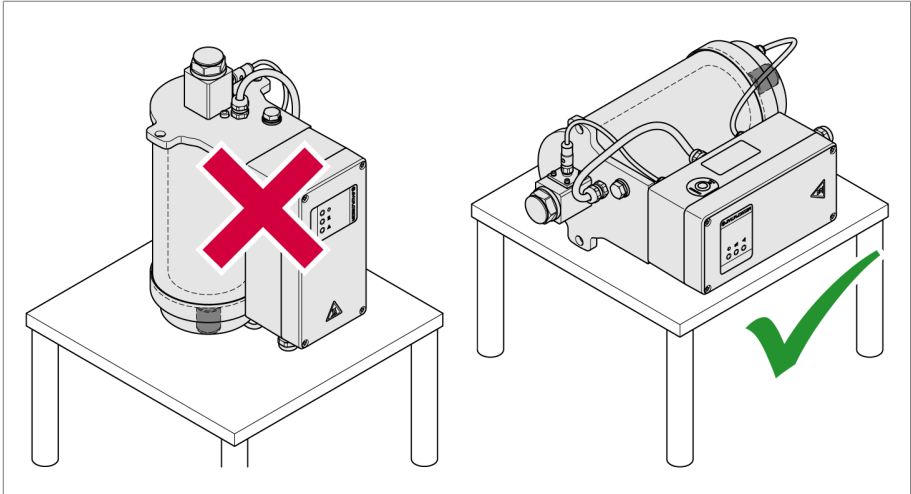


Figure 9: Setting down the DB100 / DB200

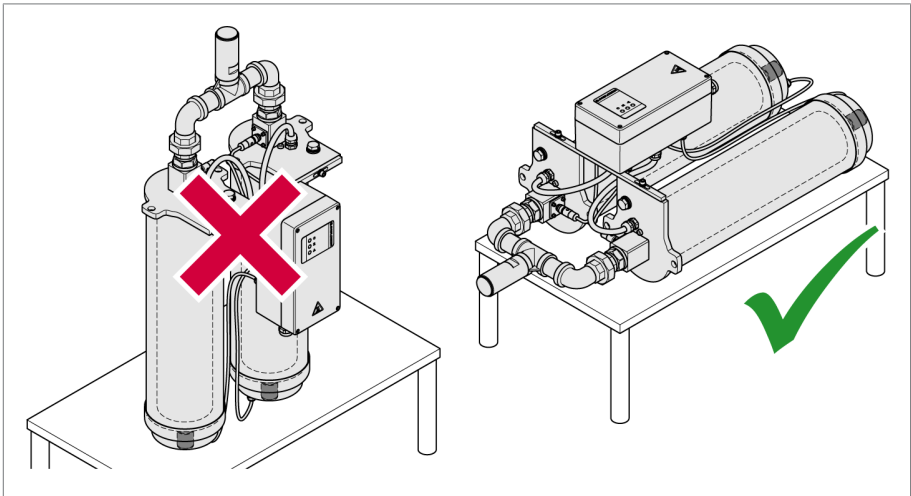


Figure 10: Setting down the DB200D / DB200G

This chapter describes how to correctly mount the device.

▲ CAUTION



Risk of injury!

Risk of injury due to shattered glass cylinder of the desiccant container as the result of mechanical tension or jolts!

- ▶ Wear safety gloves during assembly in addition to the protective equipment that must always be worn.

The DIN flange, 4-hole circular flange and 2-hole RM flange connection versions as well as the dimensions of the different device versions are listed in the chapter "Dimensional drawings [▶ Section 13, Page 113]."

5.1 Installation recommendations

- Install the dehydrating breather as close to the transformer as possible.
- Provide a pipe at least 1 m in length above the dehydrating breather.
- The total length of the pipe to the expansion tank should not be more than 20 m.
- Ensure that the pipes have an incline of at least 2%.

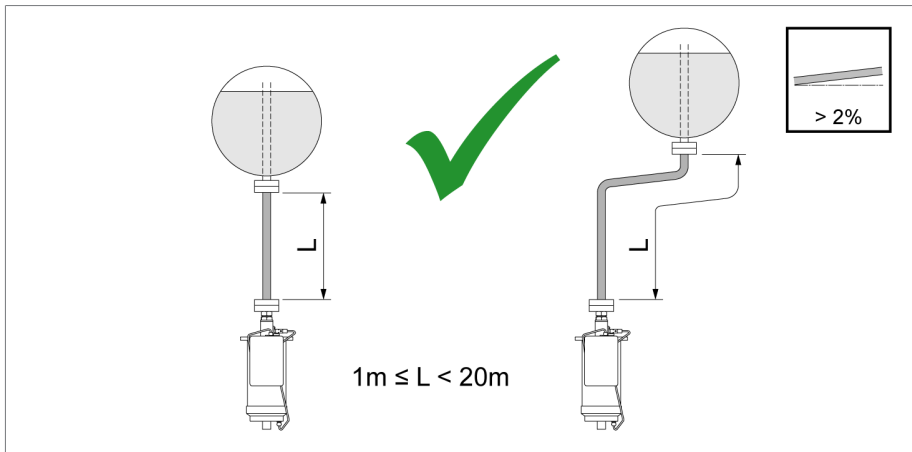


Figure 11: Pipe length

- Ensure that the pipes are not horizontal.
- Prevent the pipe from dipping between the dehydrating breather and the expansion tank.

5 Mounting

- Prevent any sources of interference in the pipe between the dehydrating breather and the expansion tank (conventional dehydrating breather, non-return valves, etc.).

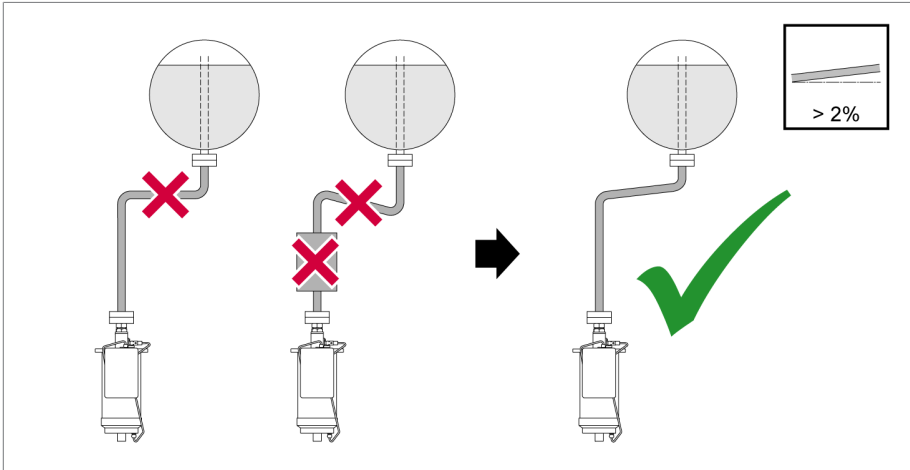


Figure 12: Pipe dips and interference sources

- Do not install dehydrating breathers in parallel.

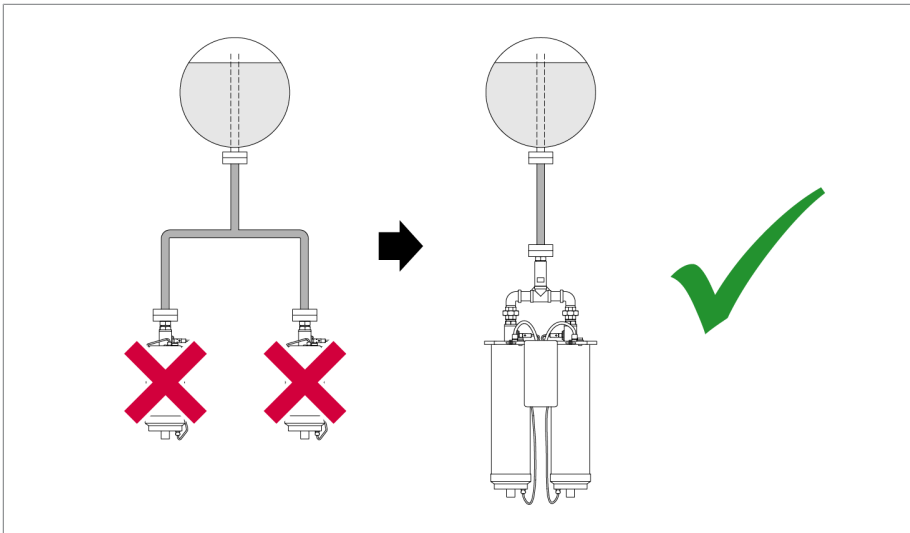


Figure 13: Parallel installation

- Do not install the dehydrating breather close to a sprinkler system that sprays upwards from below.

5 Mounting

- Only place spray water nozzles to the side and above the condensate outlet.
- Do not clean the dehydrating breather with spray water from below.

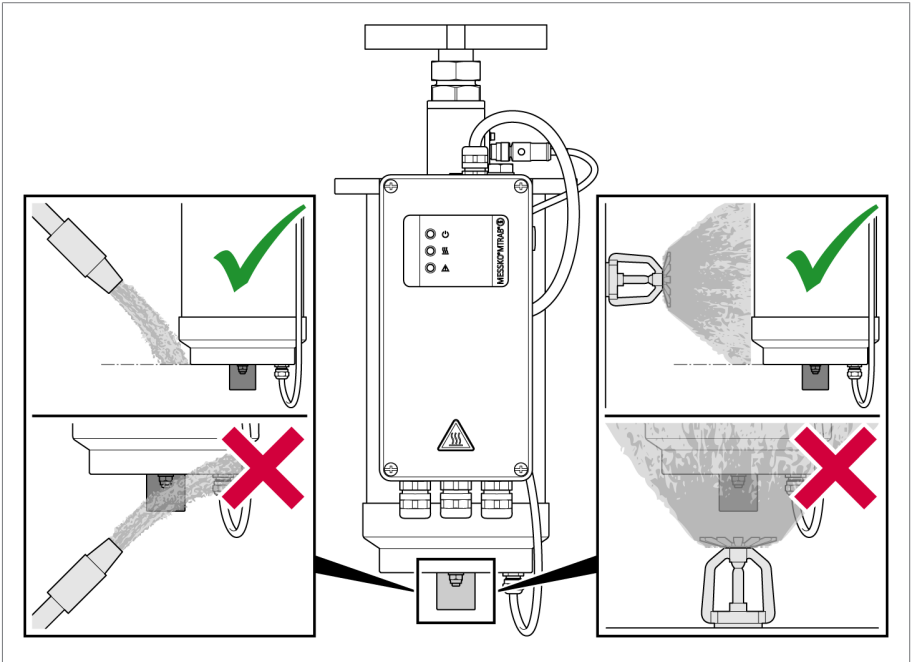


Figure 14: Sprinkler system and spray water

5.2 Checking the connecting flange on the transformer

1. Check counterflange. It must be flush and even. Permitted evenness deviation ≤ 0.2 mm.

5 Mounting

2. Check the sealing surface of the counterflange. It must be clean and undamaged, without any surface damage radiating out from the center. The surface quality of the sealing surface must be suitable for use of the gasket.

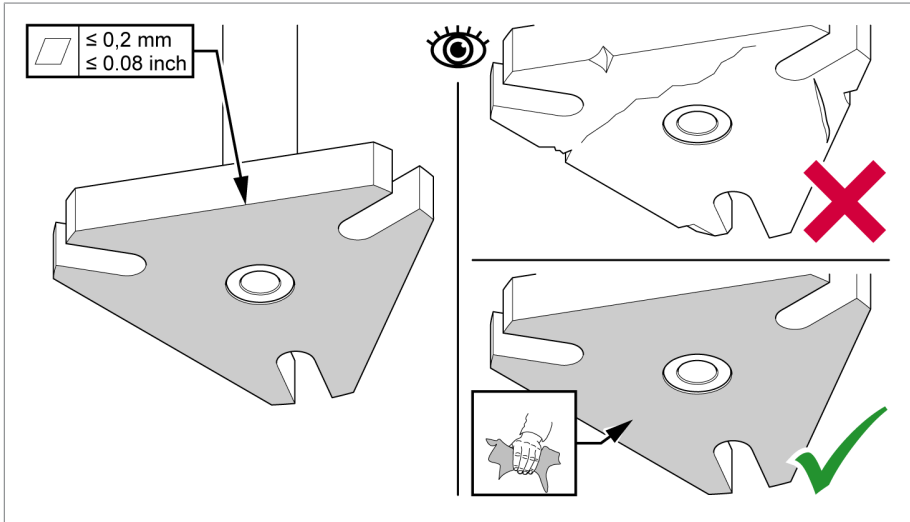


Figure 15: Counterflange

5.3 Preparing the device

NOTICE

Damage to the dehydrating breather!

Impairment of seal-tightness on the dehydrating breather due to loosening of the nut on the upper air intake spout!

- ▶ Ensure that the upper screw connection is not loosened from the dehydrating breather.

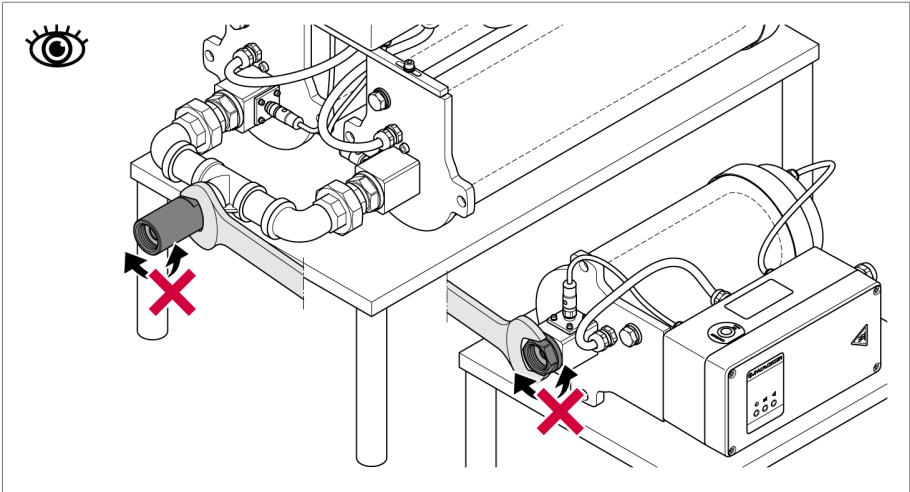


Figure 16: Nut on the upper air spout

To prepare the dehydrating breather for mounting, proceed as follows:

1. Remove the red protective cap from the upper air intake spout.
2. Check that there is a gasket in the air intake spout.

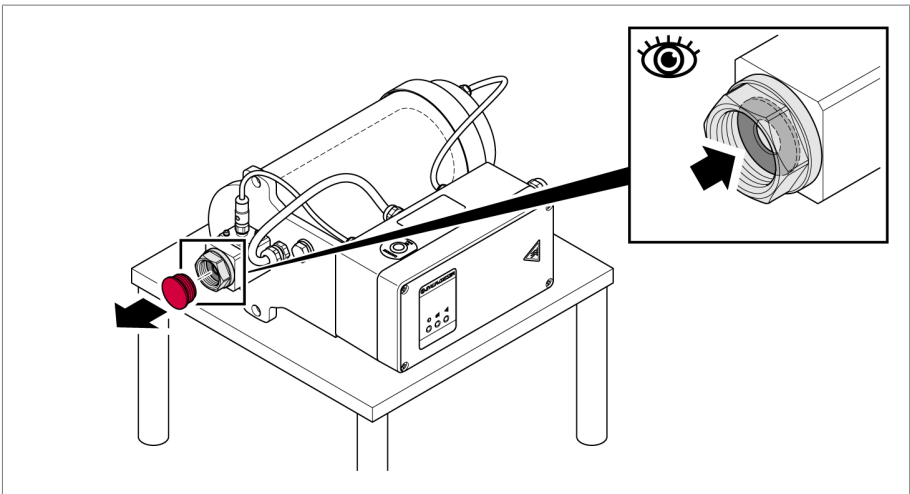


Figure 17: Protective cap and gasket

3. Insert the flange included with delivery into the upper air intake spout.

5 Mounting

NOTICE

Danger of damage to property

If a flange is used that is unsuitable for the weight of the device, the flange may fail.

- ▶ Only use the 2-hole RM flange for the DB100.

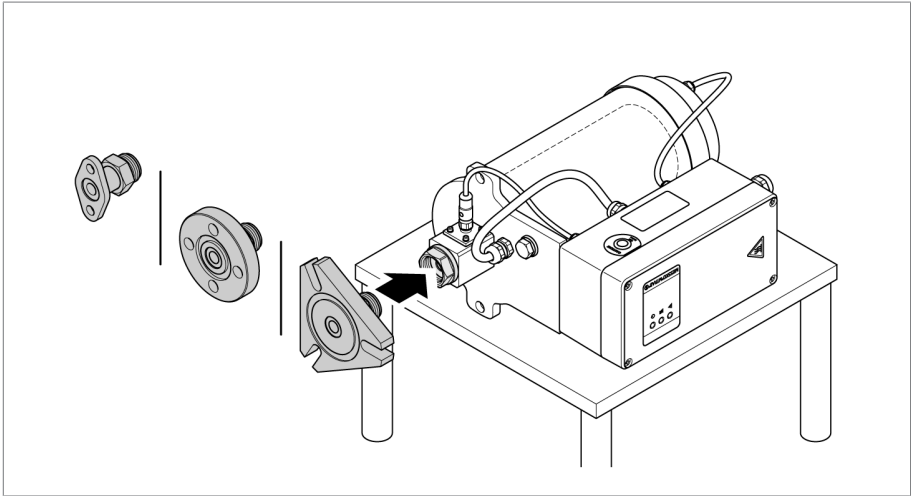


Figure 18: Inserting the flange

4. Screw the flange onto the dehydrating breather by hand (approx. 1 Nm).

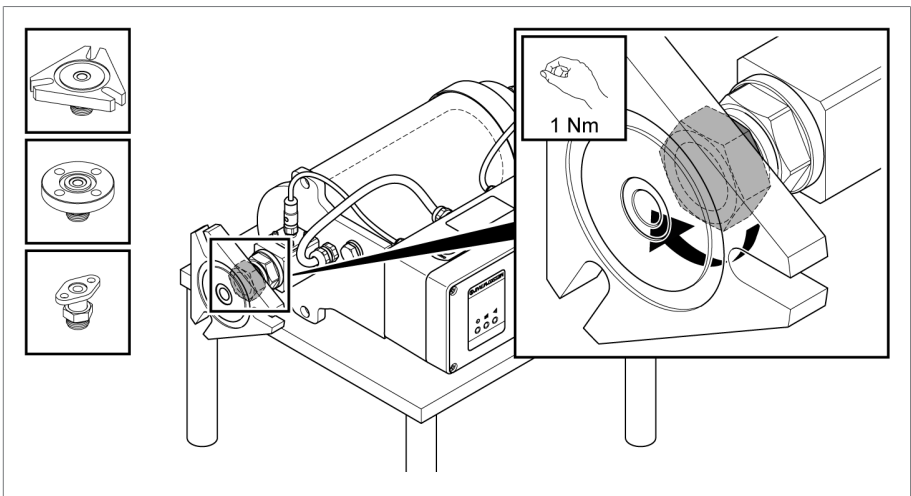


Figure 19: Screwing on the flange

5. For lifting the DB100 / DB200, replace the grounding screw with a lifting eye bolt.

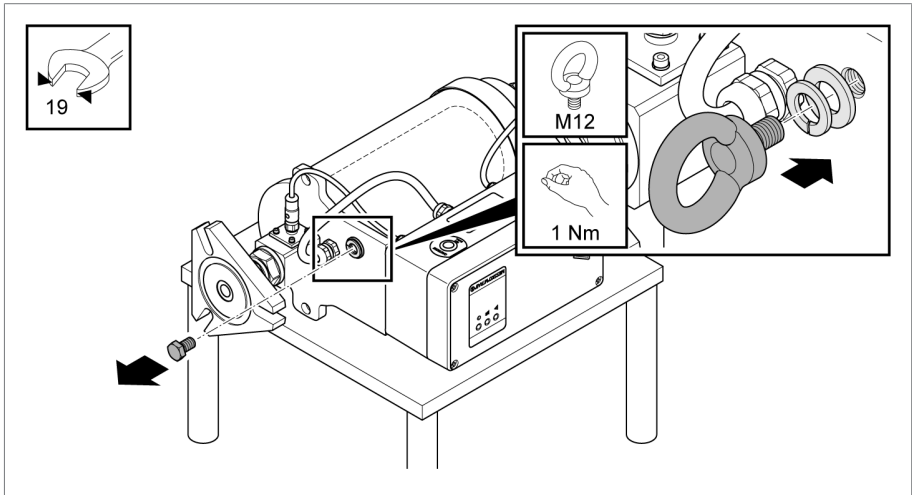


Figure 20: Lifting eye bolt

5.4 Mounting the device on the counterflange

▲ WARNING



Danger of death and damage to property!

Danger of death and damage to property due to falling load!

- ▶ Do not walk under the suspended load.
- ▶ Use a means of transport and lifting gear with sufficient carrying capacity.

NOTICE

Malfunction!

The connection may not be correctly sealed if there is grease on the flange contact surfaces.

- ▶ Ensure that the flange contact surfaces are clean and free of grease when mounting.

5 Mounting

5.4.1 Attaching the lifting gear

NOTICE

Damage to the dehydrating breather

The device can become damaged or fall if it is set down vertically on the air exhaust.

- ▶ Do not support or set the device down on the air exhaust.

To mount the dehydrating breather on the counter-flange, proceed as follows:

1. Lift and upright the DB200D / DB200G with the help of a second person. Each person should have one hand on the air exhaust and one hand on the connection pipe.

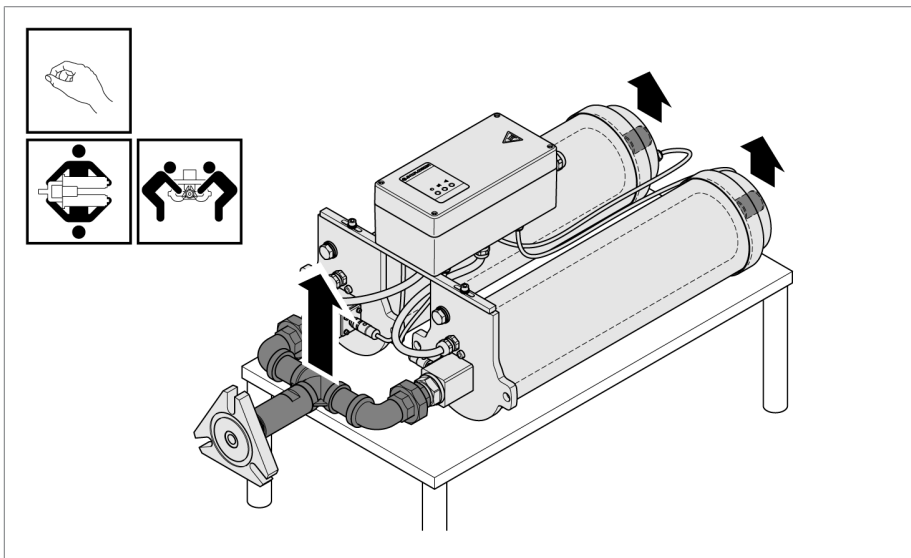


Figure 21: Lifting and uprighting the DB200D / DB200G

2. Lift and upright the DB100 / DB200 as shown in the image.

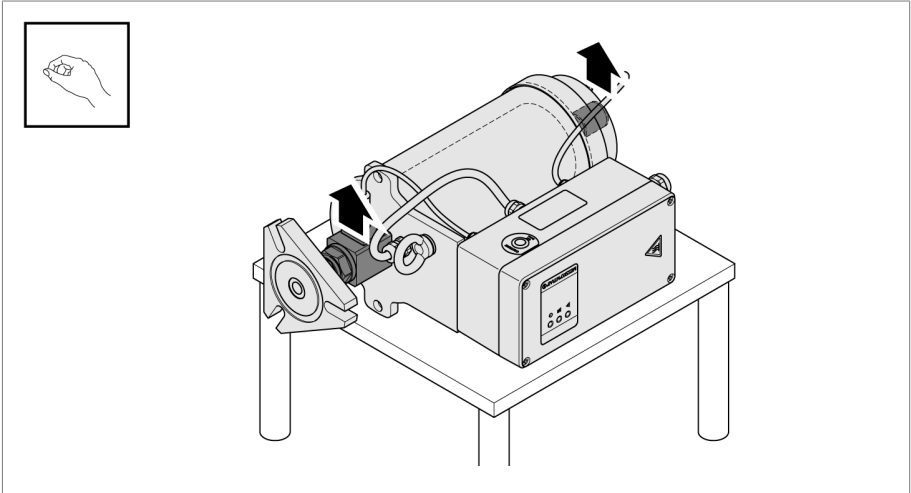


Figure 22: Lifting and uprighting the DB100 / DB200

3. Attach the lifting gear to the lifting eye bolt or pipe connection.

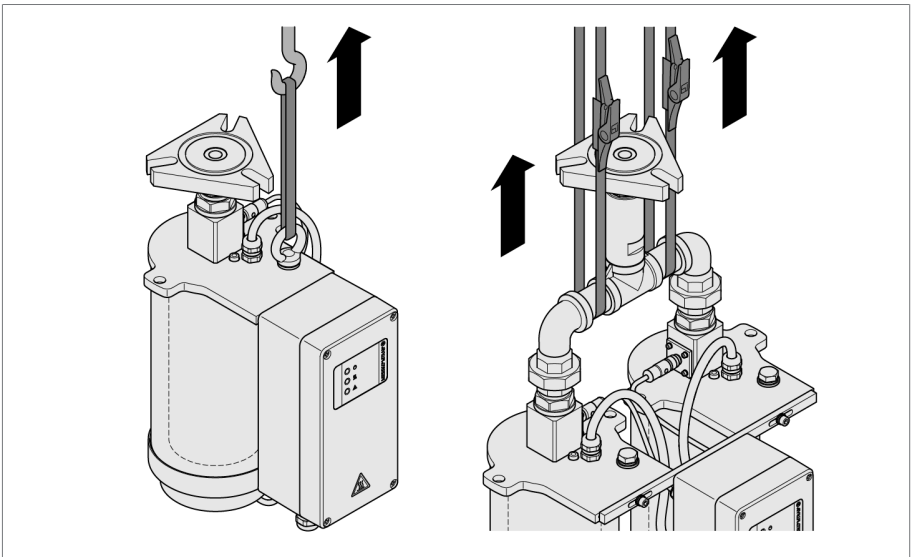


Figure 23: Lifting gear

5 Mounting

5.4.2 Inserting the flange gasket

- ▶ Insert the flange gasket.

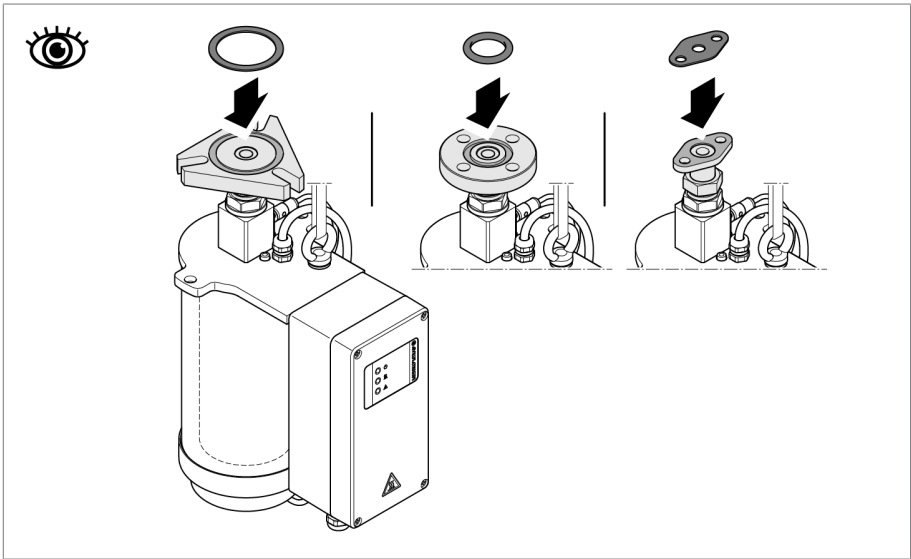


Figure 24: Flange gasket

5.4.3 Screwing on the flanges

DIN flange (optional)

1. Screw the dehydrating breather to the transformer counter-flange using the flange (mounting materials contained in the scope of delivery).

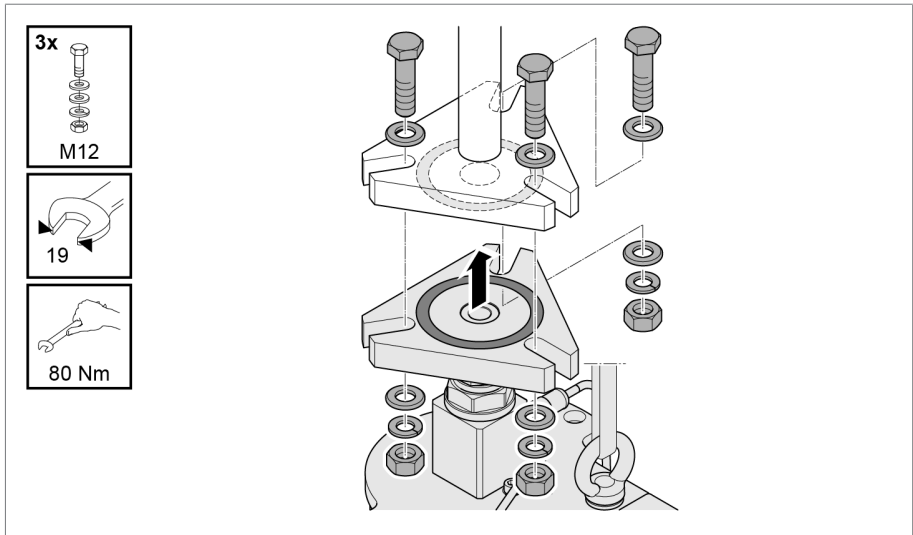


Figure 25: Screw connection

2. Tighten each screw in turn with approximately 24 Nm.
3. Tighten each screw in turn with approximately 48 Nm.
4. Tighten each screw in turn with approximately 80 Nm.
5. Wait 5 minutes.

5 Mounting

6. Tighten each screw again with approximately 80 Nm.

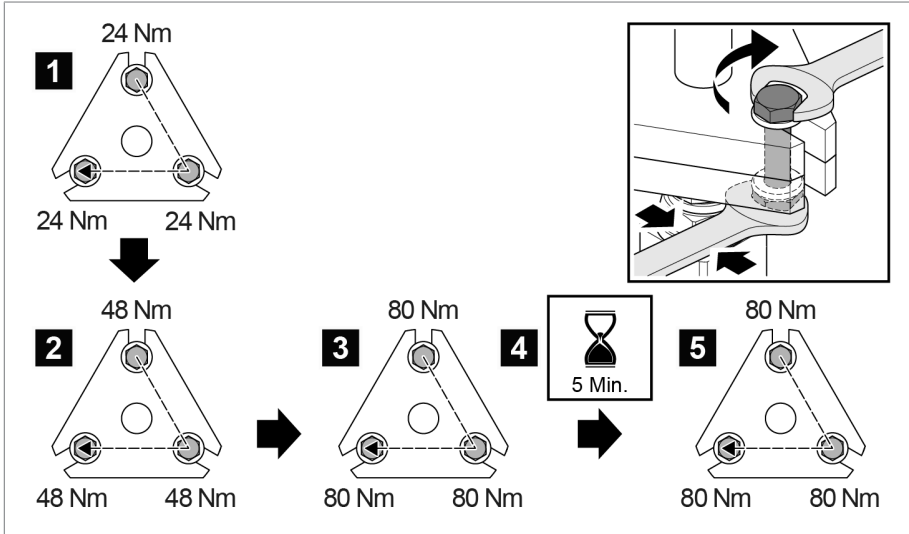


Figure 26: Screws of DIN flange

or

4-hole circular flange (optional)

1. Screw the dehydrating breather to the transformer counter-flange using the flange (mounting materials not contained in the scope of delivery).

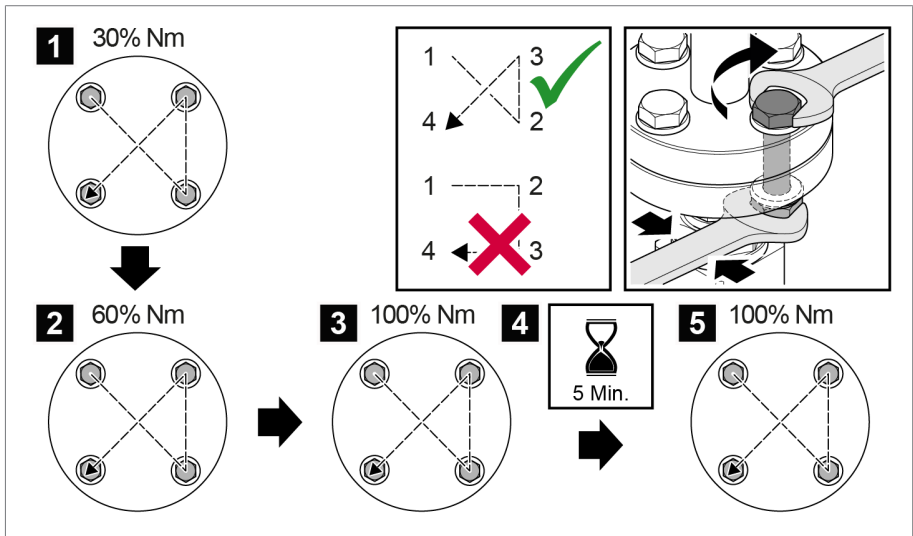


Figure 27: Screws of 4-hole round flange

2. Tighten the screws crosswise with approx. 30% of the torque.
 3. Tighten the screws crosswise with approx. 60% of the torque.
 4. Tighten the screws crosswise with approx. 100% of the torque.
 5. Wait 5 minutes.
 6. Tighten the screws crosswise again with approx. 100% of the torque.
- or

5 Mounting

2-hole RM flange (optional)

1. Screw the dehydrating breather to the transformer counter-flange using the flange (mounting materials not contained in the scope of delivery).

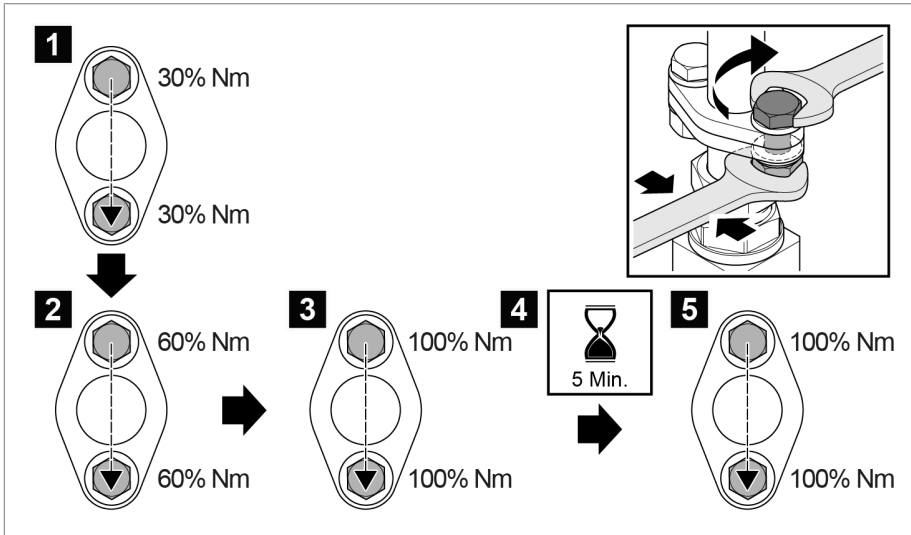


Figure 28: Screws of 2-hole RM flange

2. Tighten each screw in turn with approx. 30% of the torque.
3. Tighten each screw in turn with approx. 60% of the torque.
4. Tighten each screw in turn with approx. 100% of the torque.
5. Wait 5 minutes.
6. Tighten each screw again with approx. 100% of the torque.

5.4.4 Aligning the device

Aligning the device:

- ▶ Align the device as desired using the double screw connection after mounting.

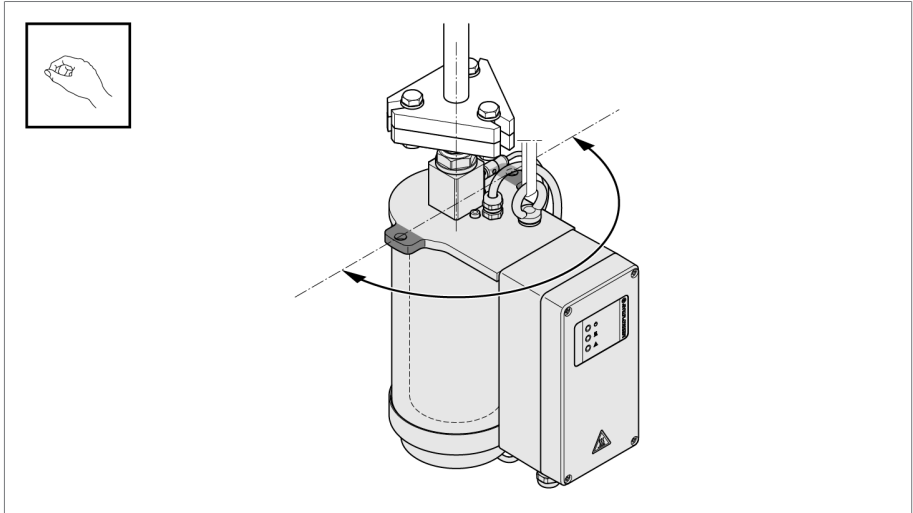


Figure 29: Alignment of dehydrating breather

5.4.5 Tightening the double screw connection

Tightening the double screw connection on the DB100 / DB200:

1. Hold the nut on the upper air spout and tighten the locknut on the flange with 250 Nm.
2. Make sure that the lower nut is not loosened from the device during assembly.
3. Wait 5 minutes.
4. Tighten the upper nut again with 250 Nm.

or

Tightening the double screw connection on the DB200D / DB200G:

1. Hold the screw connection on the upper air spout and tighten the locknut on the flange with 250 Nm.
2. Make sure that the lower screw connection is not loosened from the device during assembly.
3. Wait 5 minutes.

5 Mounting

4. Tighten the locknut again with 250 Nm.

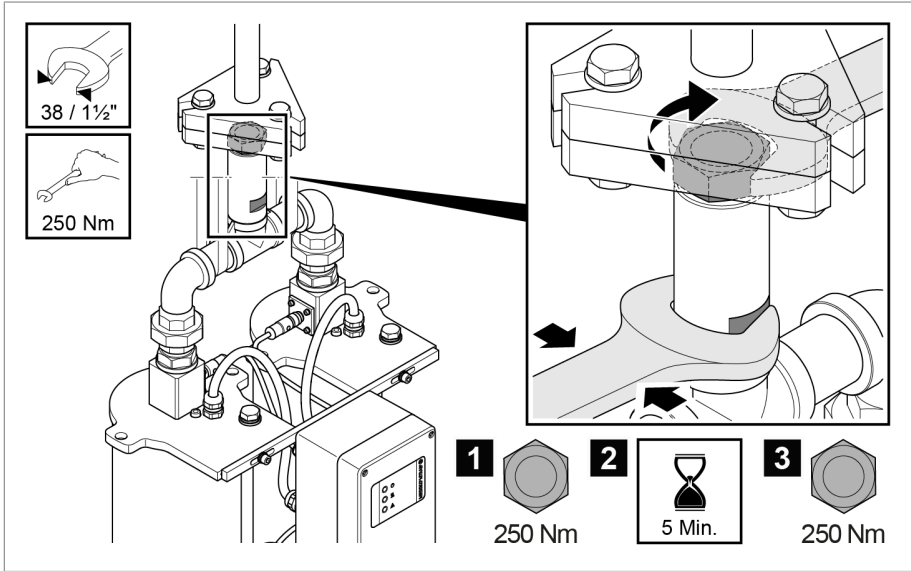


Figure 30: Double screw connection on the DB200D / DB200G

5.4.6 Removing the lifting gear again

- ▶ Remove the lifting gear again carefully. For DB100 / DB200, replace the lifting eye bolt with the grounding screw including washer.

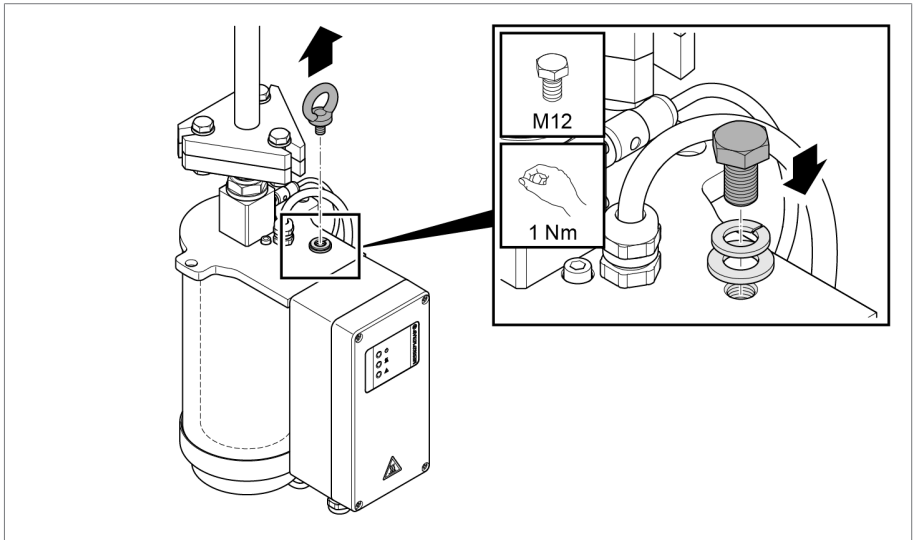


Figure 31: Grounding screw

5.5 Removing the red protective cap

NOTICE

Dehydrating breather malfunction!

The red protective cap blocks air exchange during operation of the dehydrating breather!

- ▶ Make sure that the red protective cap is removed from the dust protection tube before commissioning.



Figure 32: Warning sticker on the dust protection tube

5 Mounting

- ▶ Remove the red protective cap from the dust protection tube on the bottom of the device.

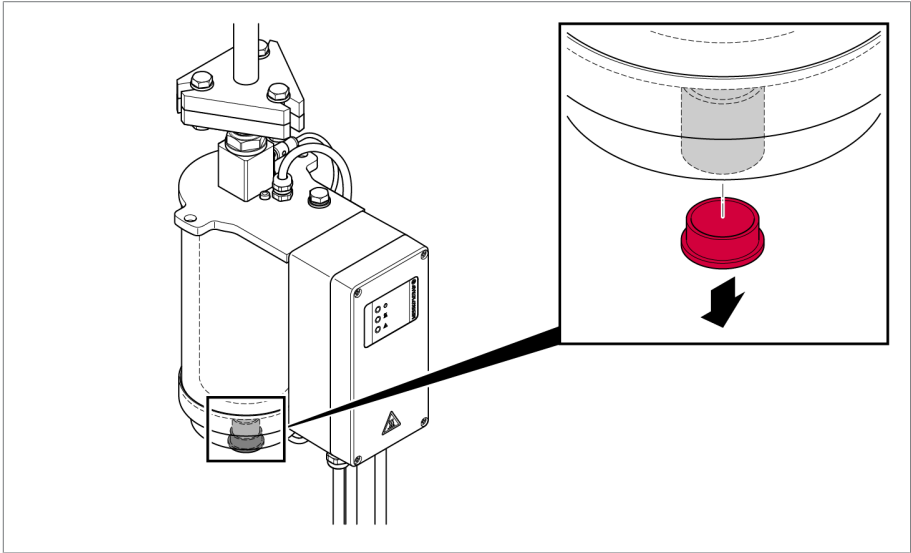


Figure 33: Red protective cap

This chapter describes the correct electrical connection of the device. Observe the following hazard notices prior to opening the device:

⚠ DANGER



Electric shock!

Risk of fatal injury due to electrical voltage. Always observe the following safety regulations when working in or on electrical equipment.

- ▶ Disconnect the system.
- ▶ Lock the system to prevent an unintentional restart.
- ▶ Ensure all poles are de-energized.
- ▶ Ground and short-circuit.
- ▶ Cover or cordon off adjacent energized parts.

NOTICE

Damage to the device!

Electrostatic discharge can lead to damage to the device.

- ▶ Take precautionary measures to prevent the build-up of electrostatic charges on work surfaces and personnel.

6.1 Electromagnetic compatibility

The device has been developed in accordance with the applicable EMC standards. The following points must be noted in order to maintain the EMC standards.

6.1.1 Wiring requirement of installation site

Note the following when selecting the installation site:

- The system's overvoltage protection must be effective.
- The system's ground connection must comply with all technical regulations.
- Separate system parts must be joined by a potential equalization.

6 Electrical connection

6.1.2 Wiring requirement of operating site

Note the following when wiring the operating site:

- Do not route lines which cause interference (e.g. supply lines) and lines susceptible to interference (e.g. signal lines) in the same cable duct.
- Maintain a distance of more than 100 mm (3.94") between lines which cause interference and those which are susceptible to interference.

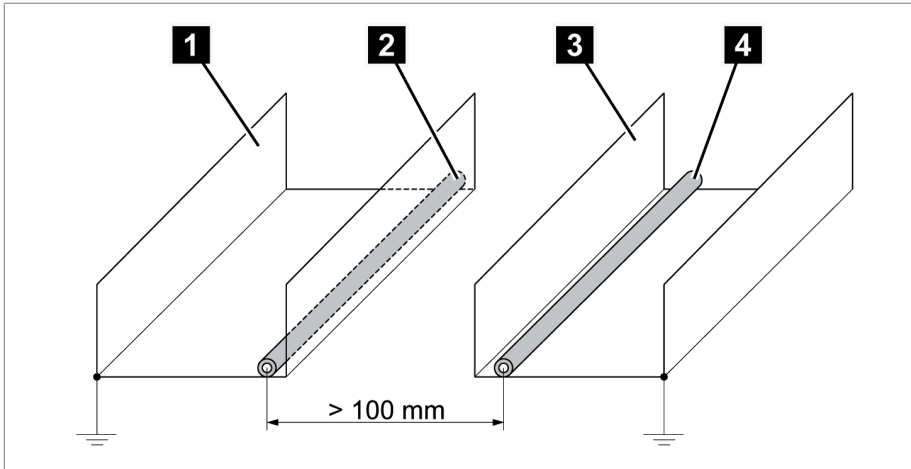


Figure 34: Recommended wiring

1 Cable duct for lines causing interference

3 Cable duct for lines susceptible to interference

2 Line causing interference (e.g. power line)

4 Line susceptible to interference (e.g. signal line)

- Never connect the device with a multi-wire collective pipe.
- Use a shielded cable for transmitting the output signal.

6.2 Supply voltage

You may only connect the device to circuits with an external overcurrent protective device and an all-pole isolating device so that the equipment can be fully de-energized if required.

Suitable equipment includes isolating devices in accordance with IEC 60947-1 and IEC 60947-3 (e.g. circuit breakers). Note the properties of the relevant circuits (voltage, maximum currents) when selecting the circuit breaker type. In addition, observe the following:

- It must be easy for the operator to access the isolating device.
- The isolating device must be labeled for the device and circuits to be isolated.
- The isolating device may not be a part of the power line.
- The isolating device may not interrupt the main protective conductor.

Miniature circuit breaker

You must fuse the power supply circuit with a miniature circuit breaker. The miniature circuit breaker must have the following properties:

- Rated current: 16 A or 20 A
- Triggering characteristic: C, K, Z

Conductor cross-section

For the power supply circuit, use a conductor cross-section suitable for the miniature circuit breaker that you have selected, but at least 1.5 mm² (AWG 15).

6.3 Cable recommendation

Please note the following recommendation from Maschinenfabrik Reinhausen GmbH when wiring the device:

- Excessive line capacitance can prevent the relay contacts from interrupting the contact current. In control circuits operated with alternating current, take into account the effect of the line capacitance of long control cables on the function of the relay contacts.
- The connection cables used must have a temperature resistance of at least +90 °C (ambient temperature max. +70 °C plus intrinsic device heating of 20 K).

6 Electrical connection

- The cables used must be flame-resistant in accordance with IEC 60332-1-2 or UL 2556 VW-1.
- If both low voltage and extra-low voltage are connected in the device, it must be ensured that the circuits for extra-low voltage and for low voltage in the connection area and in the cable are separated from each other with double insulation.


Cable ^{*)}	Terminal	Cable type	Cross-section
Protective conductor connection	1  (PE)	Unshielded	>= cross-section of the voltage supply terminal 2 (L+) and terminal 3 (N-)
Voltage supply	2 (L/+), 3 (N/-)	Unshielded	1.5...4 mm ² / AWG 11...15
Regeneration signaling relay, device error signaling relay	4, 5, 6, 7, 8, 9	Unshielded	1.5...4 mm ² / AWG 11...15
Analog outputs: Analog output 1, Analog output 2	Terminals 10 to 15	Shielded	1.5...4 mm ² / AWG 11...15
RS485		Shielded	0.14...1.5 mm ² / AWG 15...26

Table 5: Recommendation for connection cable (standard connections)

^{*)} It must be possible to load all connection cables with a nominal voltage of 300 V;

Cable type solid or flexible


6.4 Routing and preparing the cable



The glass cylinder of the dehydrating breather can reach temperatures >90 °C during regeneration. When laying the cables, ensure that they do not touch the glass cylinder.

Consider the position of the connections when preparing the cable.



Ensure that the length of the protective conductor  (terminal 1) is at least 50 mm longer than the supply voltage conductors (terminals 2 and 3).

6 Electrical connection

To prepare the cable correctly, proceed as follows:

1. Open the terminal box of the dehydrating breather. To do so, unscrew the 4 captive screws on the housing cover. The cover is held on the left-hand side by spring hinges and can be swung open to the left. The cover of the terminal box is grounded with a grounding cable.

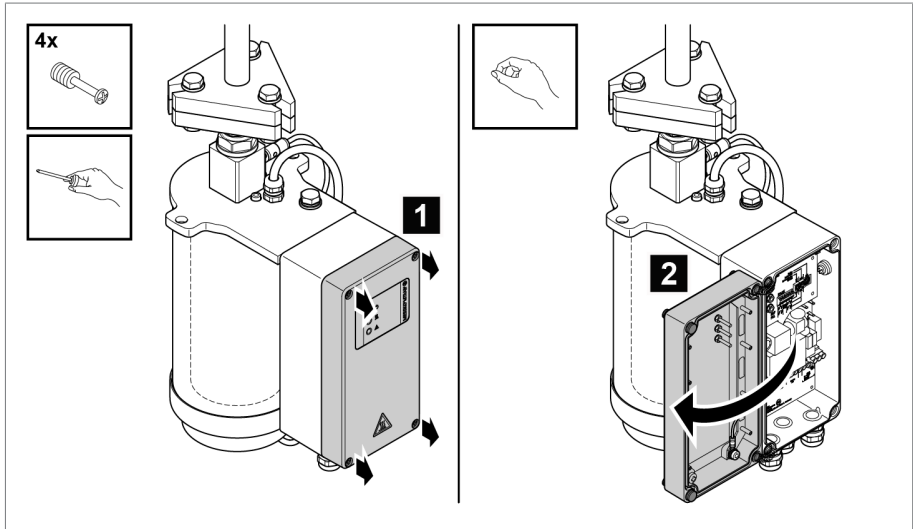


Figure 35: Uninstalling the cover of the terminal box

2. Remove the supply voltage cable jacket and cut the cable so that the length of the PE wire is 50 mm longer than the wires for L and N. Strip 7 mm (1/4") of the insulation from the wires.

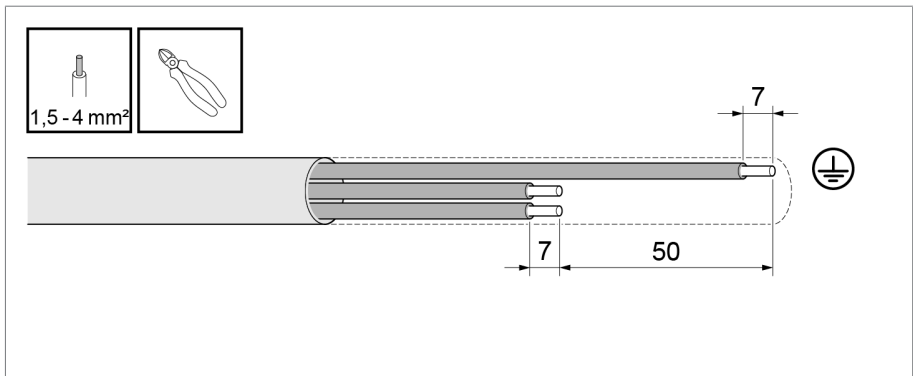


Figure 36: Preparing the cable

6 Electrical connection

3. Remove the cable jacket from the relay and analog output cables and strip 7 mm (1/4") of insulation from the wires
4. Unscrew the leftmost of the three cable glands.

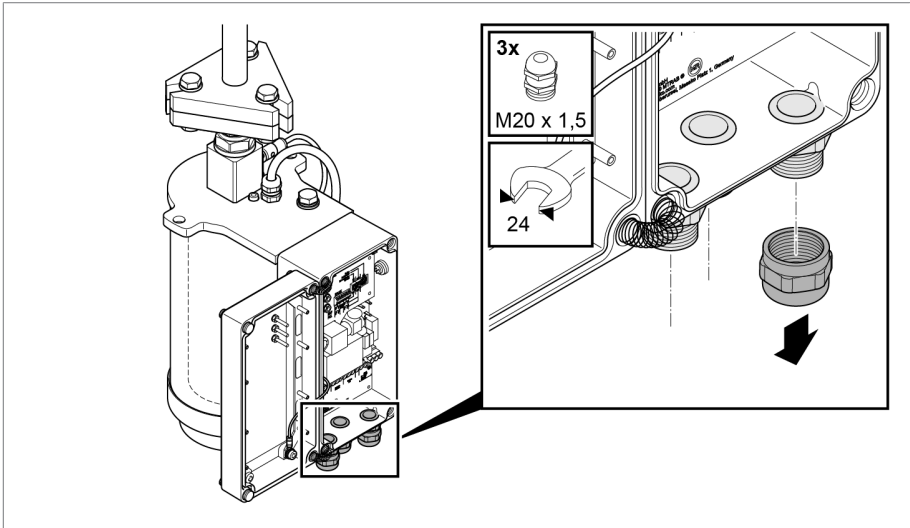


Figure 37: Unscrewing the cable gland

6 Electrical connection

5. Insert a sufficient length of cable through the cable gland and rubber gasket and tighten the cable gland so that moisture from outside cannot penetrate the terminal box.

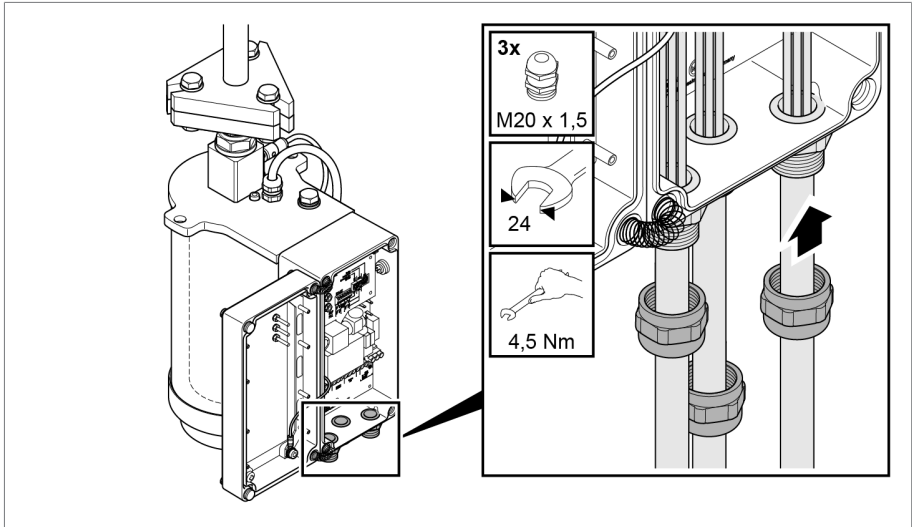


Figure 38: Closing the cable gland

NOTICE

Malfunction

Tightening the cable glands too tightly may result in line breaks and short circuits.

- ▶ Tighten the cable gland with a tightening torque of 4.5 Nm.

NOTICE

Malfunction

Unsealed or missing cable glands may result in dirt and moisture penetrating the device. This will lower or invalidate the protection class. Corrosion and malfunctions may occur.

- ▶ Remove transport dust-protection rings from unused cable glands and seal the cable glands using a dummy plug.
- ▶ Alternatively, replace the entire cable gland with a sealed locking screw.

6 Electrical connection

6.5 Connecting the supply voltage

In order to connect the cable for the supply voltage, proceed as follows:

1. Insert the wire for the protective conductor into terminal 1 (PE) and tighten the screw terminal.
2. Insert the wire for the phase/plus into terminal 2 (L+) and tighten the screw terminal.
3. Insert the wire for the neutral conductor/minus into terminal 3 (N-) and tighten the screw terminal.

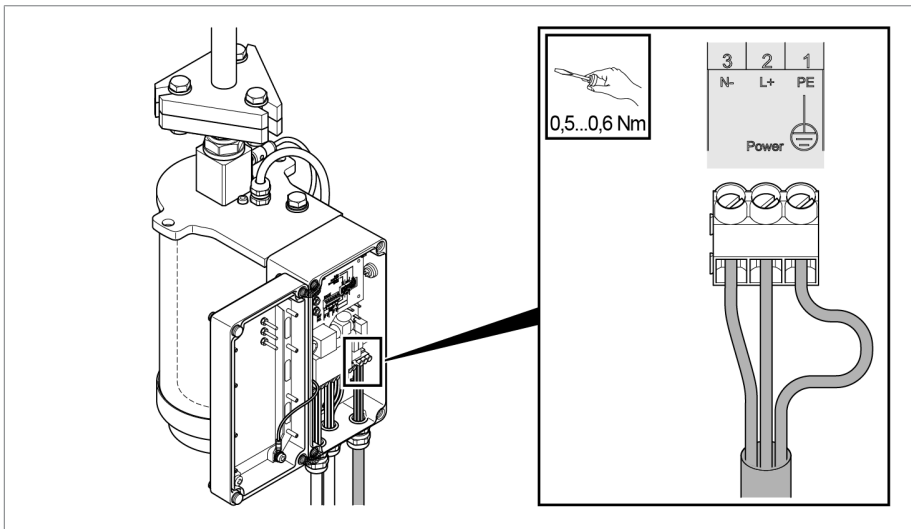


Figure 39: Connecting the supply voltage

6.6 Connecting the regeneration signaling relay

⚠ WARNING



Electric shock!

The regeneration and device error signaling contacts may both be operated either with safety extra-low voltage (SELV) or with low voltage. For electrical safety reasons, mixed operation with both SELV and low voltage is not permitted.

In order to connect the cable for transmitting the regeneration signal (changeover contact), proceed as follows:

1. Insert the wires into terminals 5 and 6 (NC contact) or 4 and 5 (NO contact).
2. Tighten the screw terminals.

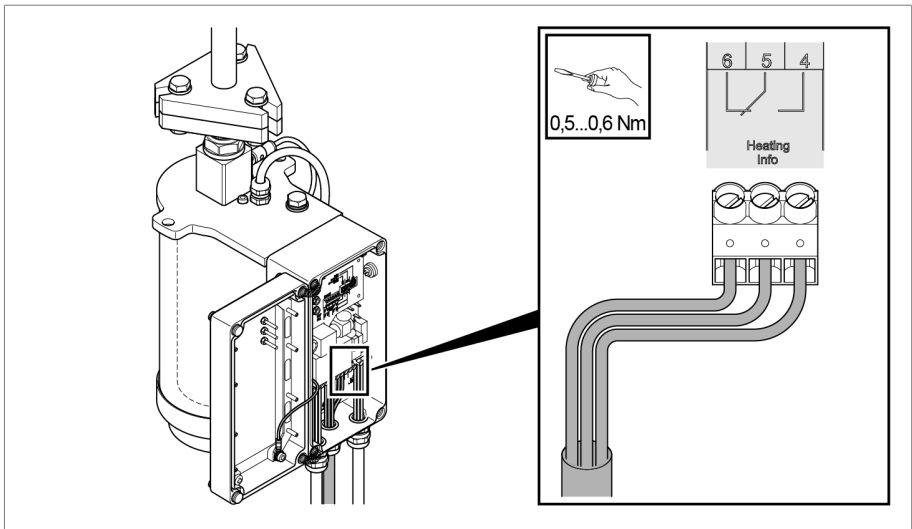


Figure 40: Regeneration signal cable

6 Electrical connection

6.7 Connecting the device error signaling relay

⚠ WARNING



Electric shock!

The regeneration and device error signaling contacts may both be operated either with safety extra-low voltage (SELV) or with low voltage. For electrical safety reasons, mixed operation with both SELV and low voltage is not permitted.

In order to connect the cable for transmitting the device error signal (NC contact, failsafe), proceed as follows:

1. Insert the wires into terminals 7 and 8 (NO contact) or 8 and 9 (NC contact).
2. Tighten the screw terminals.

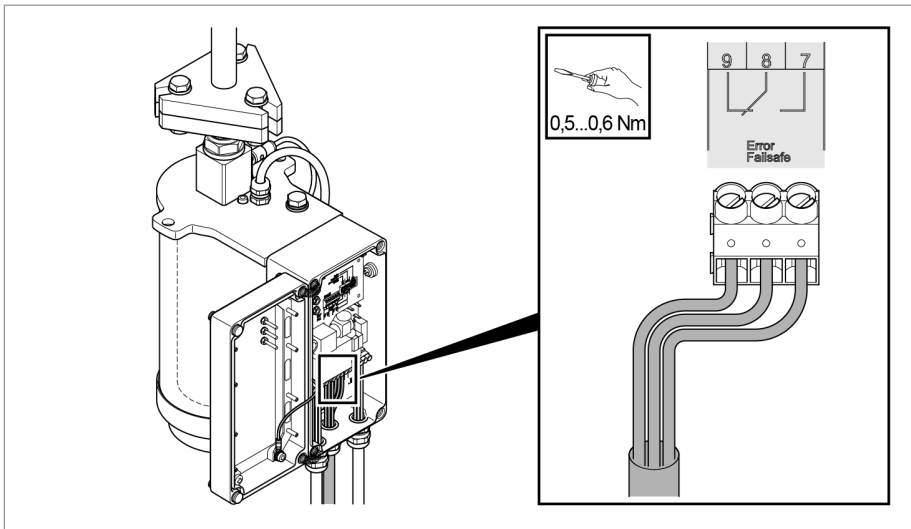


Figure 41: Device error signal cable

6.8 Connecting analog outputs

Analog 1 (left)

Analog 2 (right)

Temperature

Humidity



The analog outputs are active outputs. Observe the load resistance of 0...600 Ω .

To connect the cable for transmitting analog signal 1 for the temperature, proceed as follows:

1. Insert the wires into terminals 10(CL+) and 11(CL-).
2. Twist the shielding (if present) and insert it into terminal 12.
3. Tighten the screw terminals.

To connect the cable for transmitting analog signal 2 for the humidity, proceed as follows:

1. Insert the wires into terminals 13(CL+) and 14(CL-).
2. Twist the shielding (if present) and insert it into terminal 15.
3. Tighten the screw terminals.

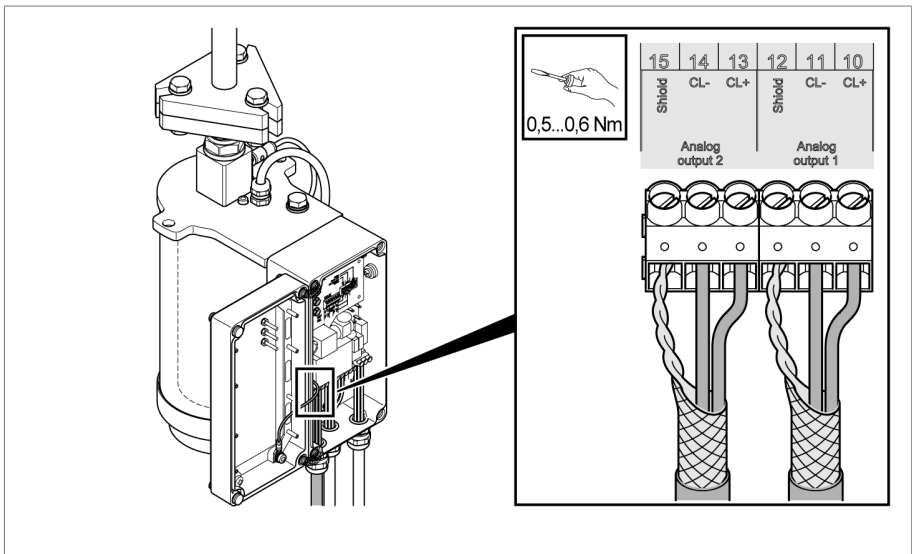


Figure 42: Analog outputs 1 and 2

6 Electrical connection



The analog output signal is a 4...20 mA signal by default (0...20 mA optional).

6 Electrical connection

6.9 Connecting the RS485 interface and configuring Modbus (optional)

The dehydrating breather can be connected to a SCADA system via the RS485 interface. This is designed as a 4-conductor system (full duplex), but can also be integrated into a 2-conductor system (half duplex).

RS485 interface assignment for Modbus RTU

PINs	4-conductor system	2-conductor system
1	Rx+	D+
1	Rx-	D-
2	Tx-	
2	Tx+	
	Shield	Shield
	Comm	Comm

6.9.1 4-conductor full duplex

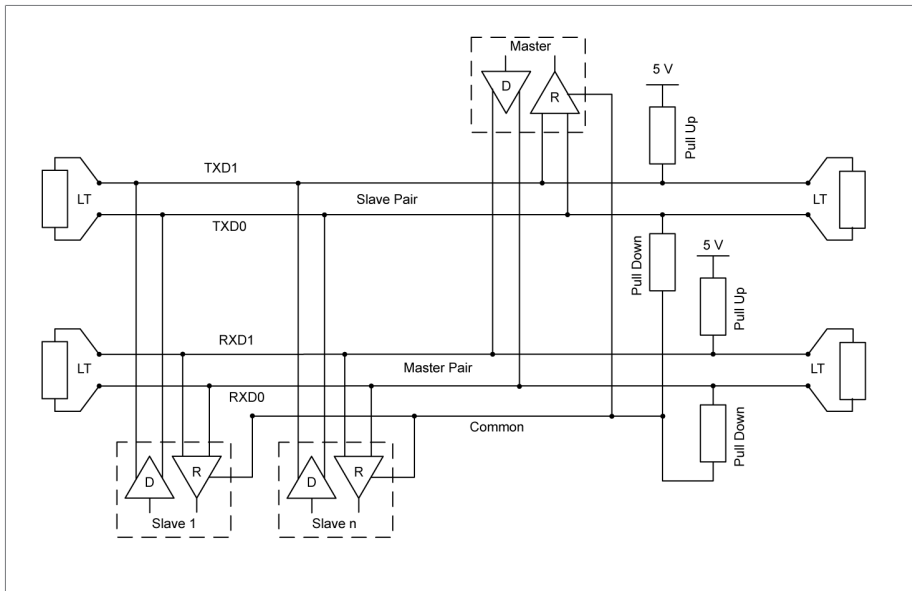


Figure 43: 4-conductor system

6 Electrical connection

To connect the cables for integration into a 4-conductor system, proceed as follows:

1. Insert the wire for Rx+ into screw terminal "1 Rx+" and tighten.
2. Insert the wire for Rx- into screw terminal "1 Rx-" and tighten.
3. Insert the wire for Tx- into screw terminal "2 Tx-" and tighten.
4. Insert the wire for Tx+ into screw terminal "2 Tx+" and tighten.
5. Insert the wire for the ground potential into screw terminal "Comm" and tighten.
6. Twist the shielding, insert it into the "Shield" terminal and tighten.

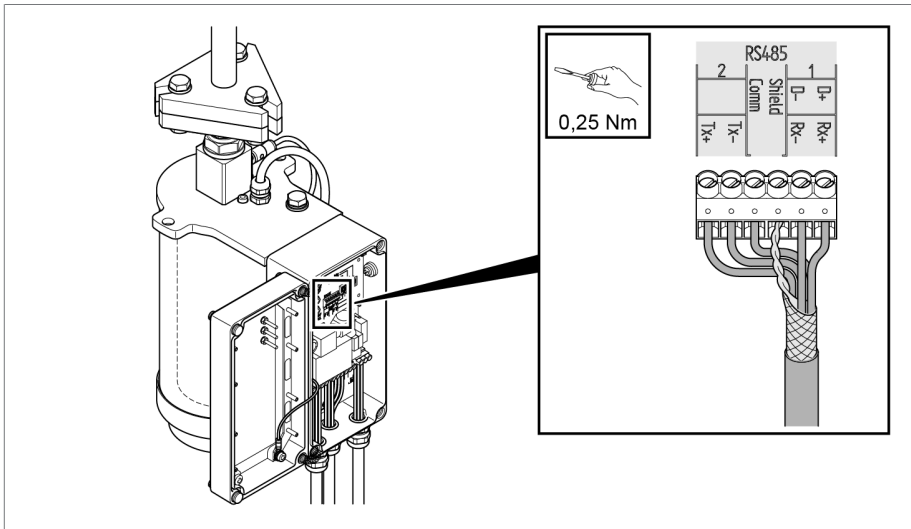


Figure 44: Connecting the full-duplex cable

6.9.2 2-conductor half duplex

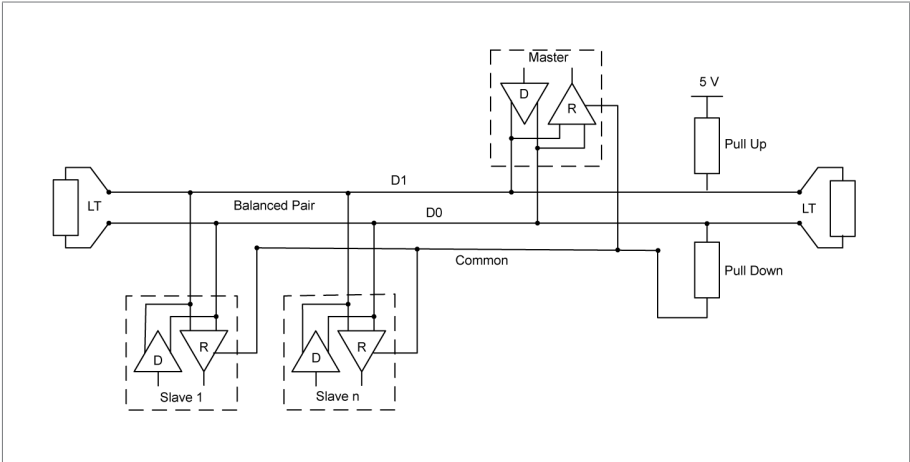


Figure 45: 2-conductor system

To connect the cables for integration into a 2-conductor system, proceed as follows:

1. Insert the wire for D+ into screw terminal "1 D+" and tighten.
2. Insert the wire for D- into screw terminal "1 D-" and tighten.
3. Insert the wire for the ground potential into screw terminal "Comm" and tighten.

6 Electrical connection

4. Twist the shielding, insert it into the "Shield" terminal and tighten.

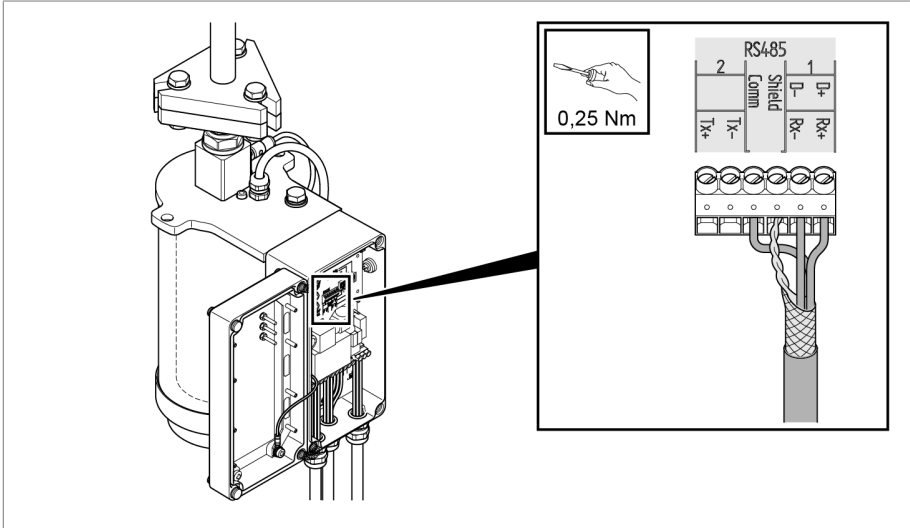


Figure 46: Connecting the half-duplex cable

6.9.3 Notes on connecting to the MR sensor bus

The optionally available MR sensor bus function lets you connect digital and analog sensors to the device over Modbus RTU. The MR sensor bus supports the connection of up to 31 sensors (Modbus slaves). The ISM® device operates as the Modbus master.



Ensure that no other Modbus master is connected over the MR sensor bus. Assign a unique Modbus address to each sensor you are connecting over MR sensor bus. The MR sensor bus may experience errors if multiple sensors are using the same Modbus address.

Observe the following notes for connecting the sensors:

- **NOTICE!** Damage to the device or sensor. Connect all of the sensors to the potential equalization rail to avoid circulating currents over the MR sensor bus.
- The MR sensor bus uses Modbus in a 2-wire configuration (2W). The 4-wire configuration (4W) is not supported.

6 Electrical connection

- You must connect the sensors via a shielded line with 3 conductors (D0, D1, Common). The data lines (D0, D1) must be in twisted pairs. Note the cable recommendation.
- Stub lines from the bus node to the respective device must be shorter than 20 m.
- You may connect the sensors directly to the CPU assembly or via an optional transfer module.
- The CPU assembly contains a terminating resistor (120 Ω) at the COM2 interface. Install another terminating resistor (120 Ω , 0.5 W) at the other end of the bus.
- The CPU assembly contains a pull-up resistor and a pull-down resistor (each of 680 Ω in accordance with the Modbus specification). No additional pull-up/pull-down resistors are needed.

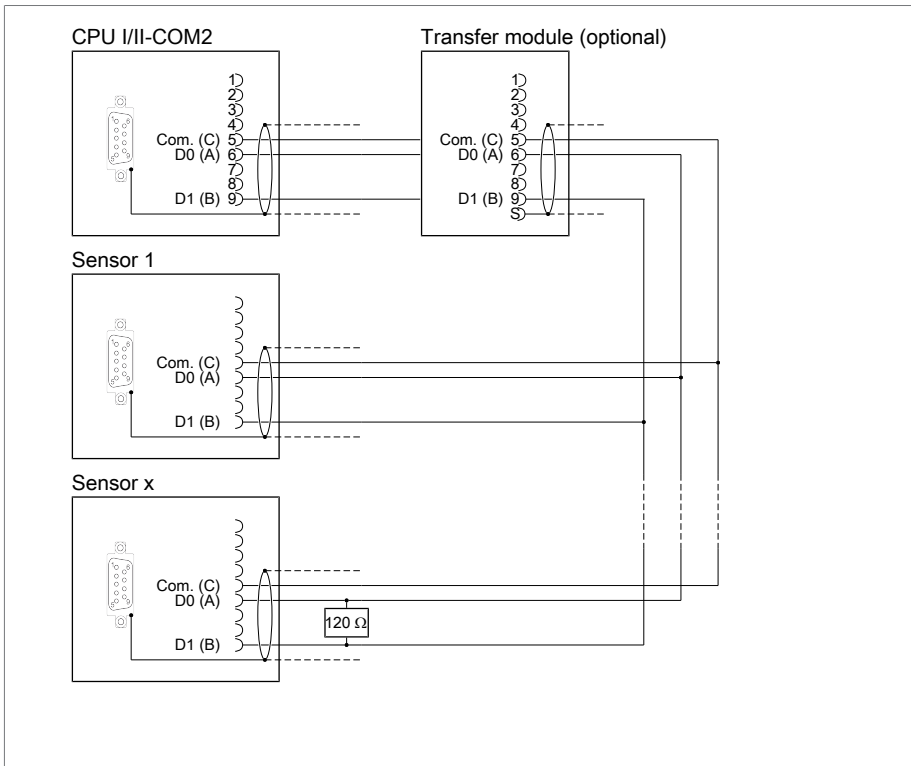


Figure 47: Connection example MR sensor bus to CPU I/II-COM2 with optional transfer module.

6 Electrical connection

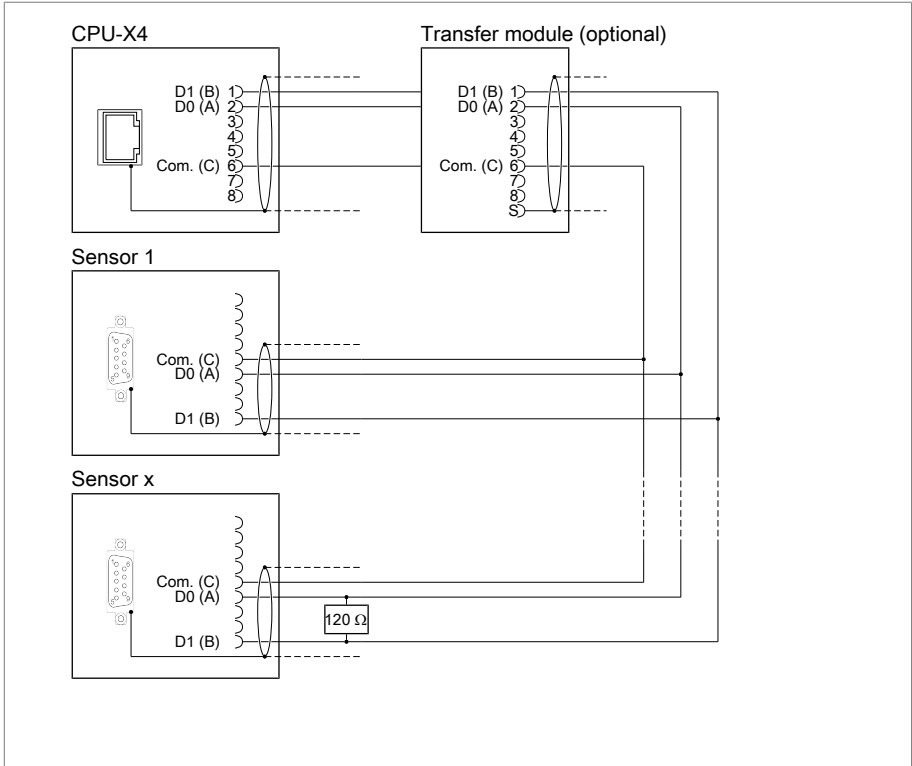


Figure 48: Connection example MR sensor bus to CPU-X4 with optional transfer module.

6.9.4 MESSKO® MTRAB® 2.5

If you would like to use a MESSKO® MTRAB® 2.5 sensor, you must connect the sensor to the RS485 plug terminals on the sensor bus.

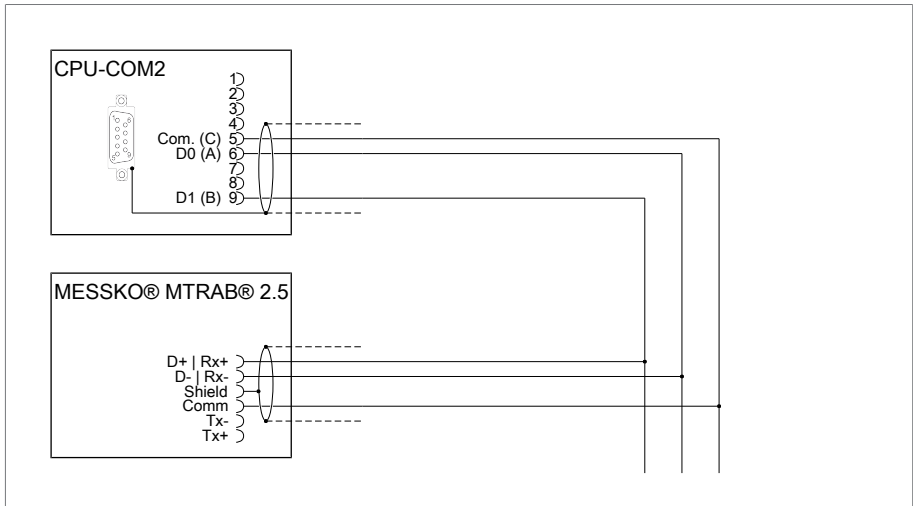


Figure 49: Connection example MESSKO® MTRAB® 2.5 (terminal RS485)

6 Electrical connection

You must enable the half-duplex operating mode on the sensor by switching the "Duplex mode" switch to the "HALF" setting. If the MESSKO® MTRAB® 2.5 sensor is the only bus device or the last bus device, you must activate the sensor terminating resistor by switching the "BUS termination 120 ohms" switch to the position "1 = ON" and "2 = OFF".

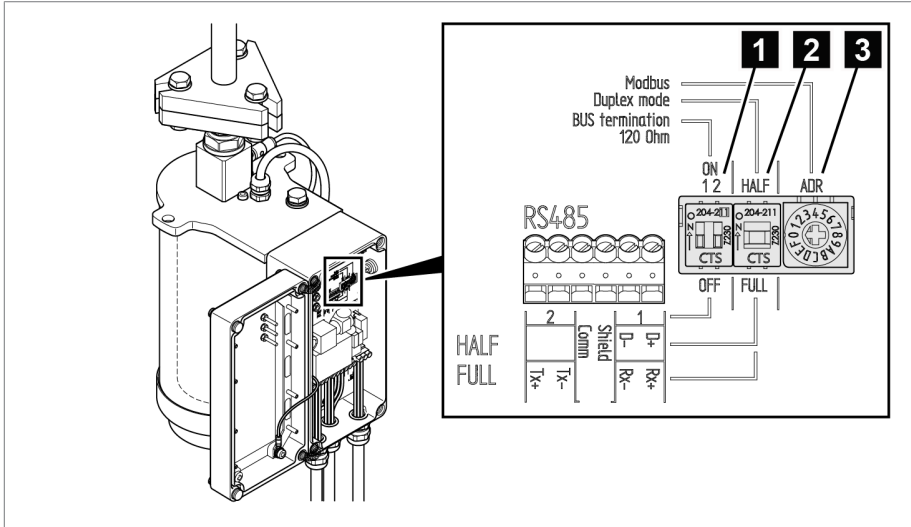


Figure 50: MESSKO® MTRAB® 2.5 Modbus configuration

1 Terminating resistor: in half duplex mode: 1 = ON, 2 = OFF; in full duplex mode: 1 = ON, 2 = ON

2 Operating mode: HALF = half duplex, FULL = full duplex

3 Modbus address

6.9.5 Modbus settings

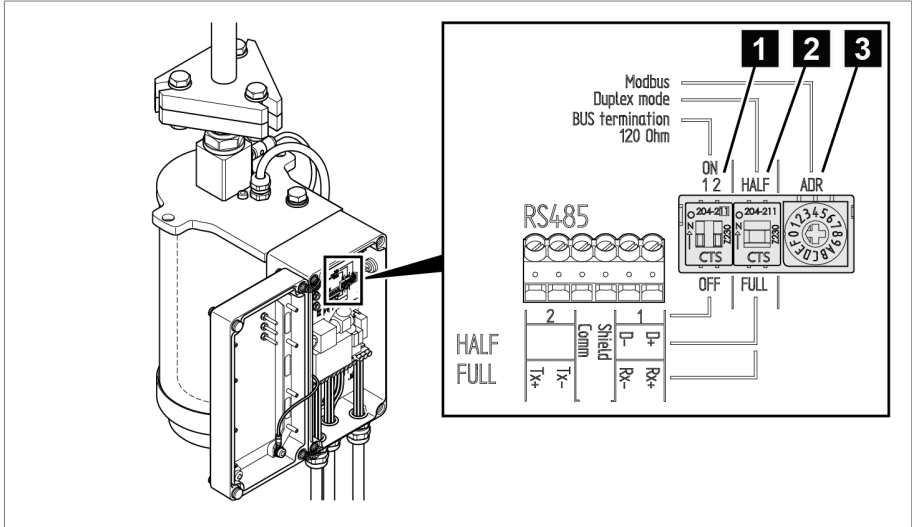


Figure 51: RS485 settings

Half-duplex or full-duplex operation

To set the dehydrating breather for half-duplex operation, proceed as follows:

- ▶ Set the "Duplex mode" switch **2** to the "HALF" position.

To set the dehydrating breather for full-duplex operation, proceed as follows:

- ▶ Set the "Duplex mode" switch **2** to the "FULL" position.

Half-duplex operation terminating resistor

If the dehydrating breather set to half-duplex operation is the last device in the bus system, the device is to be terminated with a 120-ohm resistor. To do so, proceed as follows:

- ▶ Set the left-hand switch on "BUS termination 120 Ohm" **1** to the "ON" position.

6 Electrical connection

Full-duplex operation terminating resistors

If the dehydrating breather set to full-duplex operation is the last device in the bus system, the device is to be terminated with two 120-ohm resistors. To do so, proceed as follows:

- ▶ Set both switches on "BUS termination 120 Ohm" **1** to the "ON" position.

Changing the Modbus address of the device

The Modbus address of the device is set to 3 (ADR switch position 3) as standard. In this setting, the transmission speed is 19,200 baud and the parity is "EVEN". The Modbus address of the device can be changed via the "ADR" switch **3** (see RS485 communication settings [▶ Section 14.2, Page 123]).

6.10 Closing the terminal box

To close the terminal box again, proceed as follows:

- ▶ Check the grounding cable in the terminal box.

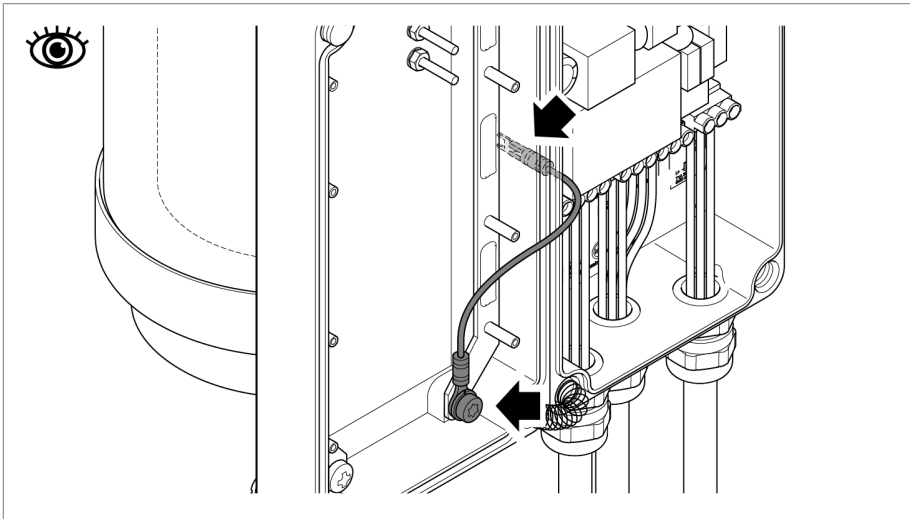


Figure 52: Terminal box grounding cable

6 Electrical connection

1. Ensure that the grounding cable to the housing cover is not damaged when closing the terminal box.

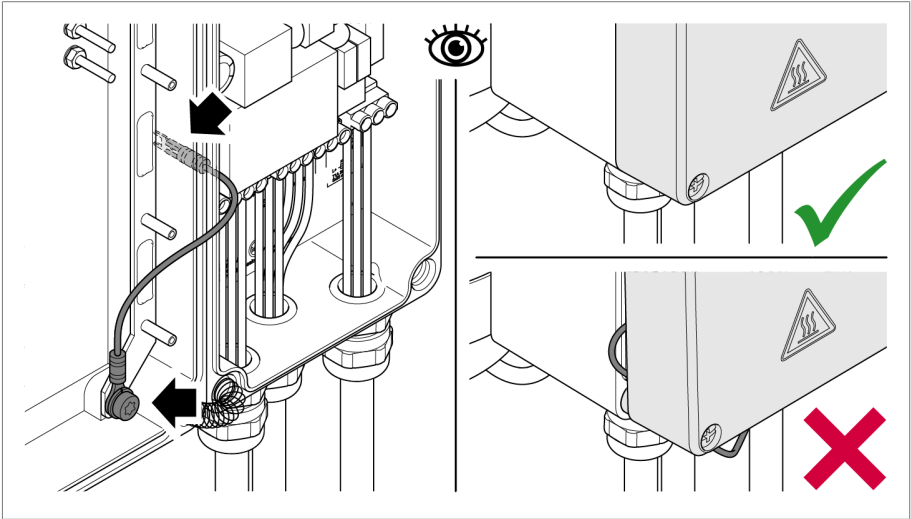


Figure 53: Visual inspection

2. Set the cover of the terminal box properly on the bottom of the housing. If necessary, grease the four housing screws (e.g. with Autol TOP 2000) and then tighten them.

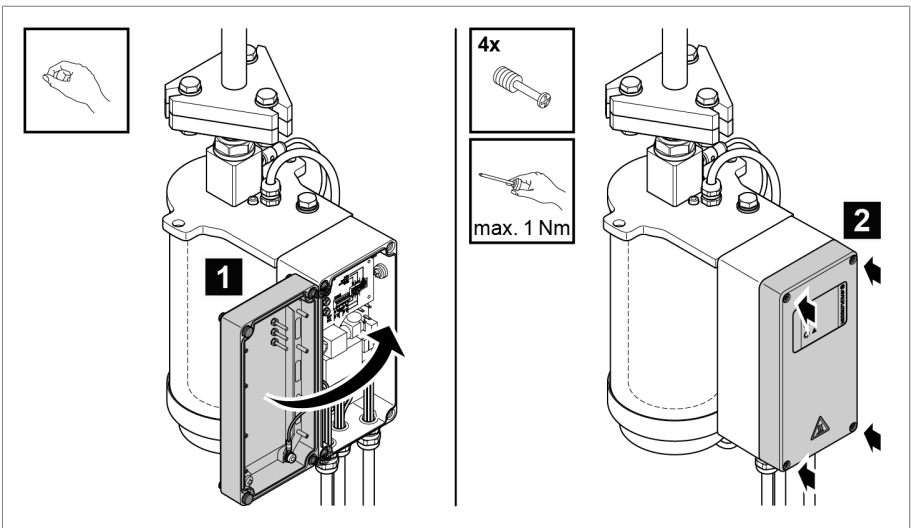


Figure 54: Closing the terminal box cover

6 Electrical connection



If necessary, also grease the four socket screws on the sensor unit (e.g. with Autol TOP 2000).

6.11 Additional device grounding

The device has an additional grounding point which, if required, can be connected to the ground potential. The material for establishing this additional ground connection is not included in the scope of delivery.

- Connect the grounding cable at the grounding point shown in the figure to the ground potential.



Connection points, bolts and washers for grounding the device may not be lacquered.

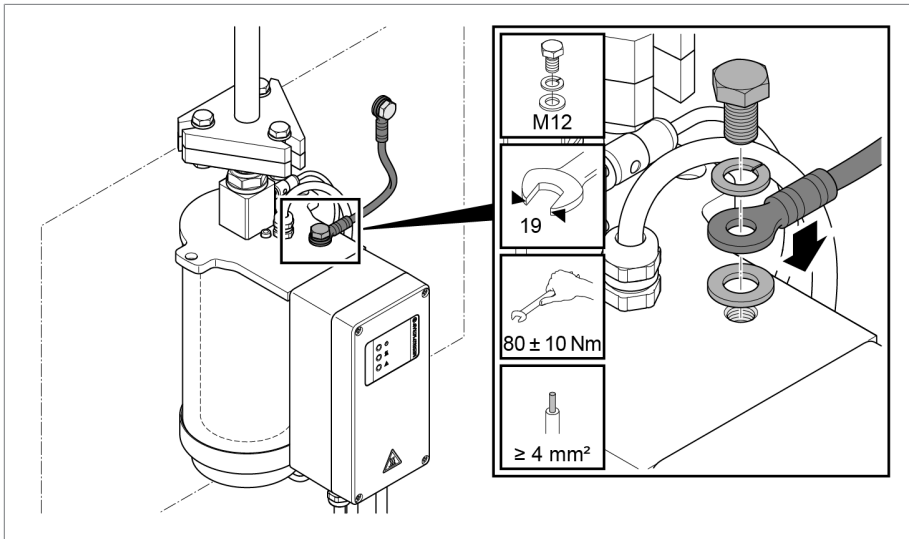


Figure 55: Additional grounding point

6.12 Dielectric test

NOTICE

Damage to the device!

Incorrect test voltage can cause damage to the device.

- ▶ Carry out dielectric testing with a maximum of 500 V DC.

✓ Prepare the test device.

✓ De-energize the dehydrating breather.

1. Conduct a test between the protective conductor (PE) at terminal 1 and neutral conductor (N-) at terminal 3.
2. Conduct a test between the protective conductor (PE) at terminal 1 and phase (L+) at terminal 2.

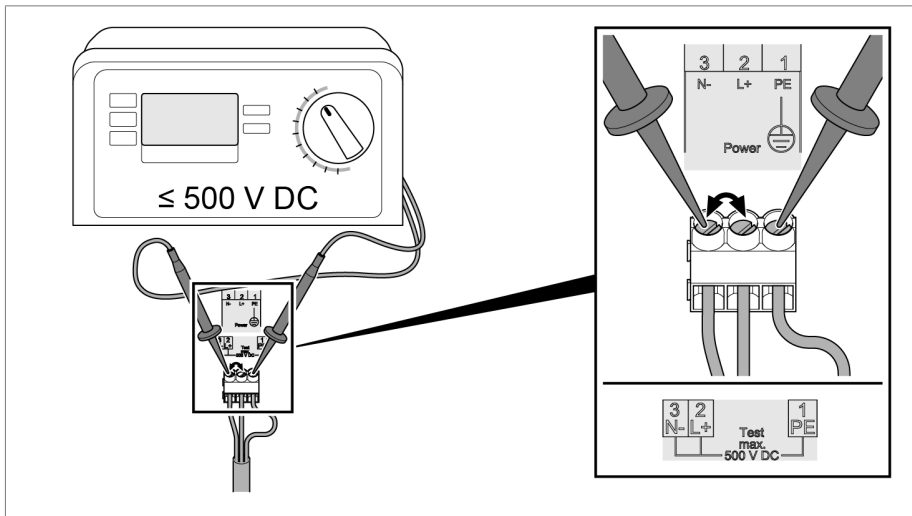


Figure 56: Dielectric test



If the device is not operated in the European Community, the national regulations for conducting the dielectric test in the respective country of use must be observed.

6 Electrical connection

6.13 Ground test

Before commissioning, perform a grounding test (test of the impedance of the protective bonding) in accordance with IEC 61010-1/AMD1. When doing so, observe the following information:

- Test current: 2 times the rated current of the overcurrent protective device in the supply line.
- Test duration: 1 minute per measurement point.
- The measured voltage between the measurement point and the protective conductor must be less than 10 V.

To perform the ground test, proceed as follows:

- ▶ Feed the test current in at the fixing screw of the grounding cable using a constant current source and measure the voltage between the measurement point and the protective conductor connection at terminal 1.

⇒ The measured voltage must remain less than 10 V for a period of 1 minute.

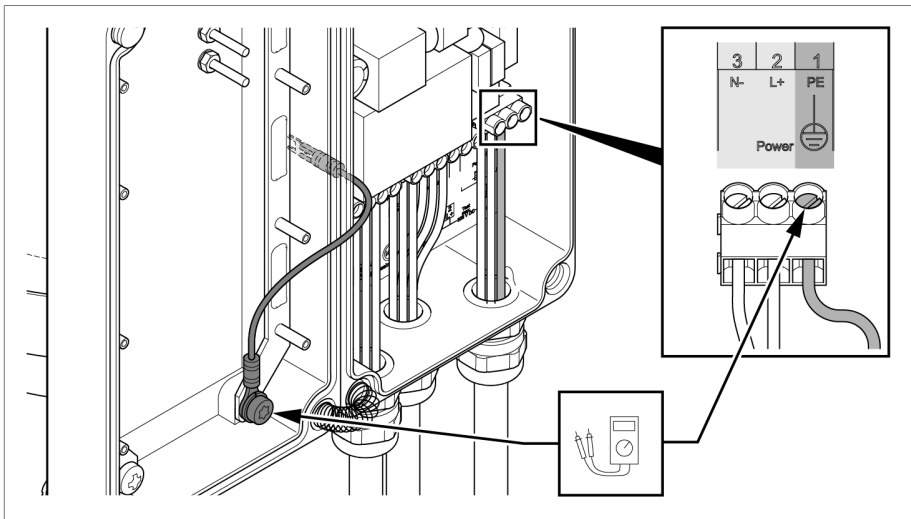


Figure 57: Protective bonding test

NOTICE

Damage to the device!

Damage to the electronics of the dehydrating breather due to incorrect supply voltage!

- ✓ Make sure that the correct supply voltage in accordance with the nameplate is present on the energized miniature circuit breaker.
- ▶ Switch on supply voltage using an external isolating device.

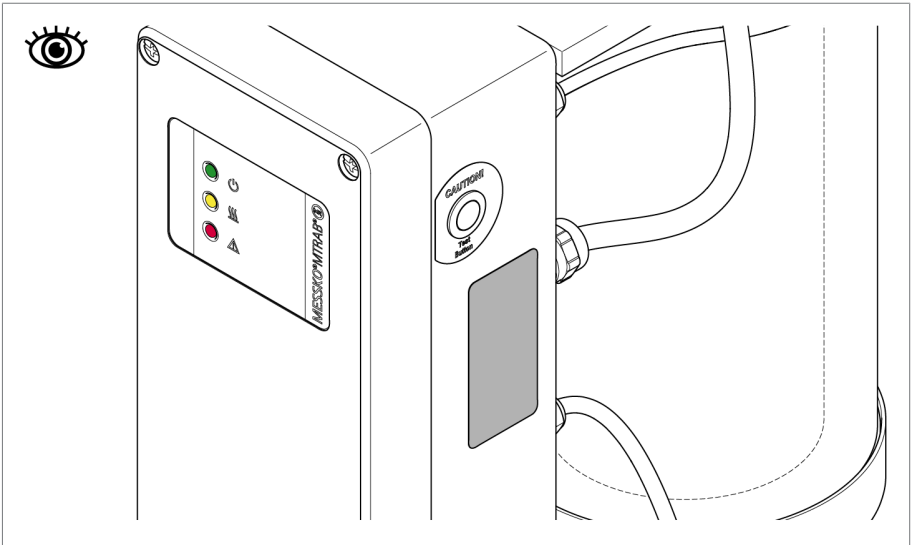


Figure 58: Nameplate

7 Commissioning

7.1 Device self test during commissioning

The dehydrating breather LED signaling during commissioning is explained in the following. Observe the following legend for the respective LED state.

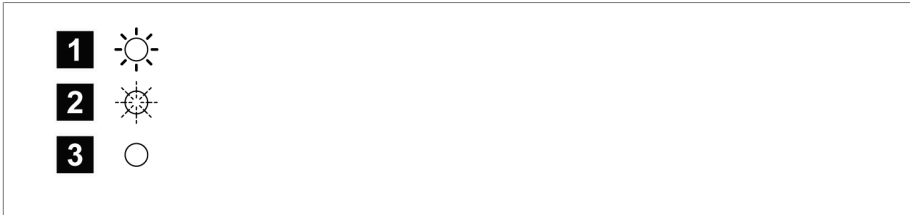


Figure 59: LED legend

1	LED lights up
2	LED flashes
3	LED off

The device performs a device self-test (approx. 5 seconds / maximum 60 seconds for devices with gamma control) independently after the supply voltage is applied. During the entire self-test, the outer LEDs flash successively

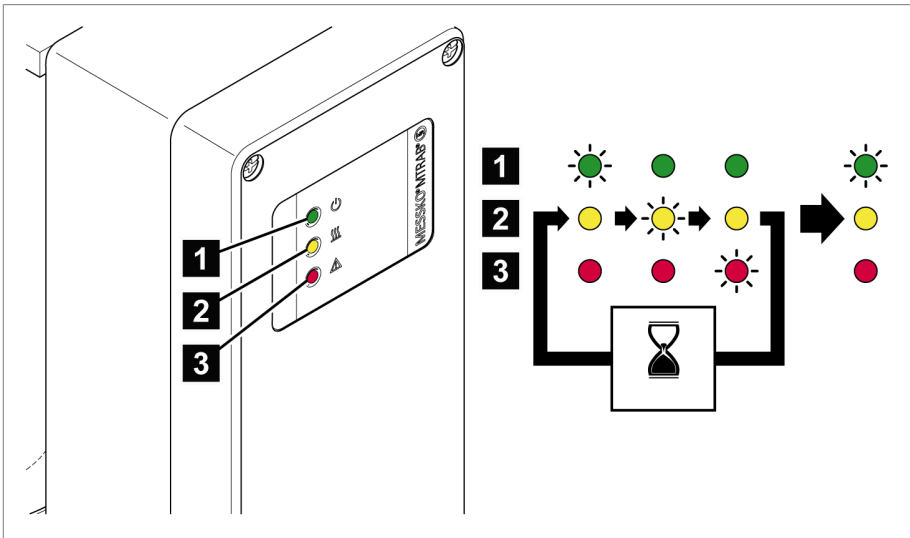


Figure 60: LED signaling during commissioning

7 Commissioning

After concluding the self-test, the green power LED remains lit. If an error has been detected, this is indicated via the LEDs (see Error messages and troubleshooting [► Section 9, Page 84]).

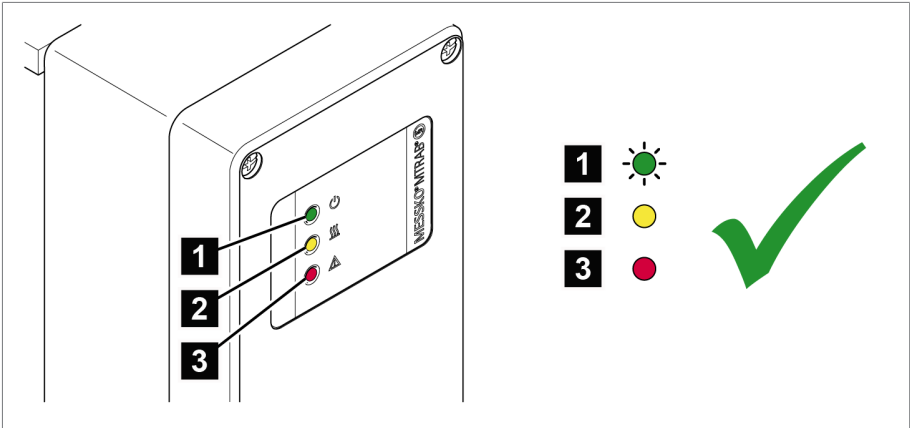


Figure 61: Error-free operation

An expanded test triggered by the user can be started using the test button (see "Test button" [► Section 10.3, Page 95]).

7.2 Adjusting Modbus settings

For information on adjusting or testing the Modbus settings, see Modbus settings [► Section 6.9.5, Page 69].

7.3 Establishing a connection with the app (optional with NFC and Bluetooth®)



The smartphone used must have at least one of the following versions of the respective operating system:

- Android 8.0 or later
- iOS 13.0 or later



The smartphone used must be compatible with Bluetooth® 4.2 LE and contain an NFC interface according to ISO/IEC 15693.

7 Commissioning

You can download the "MESSKO® MTRAB®" app to your smartphone from the App Store or the Google Play Store. The following link will automatically take you to the respective store depending on the smartphone you are using. You can scan the QR code with your smartphone or jump to the respective store via the web link:



Web link: www.reinhausen.com/mtrab-app

Verification of the device in the app



The connection process is described in detail in the app. Follow the instructions in the app to establish a connection.

The device must be verified for use with the app and must also be registered in the app. The device-specific QR code must be scanned in for verification. The QR code is affixed to the inside of the device, included in the operating instructions and depicted on the factory certification. In addition, by providing the serial number of the device, MR Support can reissue the QR code. Verification is valid for 2 years. For verification, proceed as follows:

- ▶ Scan in the QR code via the app on the smartphone.
- ⇒ The scanned device will be saved in the app under its serial number. Der Bluetooth® PIN will be communicated.

Reading out data with a smartphone without NFC function

Without NFC, you can activate the Bluetooth® interface by pressing the test button [▶ Section 10.3, Page 95].

NOTICE! The device also activates Bluetooth® during the short test.

1. Briefly press the test button on the device (≤ 3 seconds).
 - ⇒ The short test starts and the Bluetooth® interface will be activated
2. Establish a Bluetooth® connection within the app.

Reading out data via NFC-enabled smartphone

- ✓ The position of the NFC antenna of the smartphone used is known.
 - ✓ Use a smartphone without a protective cover to ensure that the NFC field strength is not reduced by the protective cover.
 - ▶ Hold the back of the smartphone against the NFC symbol on the front panel.
- ⇒ Die LED **2** lights up blue. The Bluetooth® interface is activated. The connection information will be communicated. The Bluetooth® connection is established automatically.

Reading data from a device without power

- ✓ An NFC-enabled smartphone is to be used.
 - ▶ Hold the back of the smartphone against the NFC symbol on the front panel.
- ⇒ Die LED **2** lights up blue. Data will be read from the NFC memory. A message will appear in the app stating that the device is offline.

8 Operation

During error-free operation, the green power LED is constantly lit and the red error LED is off.

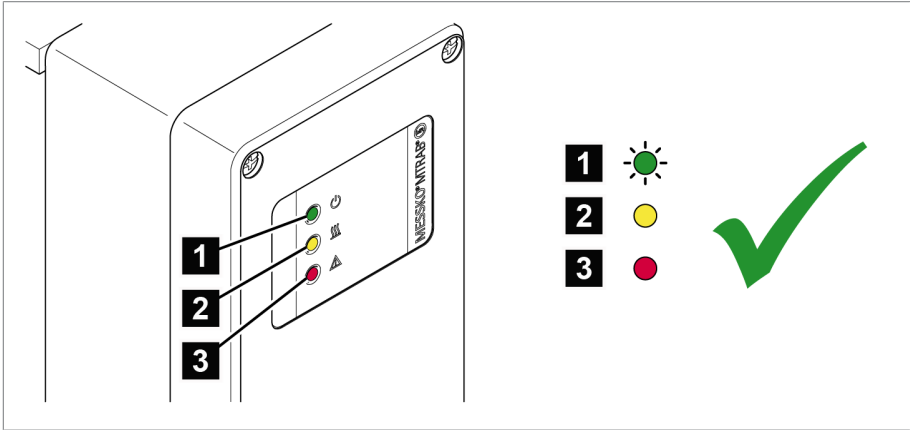


Figure 62: Error-free operation

If LED **1** and/or LED **2** issues a lit and flashing signal and the device malfunction LED **3** is off, follow the instructions in the chapter Status messages [► Section 9.2, Page 88].

If the silica gel is heat-dried during error-free operation, the yellow LED **1** then lights up continuously in addition to the green LED **2**. This state can be transmitted over the "Regeneration" signaling relay for central data collection and further processing of the dehydrating breather status.

▲ CAUTION



Risk of burns!

Danger of bodily injuries due to heat!

- During regeneration (yellow LED **2** lights up continuously), do not touch the glass cylinder of the "desiccant container".

▲ CAUTION



Slipping hazard!

Danger to health!

- ▶ In case of temperatures at or below freezing, any escaping condensation can lead to icy ground beneath the device. In this case, do not step under the device.

NOTICE

Malfunction due to contaminated silica gel

Prevent the silica gel becoming contaminated due to direct contact with the insulating fluid.

In the event of the silica gel being contaminated with insulating fluid, refer to the notes in the section Error messages and troubleshooting (Contaminated silica gel [▶ Section 9.5, Page 92]).

If a device error LED **3** lights up or flashes, please observe the error table in the chapter Error messages and troubleshooting [▶ Section 9, Page 84].

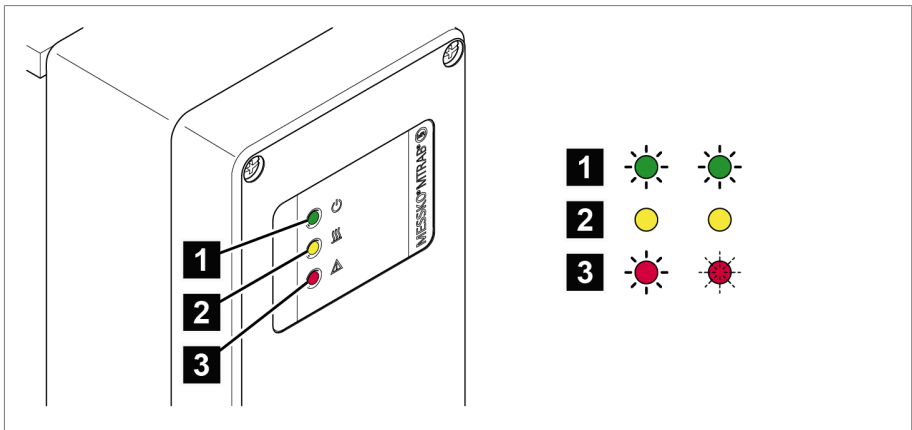


Figure 63: Signaling device errors

This also applies if an error is signaled over the "device error" relay.

8 Operation



If the fuse fails, it can easily be replaced (Fuse [► Section 9.3, Page 89]).

If it happens again, please consult "MR Service & Complaint" [► Section 9, Page 84]. A device version is available that eliminates the occurrence of overvoltages. Overvoltage protection can also be retrofitted by replacing a circuit board.

8.1 Gamma controller (DB200G only)



Make sure that the switch **1** above the ball valve **2** is in the "AUTO" position.

The display **3** on the front of the ball valve indicates which of the two cylinders is separated from the air flow. This display has absolutely no operational function.

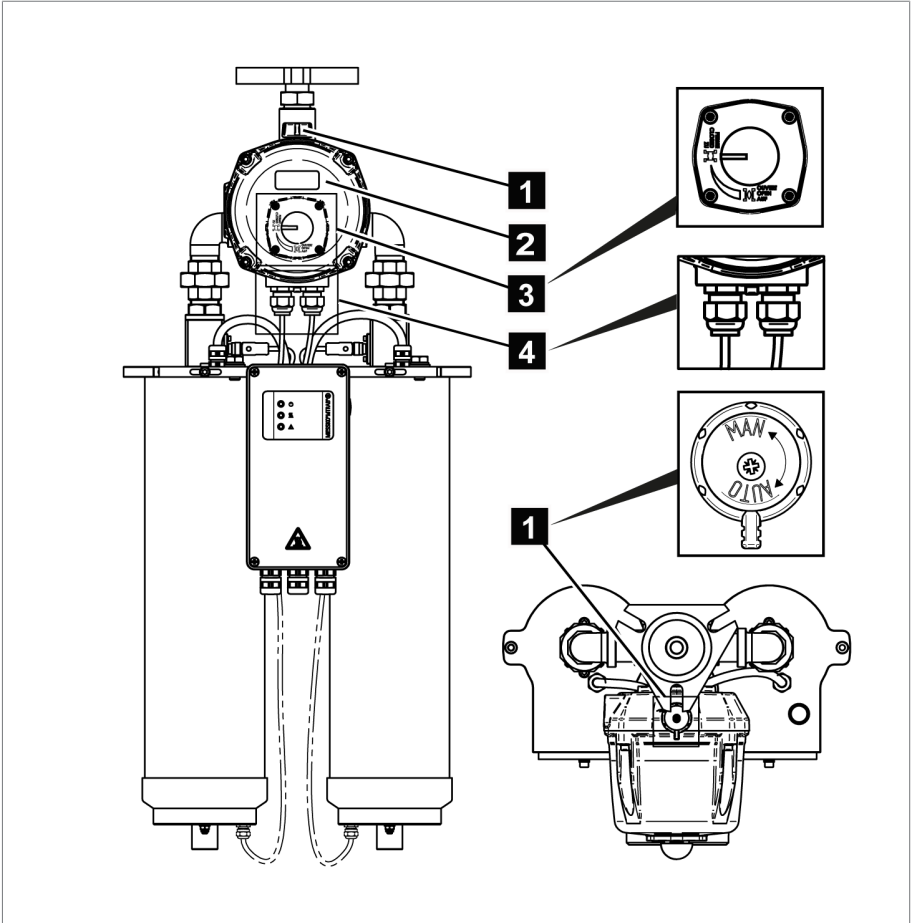


Figure 64: Ball valve

1 Switch

2 Ball valve

3 Display

4 Ball valve control cable

9 Error messages and troubleshooting

Before opening the terminal box or when checking the cables and sensors, always observe the following safety information:

WARNING



Electric shock

Risk of fatal injury due to electrical voltage.

- ▶ De-energize the device and system peripherals and take measures to ensure that they cannot be switched back on.

In terms of device functionality, a distinction must be made between air dehydration and automatic regeneration.

Air is dehydrated fully mechanically via the silica gel, and this function does not depend on a supply of electricity.

The electronics monitor and regulate automatic regeneration, thus ensuring that the dehydrating breather can be operated without maintenance. The electronics have no effect on the dehydrating performance of the device. Any error messages arising relate solely to the automatic regeneration, and therefore do not require an immediate response. Error messages do not indicate a danger to the transformer or tap changer.

We recommend that the device be checked over within a week of an error message arising.



If you would like to acknowledge an error that is no longer present, press the test button on the side of the terminal box. If several errors were present, they are to be acknowledged individually one after the other. The LED signaling is then reset, and the signaling relay for device malfunctions (failsafe) picks up again after all errors have been acknowledged.

If an error occurs that you cannot remedy yourself, please contact:

Maschinenfabrik Reinhausen GmbH

MR Service & Complaint
Falkensteinstrasse 8
93059 Regensburg
Germany

E-mail: service@reinhausen.com

E-mail: complaint@reinhausen.com

9 Error messages and troubleshooting

Using the self-monitoring function, the device identifies internal errors and signals them by illuminating and flashing LEDs **1** **2** **3** in different ways. In addition, an error is signaled via the device error relay (failsafe) [► Section 6.7, Page 58].



The device error relay is energized in normal operation and drops out after a delay (> 7 seconds) after switching off the supply voltage so as to avoid generating an error message during short interruptions of the supply voltage.

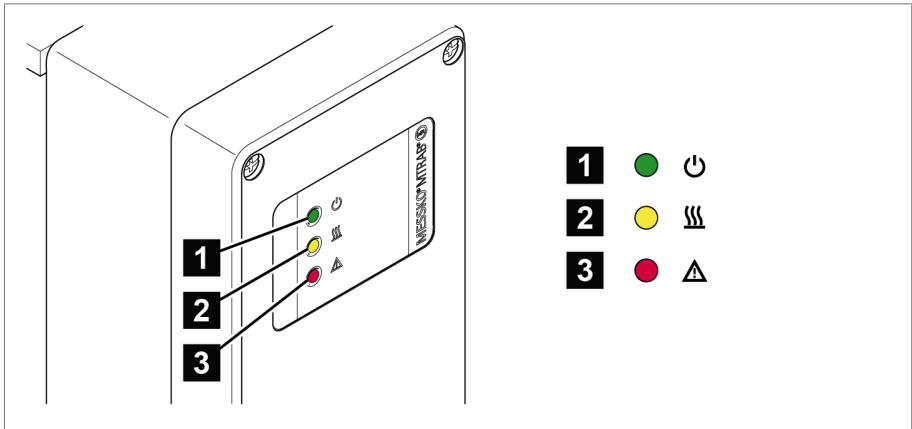


Figure 65: LEDs

1 LED green

2 LED yellow
















Optionally with NFC and Bluetooth®: LED yellow/blue

3 LED red

9 Error messages and troubleshooting

9.1 Error messages

The individual errors and possible corrective actions are listed in the following table. If a suitable corrective action cannot be found in this table, please contact MR Service & Complaint [► Section 9, Page 84].

Green LED 1	Yel-low LED 2	Red LED 3	Error	Action
			Dehydrating breather not working	Check whether the isolating device for the voltage supply is switched on. Check whether the supply voltage is connected correctly. Check that supply voltage [► Section 6.5, Page 56] is in accordance with nameplate [► Section 7, Page 75]. Check the fuse [► Section 9.3, Page 89] and replace if necessary.
			Sensor failure on the left-hand desiccant container	Check the cable connection of the sensor 5 and tighten by hand if necessary (1 Nm +/- 0.2 Nm).
			Sensor failure on the right-hand desiccant container (DB200D and DB200G only)	Check the sensor cable 6 for damage. Check the sensor contacts and sensor cable socket 4 for corrosion. The sensor may be soiled or defective.
			Error when heat-drying the left-hand desiccant container	Check the wiring of the supply voltage; retighten terminals if necessary.
			Error when heat-drying the right-hand desiccant container (DB200D and DB200G only)	Check that supply voltage [► Section 6.5, Page 56] is in accordance with nameplate [► Section 7, Page 75]. Check the cable for silica gel heating 3 for damage. The silica gel heating may be defective.

9 Error messages and troubleshooting











Green LED 1	Yel-low LED 2	Red LED 3	Error	Action
			Internal error	General device error. Contact MR Service & Complaint [▶ Section 9, Page 84].
			Left-hand position ball valve error (DB200G only)	Check whether the ball valve switch [▶ Section 8.1, Page 82] is in the "AUTO" position.
			Right-hand position ball valve error (DB200G only)	Check both cables to the ball valve (see Gamma controller (DB200G only) [▶ Section 8.1, Page 82] 4) for damage.

Table 6: Error messages

 = LED OFF

 = LED ON

 = LED FLASHING

9 Error messages and troubleshooting

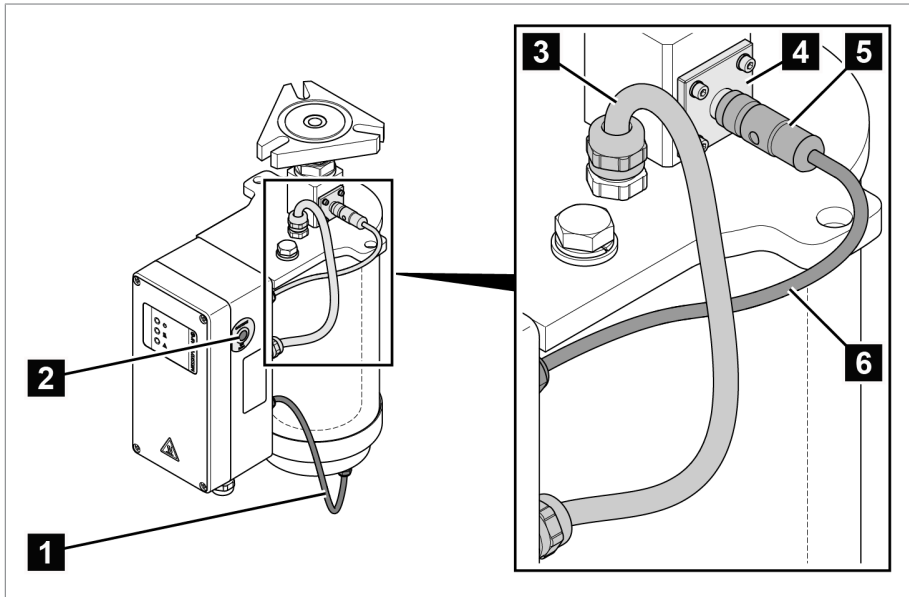


Figure 66: Tests

- | | |
|---|-----------------------|
| 1 Filter-heater supply cable (optional / HT version only) | 2 Test button |
| 3 Silica-gel heating supply cable | 4 Sensor-cable socket |
| 5 Sensor-cable screw connection | 6 Sensor cable |

9.2 Status messages

The individual status messages that do not have an error as the cause are listed in the following table.

Green LED 1	Yellow LED 2	Red LED 3	Status messages	Action
	<input type="radio"/>	<input type="radio"/>	Device is active	
	<input type="radio"/>	<input type="radio"/>	Device is sending data logger data	Optional software for output via USB is necessary.

9 Error messages and troubleshooting













Green LED 1	Yellow LED 2	Red LED 3	Status messages	Action
			Device is in regeneration mode	
			Regeneration being repeated	
			Forced regeneration	
			RTC battery voltage too low	Replace battery [▶ Section 9.4, Page 91] (CR2032).

Table 7: Status messages

 = LED OFF

 = LED ON

 = LED FLASHING

9.3 Fuse



If the fuse fails again, please consult MR Service & Complaint [[▶ Section 9, Page 84](#)]. A device version is available that eliminates the occurrence of overvoltages. Overvoltage protection can be retrofitted by replacing a circuit board.

A fine-wire fuse is installed on the circuit board in the terminal box to protect the control electronics. This can be replaced by a replacement fuse (see [[▶ Section 12.1, Page 104](#)]) if needed.

In order to replace the fuse, proceed as follows:

1. De-energize the dehydrating breather.

9 Error messages and troubleshooting

2. Open the terminal box of the dehydrating breather (see [► Section 6.4, Page 52]). To do so, unscrew the 4 captive screws on the housing cover. Open the cover of the terminal box.

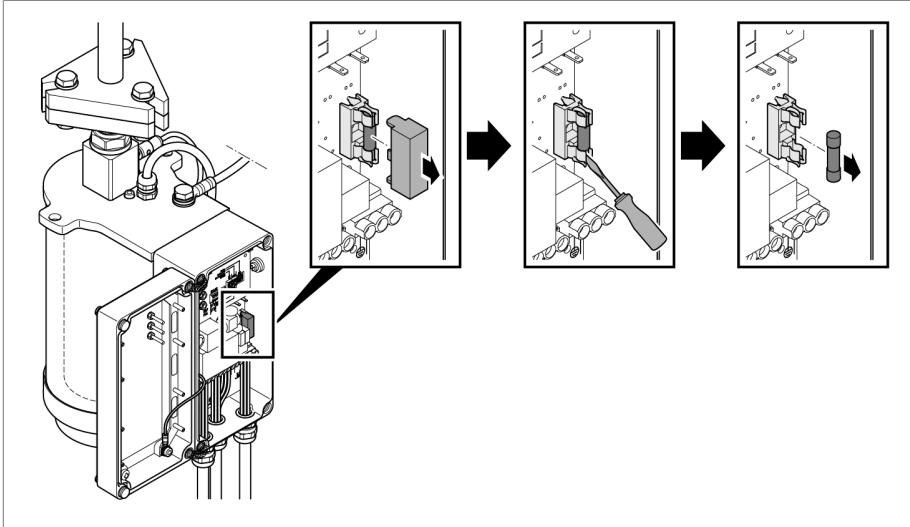


Figure 67: Removing the fine-wire fuse

3. Remove the safety cover.
4. Using a screwdriver, carefully move under one end of the fuse and lift it out of the holder.
5. Remove the fuse.
6. Position the new fuse (5x20 mm; T2A; 250 V) with both ends on the holder and carefully press down until it snaps in place.

9 Error messages and troubleshooting

7. Replace the safety cover.

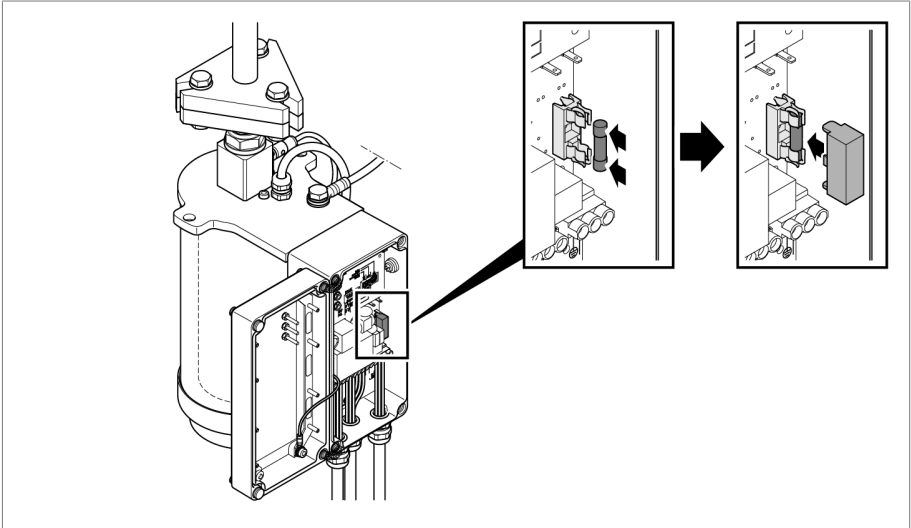


Figure 68: Inserting the fine-wire fuse

8. Close the terminal box again (see [▶ Section 6.10, Page 70]).

9.4 Replacing the battery (CR2032)

If the following LED signaling arises, the CR2032 battery in the device is to be replaced.

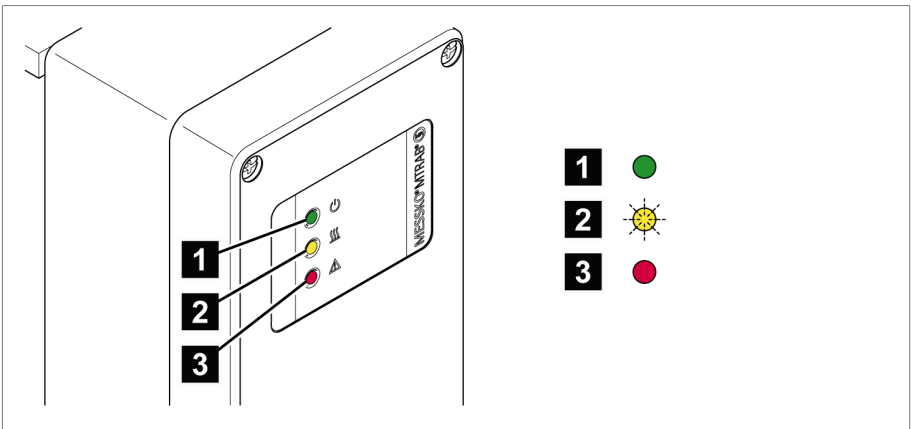


Figure 69: Battery exhausted

9 Error messages and troubleshooting

To replace the CR2032 battery in the device, proceed as follows:

- ✓ New battery is available.
 - ✓ The device and system peripherals have been de-energized and measures have been taken to ensure that they cannot be switched back on.
1. Open the terminal box of the dehydrating breather. To do so, unscrew the 4 captive screws on the housing cover. The cover is held on the left-hand side via spring hinges and can be swung open to the left.
 2. Remove the exhausted CR2032 battery from the battery holder.
 3. Insert the new battery (see [▶ Section 12.1, Page 104]) quickly and do not allow several minutes to pass, because otherwise the internal time will no longer match the current time. When doing so, ensure the polarity is correct.

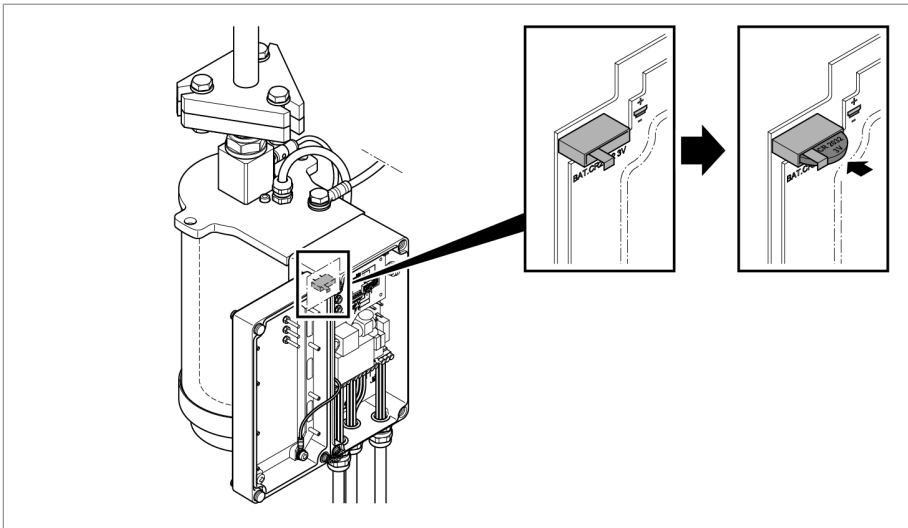


Figure 70: Replacing the CR2032 battery

4. Close the terminal box again (see [▶ Section 6.10, Page 70]).
5. Recommission the device (see [▶ Section 7, Page 75]).

9.5 Contaminated silica gel

The silica gel must not come into direct contact with the insulating fluid. In the event of the dehydrating breather being inadvertently flooded with insulating fluid, it must be thoroughly cleaned, the silica gel replaced completely and the correct function tested.

9 Error messages and troubleshooting

In the event of the device being flooded, contact Maschinenfabrik Reinhausen Service. Service will replace the silica gel and clean the device. Alternatively, you can request detailed documentation on replacing the silica gel.

Maschinenfabrik Reinhausen GmbH

MR Service & Complaint

Falkensteinstrasse 8

93059 Regensburg

Germany

E-mail: service@reinhausen.com

E-mail: complaint@reinhausen.com

10 Maintenance, inspection and care

▲ CAUTION



Risk of burns!

Danger of bodily injuries due to heat!

- ▶ During regeneration (yellow LED **2** lights up continuously), do not touch the glass cylinder of the desiccant container.

10.1 Maintenance

The dehydrating breather does not require maintenance.

10.2 Inspection

Depending on the conditions of use of the device and the national specifications in the respective country of use, the transformer manufacturers can specify different inspection intervals.

- ▶ Observe the inspection intervals defined in CIGRE Publication No. 445 "Guide for Transformer Maintenance" or the inspection intervals specified by the transformer manufacturer.

The following checks are necessary for **each** transformer inspection:

- Check the external condition of the device for contamination, damage and corrosion.
- Also carefully clear contamination from the dust protection tube. Do not use any sharp-edged or pointed tools for this.
- If the device is opened for inspection purposes (e.g. for repeated insulation or ground testing or for reading off log data), the housing screws are to be inspected for corrosion and, if necessary, regreased (e.g. with Autol TOP 2000). If necessary, also grease the four socket screws on the sensor unit. This may be necessary not just for offshore applications but also for onshore applications if the air is known to be more aggressive (e.g. increased salinity, sulfur content).
- Check the display of the LEDs.
- Use the test button for checking the signaling paths (see next section).
- In the event of questions or discrepancies, contact:

Maschinenfabrik Reinhausen GmbH

MR Service & Complaint

Falkensteinstrasse 8

93059 Regensburg

Germany

E-mail: service@reinhausen.com or complaint@reinhausen.com

10.3 Test button



If there was an error on the dehydrating breather, this must be acknowledged prior to conducting a function test. If several errors were present, they are to be acknowledged individually one after the other. If an error remains present, it is not possible to conduct a function test at this time (see [► Section 9, Page 84]).



It is also not possible to conduct a function test if the device is heat-drying (yellow LED **2** is lit). If the test button is actuated in this case, all LEDs flash simultaneously 10 times.

The test button can be used to force performance of a function test.

Quick test [► Section 10.3.1, Page 96]

If the test button is held down briefly (≤ 3 seconds), the humidity level in the upper air spout will be displayed for 30 seconds.

Long test [► Section 10.3.2, Page 99]

If the test button is held down for a longer period (> 3 seconds) and then released, the following tests will be performed:

- Heating test
- Analog output test
- Failsafe relay test
- Ball valve test (MTRAB DB200G only)

10 Maintenance, inspection and care

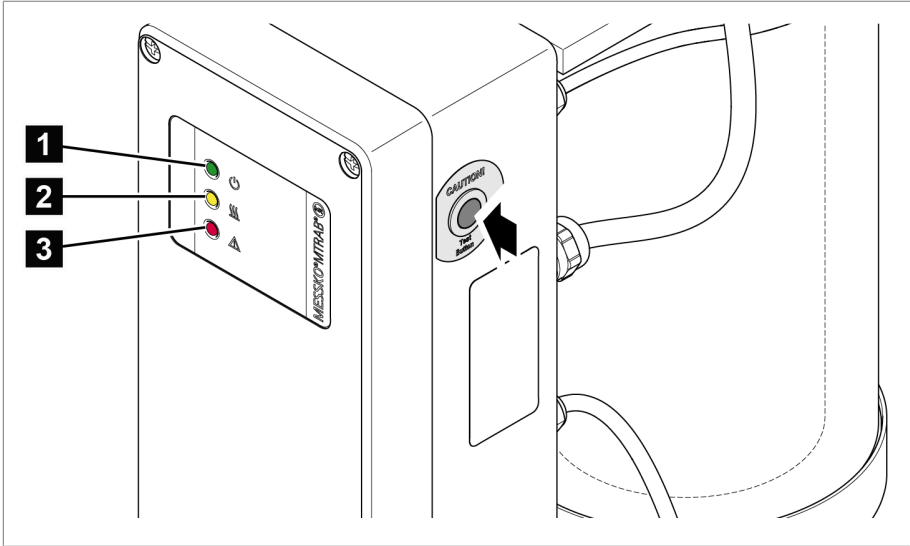











Figure 71: Test button

10.3.1 Quick test

Green LED 1	Yellow LED 2	Red LED 3	Humidity level	Action
	<input type="radio"/>	<input type="radio"/>	≤10% R.H.	Humidity OK.
		<input type="radio"/>	≤10% R.H.	Humidity OK. Regeneration imminent.
		<input type="radio"/>	≤10% R.H.	Humidity OK. Regeneration performed within the last 7 days.
	<input type="radio"/>	<input type="radio"/>	>10% and <20% R.H.	Humidity OK.
		<input type="radio"/>	>10% and <20% R.H.	Humidity OK. Regeneration imminent.
		<input type="radio"/>	>10% and <20% R.H.	Humidity OK. Regeneration performed within the last 7 days.
<input type="radio"/>		<input type="radio"/>	20% R.H.	Regeneration imminent.

10 Maintenance, inspection and care

Green LED 1	Yellow LED 2	Red LED 3	Humidity level	Action
			>20% R.H.	<p>Humidity increased, even though regeneration has been performed within the last 7 days.</p> <p>The device may be inadequately dimensioned or the silica gel may be contaminated.</p> <p>Check the installation situation. Are all transition points of the piping still sealed tightly?</p> <p>Contact MR Service & Complaint [▶ Section 9, Page 84] if necessary.</p>
			>40% R.H.	<p>WARNING! Humidity too high. Regeneration imminent.</p> <p>The device may be inadequately dimensioned or the silica gel may be contaminated.</p> <p>Check the installation situation. Are all transition points of the piping still sealed tightly?</p> <p>Contact MR Service & Complaint [▶ Section 9, Page 84] if necessary.</p>
			>40% R.H.	<p>WARNING! Humidity is too high, even though regeneration has been performed within the last 7 days.</p> <p>Check the installation situation. Are all transition points of the piping still sealed tightly?</p> <p>Contact MR Service & Complaint [▶ Section 9, Page 84] if necessary.</p>

 = LED OFF

 = LED ON

 = LED FLASHING

10 Maintenance, inspection and care

Starting a quick test in normal operation

- ✓ Device is not in the regeneration process (the silica gel is not being heat-dried; the yellow LED **2** is off).
- ▶ Briefly press the test button (hold down for ≤ 3 seconds).
- ⇒ The start of the quick test is signaled by an LED sequence (see following figure).
- ⇒ The code for the device humidity will be displayed via the LEDs (see table) for 30 seconds.
- ▶ If necessary, make a note of the code for the humidity.
- ⇒ The end of the quick test is signaled by an LED sequence (see following figure).
- ⇒ After this, the power LED **1** alone is permanently lit in error-free operation.

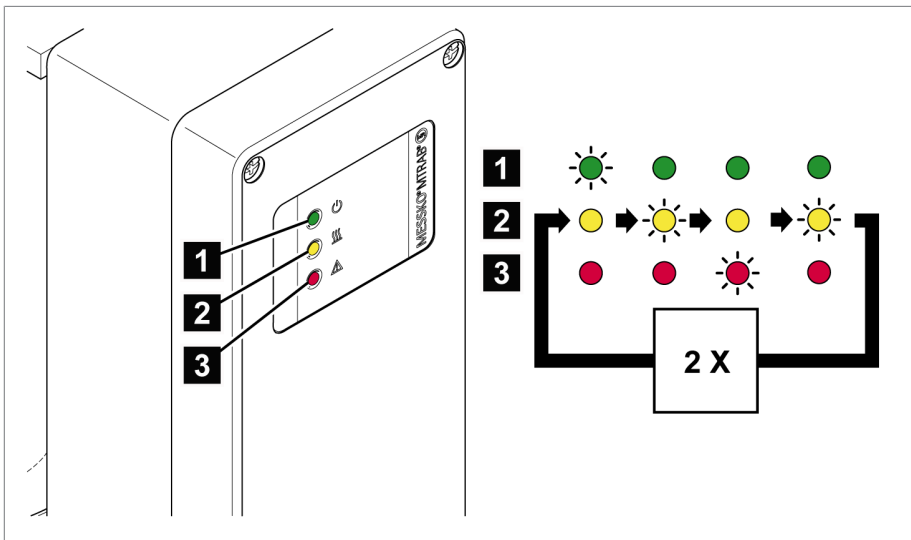


Figure 72: LED signal sequence at the beginning and end of the quick test

If the LEDs signal again or if an error is signaled over the device error signaling relay, observe the chapter Error messages and troubleshooting [▶ Section 9, Page 84].

10.3.2 Long test

NOTICE

Incorrect messaging!

When performing the long test, the failsafe relay will be activated for test purposes.

- ▶ Inform the control room that the failsafe relay will be activated.

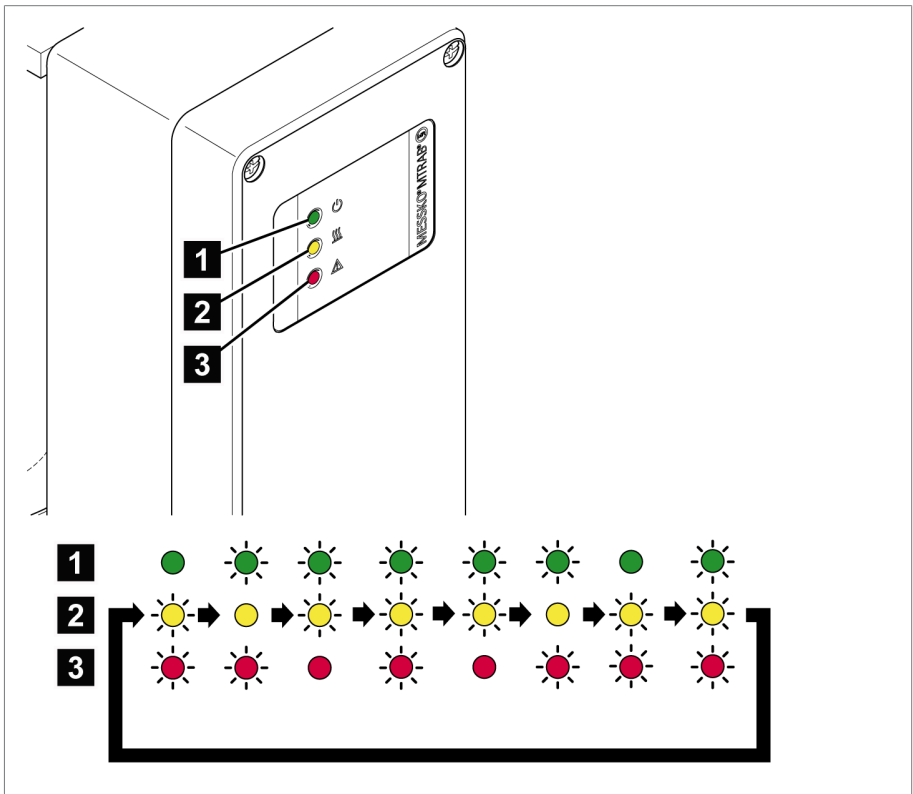


Figure 73: LED signaling during the long test

10 Maintenance, inspection and care

Starting a long test in normal operation

- ✓ Device is not in the regeneration process (the silica gel is not being heat-dried; the yellow LED **2** is off).
- 1. Press the test button for a longer period and then release (hold down for > 3 seconds).
- 2. The long test can only be interrupted within the first minute of starting the long test by pressing the key for at least 5 seconds. In this case, the interruption will be signaled by a flashing green LED and the device will be reset to its original status.
 - ⇒ The long test will be signaled by the LEDs for the duration of the test (approx. 10 minutes) as shown in the figure above.
 - ⇒ A heating test will be performed. In addition, the heating signaling relay will be activated.
 - ⇒ A 4...20 mA signal will be issued cyclically at the analog outputs for the duration of the test.
- 3. In the control room, check whether the heating signaling relay is energized.
- 4. Check whether the heat-drying process starts on the device.
- 5. Using a measuring device in the control room, check whether the signal at the analog outputs rises from 4 mA to 20 mA and then drops to 4 mA again within one minute.

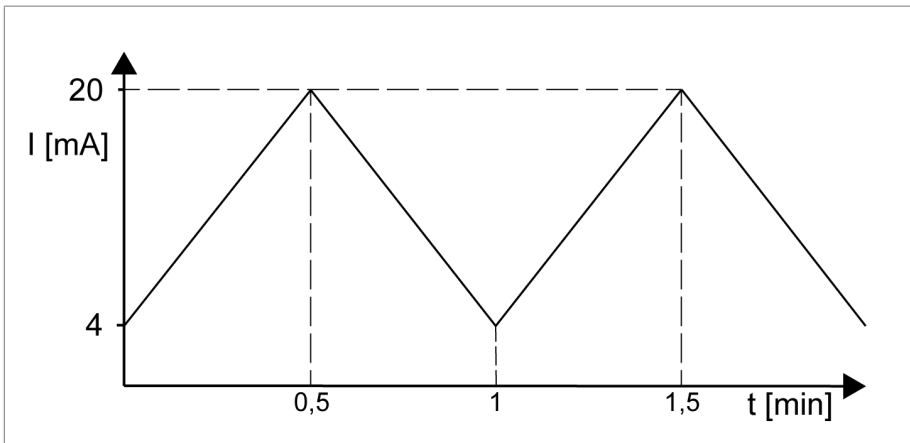


Figure 74: Analog signal

- 6. In the control room, check whether the device error signaling relay is deenergized and then energized again.

10 Maintenance, inspection and care

7. On a DB200G device (gamma control), check whether the ball valve moves to the opposite position and back again. While doing so, monitor the display **3** on the front of the ball valve [► Section 8.1, Page 82].

⇒ Once the long test has been completed, the power LED **1** is permanently lit in error-free operation.

If the LEDs signal again or if an error is signaled over the device error signaling relay, observe the chapter Error messages and troubleshooting [► Section 9, Page 84].

10.4 MSET MTRAB® data logger software (optional)

The MESSKO® MSET MTRAB® data logger software is used for visualization, for processing the measurement and event data, and for the configuration of the optional Modbus interface of the dehydrating breather. Furthermore, you can backup and export data with the program. You will find further details on software in the associated operating instructions.

10.5 Care

▲ WARNING



Electric shock!

Risk of fatal injury due to electrical voltage.

- De-energize the device and system peripherals and take measures to ensure that they cannot be switched back on.

NOTICE

Damage to the dehydrating breather!

Impairment to function due to the ingress of splash water via the dust protection tube.

- Spray water may only be applied from above. Do not clean the dehydrating breather from below with spray water.

10 Maintenance, inspection and care

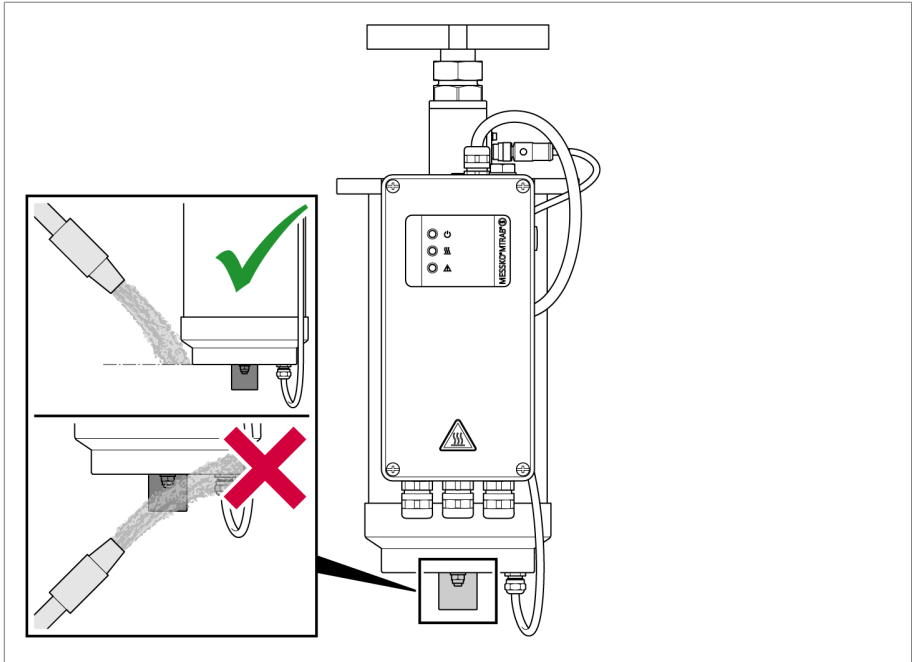


Figure 75: Spray water

Only use a damp cloth and mild cleaning agent to clean the device when needed.

Observe the national disposal regulations in the country of use.

11.1 SVHC information in accordance with the REACH regulation

This product complies with the provisions of European Regulation 1907/2006/EC dated December 18, 2006 on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

The following components of the product contain > 0.1% [w/w] of the SVHC substance lead (CAS no. 7439-92-1):

- Aluminum alloy
- Brass alloy
- Standard parts with a low property class

12 Technical data

12.1 Technical data



The technical data applies to the standard design and may vary depending on the design delivered. Subject to change without prior notice.

Operating conditions	
Location of use	Indoors and outdoors
Pollution degree (terminal box)	4
Relative humidity (operation and storage)	Inside the terminal box: 5 to 95% (non-condensing)
Ambient air temperature	DB100/200/200D: 0...+70 °C / -50...+70 °C HT version*; DB200G: 0...+70 °C / -20...+70 °C HT version*; *) HT version for applications in cold regions, i.e. ambient temperature is continuously below 0 °C over a time period of 20 days.
Storage temperature	-50 °C...+70 °C
Operating temperature	DB100/200/200D: 0...+70 °C / -40...+70 °C HT version*; DB200G: 0...+70 °C / -20...+70 °C HT version*; *) HT version for applications in cold regions, i.e. ambient temperature is continuously below 0 °C over a time period of 20 days.
Degree of protection in accordance with IEC 60529	<ul style="list-style-type: none">▪ Entire device: IPx6 with limitation, application of spray water only from above or from the sides▪ Terminal box only: IP66 and IP67
Overvoltage category	III
Protection class	I
Installation altitude	Max. 4,000 m above sea level

Design types

Materials	All external parts are resistant to weathering and UV radiation; version with resistance to saltwater (offshore) optional
Color	Flanges and metal parts: anodized (aluminum) Terminal box: Powder-coated (C4H or CX in accordance with DIN EN ISO 12944-9 as an option) RAL 7033 (cement gray) or RAL 7038 (agate gray) or RAL 7035 (light gray)
Weight (without flange)	DB100: approx. 8.6 kg DB200: approx. 12.6 kg DB200D: approx. 23.6 kg DB200G: approx. 31.6 kg
Dimensions	See section Dimensional drawings
Flange connection (flanges optional)	<ul style="list-style-type: none">▪ DIN flange (similar to DIN 42 562-3) including NBR70 gasket in accordance with DIN 5305 and including mounting kit (optional)▪ 2-hole RM flange (in accordance with DIN 2558) including Centellen WS3820 gasket; for DB100 only (optional)▪ 4-hole circular flange for 1/2" screws including NBR75 gasket black (optional)▪ Further customer-specific flanges on request▪ See dimensional drawings and design
Desiccant	Only use special colorless, non-toxic silica gel (silicon dioxide) sold by Maschinenfabrik Reinhausen GmbH; See application table for volume

12 Technical data

Power supply	
Nominal voltage	200 ...240 V AC, 50/60 Hz, 200...240 V DC Pmax. 2,500 W or 100...127 V AC, 50/60 Hz, 100...127 V DC Pmax. 2,500 W
Power consumption	Max. 100 mA (in normal operation); Increased power consumption during regeneration; refer to the heating current values in the application table
Heating current	Current during heating process (approx. 1–2 minutes after activating the heating): Refer to heating current values in the application table
External fuse protection	Miniature circuit breaker characteristic C, K, Z with nominal current of 16 A or 20 A
Rated insulation voltage	500 V DC (in accordance with IEC 61010-1) L against protective conductor  N against protective conductor 
RTC buffer battery	CR2032 (recommendation CR2032 from Renata or CR2032W from Murata Electronics)

Terminal box	
Pressure equalization element	Ventilated to prevent water condensation
Cable glands	M20x1.5 as nickel-plated brass or 1/2"-14NPT as nickel-plated brass or M20x1.5 rust-free stainless steel
Connection terminals	Supply connection, relay, analog outputs: 1.5...4 mm ² , AWG11–15 (solid or flexible), tightening torque 0.5...0.6 Nm RS485 interface: 0.14...1.5 mm ² , AWG15–26 (solid or flexible), tightening torque 0.25 Nm

12 Technical data

Terminal box

Status display	3 LEDs (green – operation indicator, yellow/blue – regeneration heating/NFC connection, red – device malfunction) visible from the outside; refer to status messages for the status
Test button	For the device function test
Fuse	5x20 mm; T2A; 250 V (e.g. Littelfuse 477 series 477002)

Signaling contacts

Contact type	1x change-over contact, silica gel regeneration signaling relay; 1x change-over contact, device error signaling relay (failsafe)
Contact material	Gold-plated contacts for applications with low switching currents Minimum load: ≥ 1 mV/1 mA
Dielectric strength	Between circuits and ground: ≥ 2 kV, 50 Hz, duration 1 minute; Between contacts in the open position: ≥ 1 kV, 50 Hz, duration 1 minute; Impulse voltage withstand strength between contacts: ≥ 3 kV, 1.2/50 μ s
Reliable switching capacity	240 V AC, 8 A (IEC 61810, 100,000 switching cycles); 240 V AC, 10 A, 2,000 VA (UL 508, 30,000 switching cycles); 30 V DC, 8 A, 240 W; 240 V DC, 300 mA
Maximum switching capacity	In accordance with IEC 60076-22-7, 1,000 switching cycles: 230 V AC, 1,840 VA / $\cos \phi > 0.5$ 250 V AC, 2,500 W / resistive load 24 V DC, 192 W / resistive load

12 Technical data

Analog outputs (active)

Output analog 1, left, in the upper air spout	Temperature: -40...+80 °C 4...20 mA: 7.5 °C/mA or optionally 0...20 mA: 6.0 °C/mA Measuring error: 4...20 mA: +/-2.3 °C 0...20 mA: +/-1.8 °C
Output analog 2, right, in the upper air spout	Humidity: 0...100% 4...20 mA: 6.25% R.H./mA or optionally 0...20 mA: 5.0% R.H./mA Measuring error: 4...20 mA: +/- 1.9% R.H. 0...20 mA: +/- 1.5% R.H.
Error signal in the event of sensor failure	< 3.6 mA (with 4...20 mA output signal); > 23 mA (with 0...20 mA output signal)
Load resistance	0...600 Ω

Options

Offshore	Terminal box in accordance with the requirements of DIN EN ISO 12944-9 with corrosion protection class CX; Offshore flange version; Cable gland stainless-steel version (grade 1.4404)
Insect protective grate	See dimensional drawings in attachment 7 SED 6356099
Cable protection	Protects the cable from damage such as animal bites, designed as a spiral coiled hose (stainless steel, suitable for offshore applications); refer to dimensional drawings in attachment 4 SED 6600056 and attachment 5 SED 6600296

Options

Filter heater	HT version: With heated stainless-steel filter; recommended for cold regions with an ambient temperature that is continuously below 0 °C for more than 20 days in order to guarantee proper function <hr/> Switching point < 5 °C (switch on)
Lateral mounting	See dimensional drawings in attachment 2 SED 6356077 and attachment 3 SED 6367297
Protective grate	See dimensional drawings in attachment 7 SED 6356099
Data logger software	For the evaluation of the data
RS485 interface	For connection to a SCADA system
Overvoltage protection	For protection against overvoltages
NFC and Bluetooth®	NFC and Bluetooth® function

Standards and directives

Electrical safety

IEC 61010-1	Safety requirements for electrical measurement and control and regulation equipment and laboratory instruments
UL 61010-1	
CAN/CSA-C22.2 No. 61010-1	
	<ul style="list-style-type: none">▪ Protection class I▪ Overvoltage category III▪ Contamination level 2

Electromagnetic compatibility

IEC 61000-6-5, IEC/KC 61000-6-2, IEC/KC 61000-6-4, FCC 47 CFR Part 15B, ICES-003

12 Technical data

Environmental durability tests	
IEC 60529	<ul style="list-style-type: none">▪ Entire device: IPx6 with limitation, application of spray water only from above or from the sides▪ Terminal box only: IP66 and IP67
IEC 60068-2-1	Dry cold – -25 °C / 96 hours
IEC 60068-2-2	Dry heat +70 °C / 96 hours
Power transformer and reactor fittings	
IEC 60076-22-7	Accessories and fittings
IEC 60076-22-7 Chapter 6.6.5.2.3	Duration test at least 100 regenerations passed
Radio equipment approvals (only for NFC and Bluetooth®)	
Europe (R.E.D.)	2014/53/EU Directive 2014/53/EU of the European Parliament and Council dated April 16, 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC Article 3.1 a) EN 61010-1: 2010 Article 3.1 b) EN 301 489-1 V2.2.3 EN 301 489-3 V2.1.1 EN 301 489-17 V3.2.2 Article 3.2) EN 300 330 V2.1.1 EN 300 328
USA (FCC)	Contains FCC ID: S9NBNRGM2SP
Canada (IC)	Contains IC: 8976C-BNRGM2SP

12.2 Application table

Application	Device type	Silica gel		
Tap changer	DB100	1.1 kg		
Arc suppression coil (Petersen coil)	DB100	1.1 kg		
Air-filled cable boxes	DB100	1.1 kg		
Vehicle transformers	DB100	1.1 kg		
Network transformers ≤ 40 MVA	DB100T	1.1 kg		
Network transformers and step-up transformers > 40 MVA ≤ 200 MVA	DB200T	2.2 kg		
Network shell transformers > 200 MVA	DB200D-T or 2x DB200T ²⁾	4.4 kg		
Phase shifter ≤ 40 MVA	DB100T	1.1 kg		
Phase shifter > 40 MVA ≤ 200 MVA	DB200T	2.2 kg		
Phase shifter > 200 MVA	DB200D-T or 2x DB200T ²⁾	4.4 kg		
Reactors ≤ 40 MVar	DB100T	1.1 kg		
Reactors > 40 Mvar ≤ 200 Mvar	DB200T	2.2 kg		
Reactors > 200 MVar	DB200D-T or 2x DB200T ²⁾	4.4 kg		
High voltage DC transmission (HVDCT) transformers	DB200D-T or 2x DB200T ²⁾	4.4 kg		
Furnace transformers	DB200G	4.4 kg		
Underground hall transformers	DB200G	4.4 kg		
GSU machine transformers	DB200G	4.4 kg		
Device type	Heating current ¹⁾		Silica gel	Control ³⁾
	$U_V = 120$ V	$U_V = 230$ V		
DB100	1.2 A	0.6 A	1.1 kg	Alpha
DB100T	1.2 A	0.6 A	1.1 kg	Beta
DB200T	2.3 A	1.2 A	2.2 kg	Beta

12 Technical data

Device type	Heating current ¹⁾		Silica gel	Control ³⁾
	U _v = 120 V	U _v = 230 V		
DB200D-T	4.7 A	2.4 A	4.4 kg	Beta
DB200G	2.3 A	1.2 A	4.4 kg	Gamma

1) Heating current during the heating process (approx. 1–2 min. After heating activation).

2) Mount individually on the conservator tank, no parallel mounting (see mounting recommendations).

3) **Alpha control:** Status-dependent control of the heat-drying process through humidity monitoring.

Beta controller (suffix T in the type designation): Self-learning system with status-dependent control of the heat-drying procedure through humidity monitoring and temperature-dependent determination of the most advantageous time to perform heat-drying.

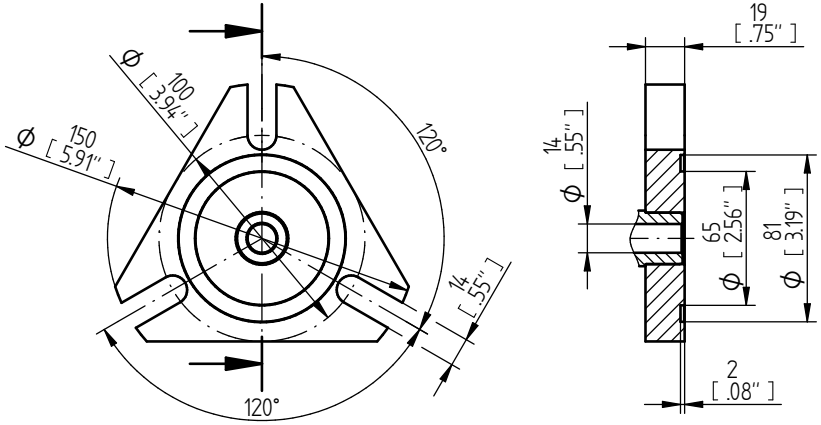
Gamma controller: System for applications with non-periodic breathing behavior. By monitoring the air humidity, the dehydrating cylinders are alternately regenerated based on status.

13 Dimensional drawings

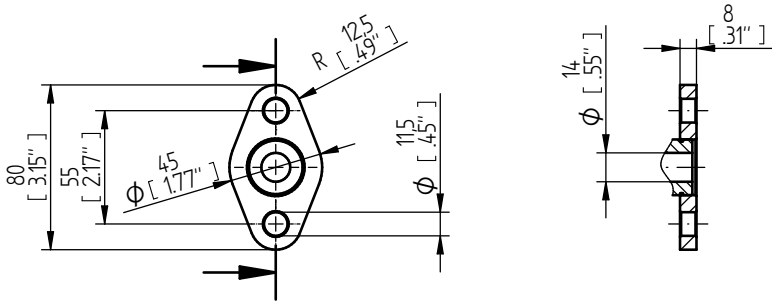
For dimensional drawings, refer to the following pages.

© MASCHINENFABRIK REINHAUSEN GMBH 2019
 Weitergabe sowie Vervielfältigung dieses Dokuments, Verwertung und Mitteilung seines Inhaltes sind verboten, soweit nicht ausdrücklich gestattet.
 Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte für den Fall der Patent-, Gebrauchsmuster- oder Designeintragung vorbehalten.

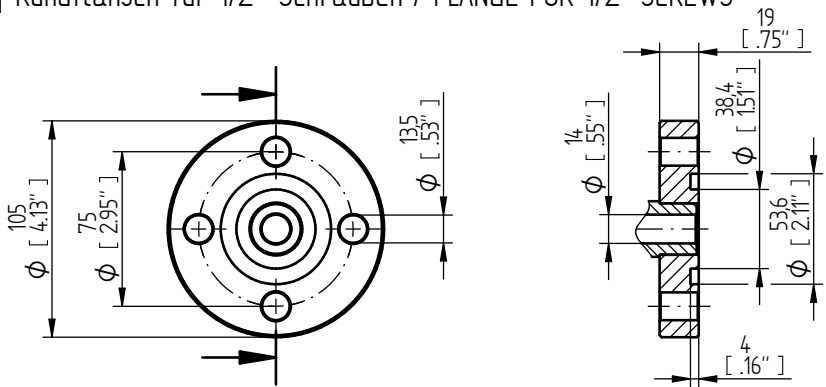
1 DIN-Flansch ähnlich / DIN FLANGE SIMILAR TO DIN 42562-3



2 RM-Flansch nach / RM FLANGE IN ACCORDANCE WITH DIN 2558



3 Rundflansch für 1/2"-Schrauben / FLANGE FOR 1/2" SCREWS



Datum	Name	Dokumentennummer
28.01.2019	RAEDLINGER	SED 6653712_000_00
Gepr.: 30.01.2019	HUBERTHO	Änderungsnummer Maßstab
Norml.: 30.01.2019	KLEYN	1090594 1:2.5

Maßangaben
 in mm, soweit
 nicht anders
 angegeben



MTRAB® Standard-Flanschanschlüsse
 MTRAB® STANDARD FLANGE CONNECTIONS
 Maßzeichnung / DIMENSION DRAWING

Serialnummer	
Materialnummer	Blatt
101227020M	1 / 1

© MASCHINENFABRIK REINHAUSEN GMBH, 2018
 THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DOCUMENT AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO OTHERS WITHOUT EXPRESS AUTHORIZATION IS PROHIBITED. OFFENDERS WILL BE HELD LIABLE FOR THE PAYMENT OF DAMAGES. ALL RIGHTS RESERVED IN THE EVENT OF A PATENT, UTILITY MODEL OR DESIGN.

DATE	NAME	DOCUMENT NO.
DFTR. 12.12.2018	RAEDLINGER	SED 6356077 000 00
CHKD. 17.02.2018	HUBERTHO	CHANGE NO.
STAND 03.01.2019	KLEYN	1090594
		SCALE
		1:4

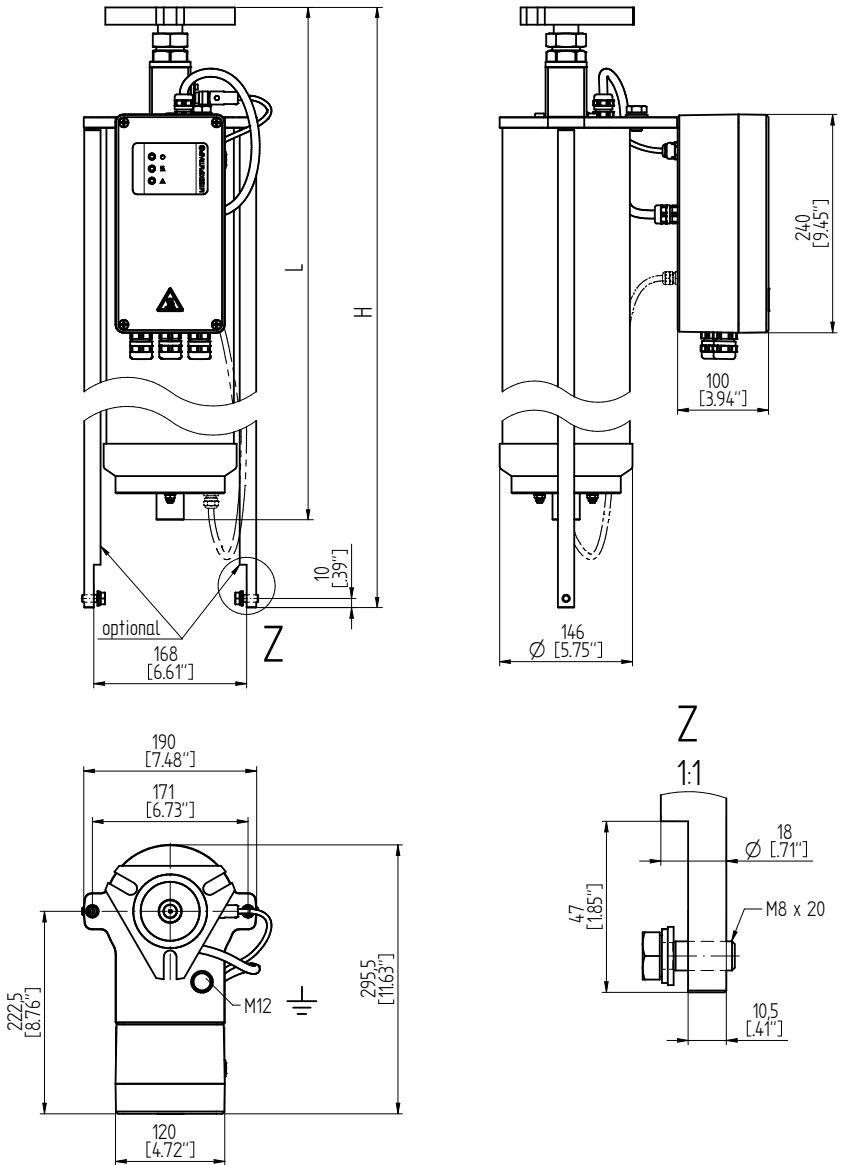
DIMENSION
 IN mm
 EXCEPT AS
 NOTED



MTRAB® DB100/DB200 mit seitlicher Zusatzbefestigung /
 MTRAB® DB100/DB200 WITH ADDITIONAL FASTENING POINTS
 Maßzeichnung / DIMENSION DRAWING

SERIAL NUMBER

MATERIAL NUMBER SHEET
 101213140M 1 / 1



MTRAB-Abmessung mit Flansch / MTRAB DIMENSIONS WITH FLANGE	DB100 L	DB100 H	DB200 L	DB200 H
DIN-Flansch / DIN FLANGE	454,5 [17.89"]	634 [24.96"]	684,5 [27.11"]	781 [30.75"]
RM-Flansch / RM FLANGE	458,5 [18.05"]	638 [25.12"]	-	-
1/2"-Schrauben / 1/2" SCREWS	454,5 [17.89"]	634 [24.96"]	684,5 [27.11"]	781 [30.75"]

© MASCHINENFABRIK REINHAUSEN GMBH, 2018
 THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DOCUMENT AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO OTHERS WITHOUT EXPRESS AUTHORIZATION IS PROHIBITED. OFFENDERS WILL BE HELD LIABLE FOR THE PAYMENT OF DAMAGES. ALL RIGHTS RESERVED IN THE EVENT OF THE GRANT OF A PATENT, UTILITY MODEL OR DESIGN.

DATE	NAME	DOCUMENT NO.
DFTR. 21.01.2020	SCHAEFFER	SED 6367297 000 01
CHKD. 21.01.2020	REINHELT	CHANGE NO.
STAND. 22.01.2020	KLEYN	1098810
		SCALE
		1:4

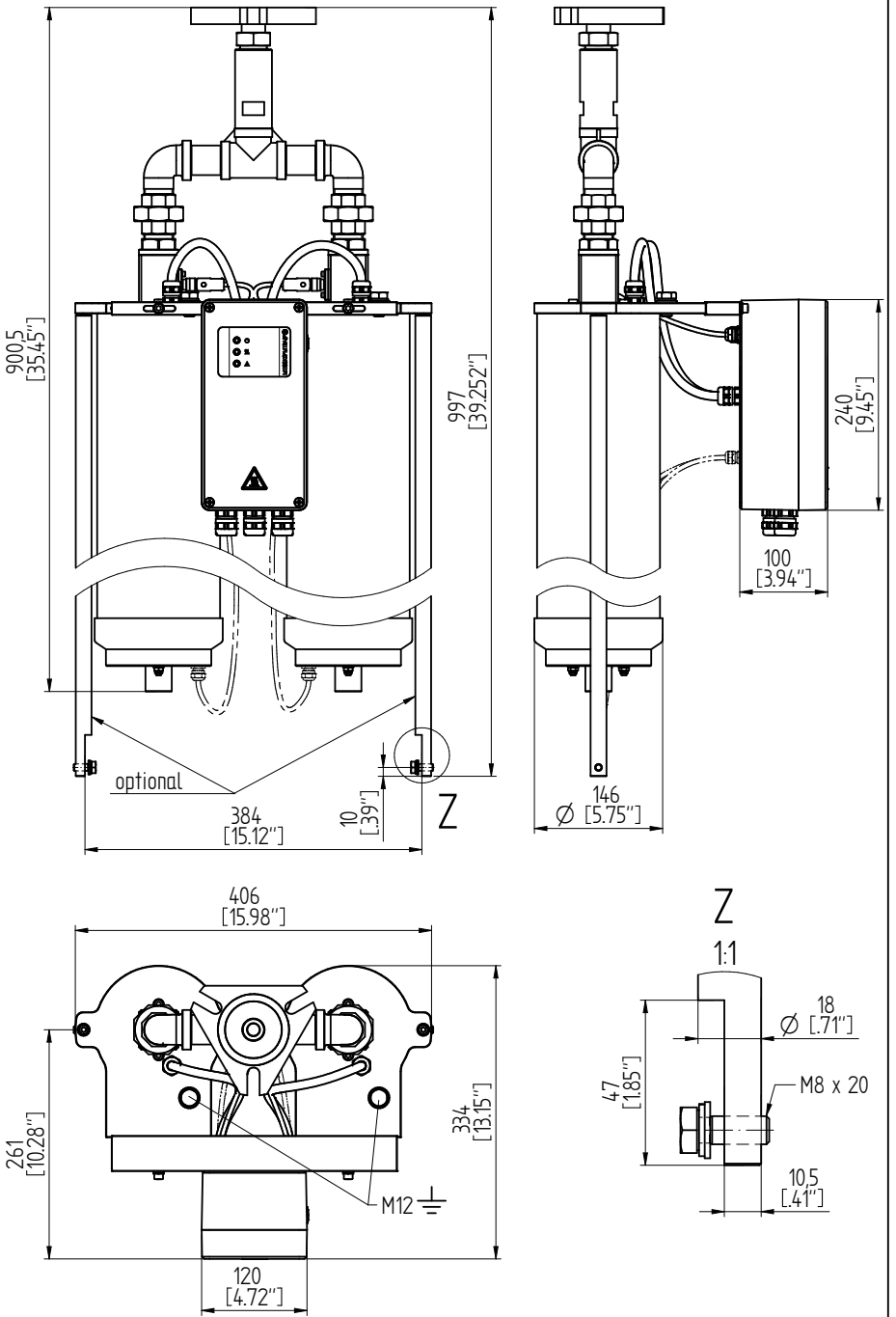
DIMENSION
 IN mm
 EXCEPT AS
 NOTED



MTRAB® DB200D-T mit seitlicher Zusatzbefestigung /
 MTRAB® DB200D-T WITH ADDITIONAL FASTENING POINTS
 Maßzeichnung / DIMENSION DRAWING

SERIAL NUMBER

MATERIAL NUMBER 101213171M SHEET 1 / 1



© MASCHINENFABRIK BEINHAUSEN GMBH 2018
 THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DOCUMENT AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO OTHERS WITHOUT EXPRESS AUTHORIZATION IS PROHIBITED. OFFENDERS WILL BE HELD LIABLE FOR THE PAYMENT OF DAMAGES. ALL RIGHTS RESERVED IN THE EVENT OF A PATENT, UTILITY MODEL OR DESIGN.

DATE	NAME	DOCUMENT NO.
DFTR. 26.02.2019	RAEDLINGER	SED 6600056.000.00
CHKD. 01.03.2019	HUBERTHO	CHANGE NO. SCALE
STAND. 01.03.2019	GRAUL	1090594 1:4

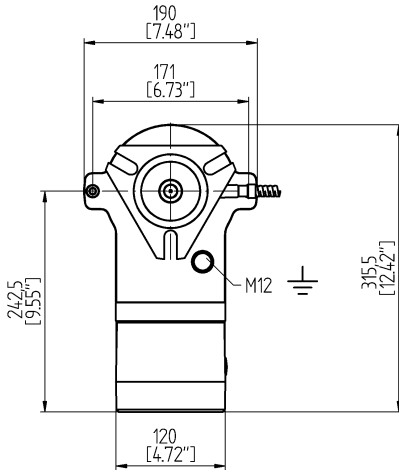
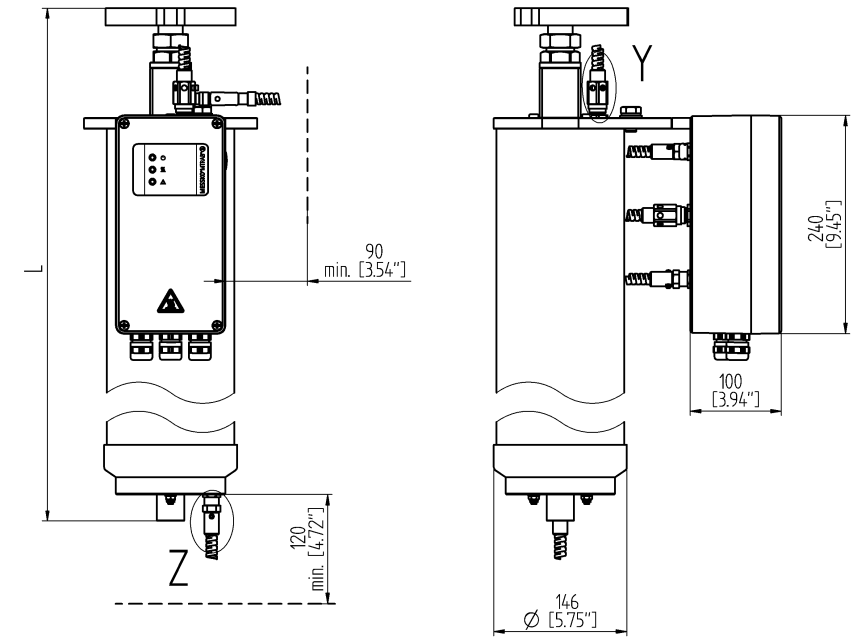
DIMENSION
 IN mm
 EXCEPT AS
 NOTED



MTRAB® DB100/DB200 mit Kabelschutz (optional) /
 MTRAB® DB100/DB200 WITH CABLE PROTECTION (OPTIONAL)
 Maßzeichnung / DIMENSION DRAWING

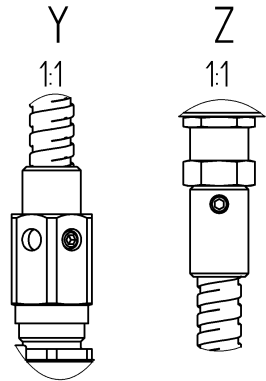
SERIAL NUMBER

MATERIAL NUMBER SHEET
 101235300M 1 / 1

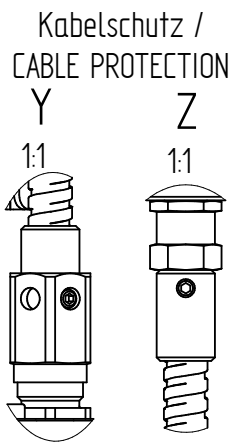
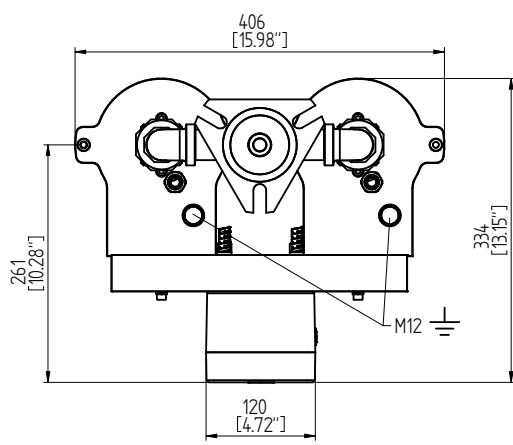
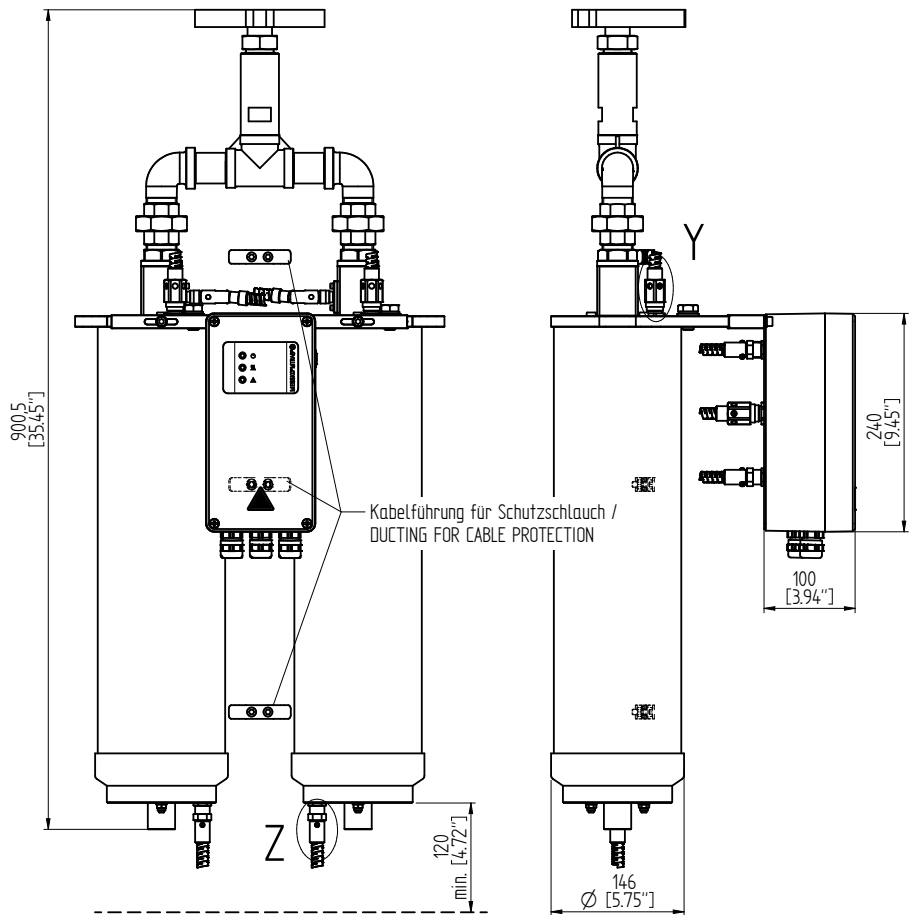


MTRAB-Abmessung mit Flansch / MTRAB DIMENSIONS WITH FLANGE	DB100 L	DB200 L
DIN-Flansch / DIN FLANGE	454,5 [17.89\"]	684,5 [27.11\"]
RM-Flansch / RM FLANGE	458,5 [18.05\"]	-
1/2"-Schrauben / 1/2" SCREWS	454,5 [17.89\"]	684,5 [27.11\"]

Kabelschutz /
 CABLE PROTECTION



© MASCHINENFABRIK REINHAUSEN GMBH, 2018
 THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DOCUMENT AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO OTHERS WITHOUT EXPRESS AUTHORIZATION IS PROHIBITED. OFFENDERS WILL BE HELD LIABLE FOR THE PAYMENT OF DAMAGES. ALL RIGHTS RESERVED IN THE EVENT OF A PATENT, UTILITY MODEL OR DESIGN.



DATE	NAME	DOCUMENT NO.
21.10.2020	SCHAEFFER	SED 6600296 000 01
21.10.2020	REINHELT	CHANGE NO.
22.02.2020	KLEYN	1098810
		SCALE
		1:4

DIMENSION
 IN mm
 EXCEPT AS
 NOTED



MTRAB® DB200D-T mit Kabelschutz (optional) /
 MTRAB® DB200D-T WITH CABLE PROTECTION (OPTIONAL)
 Maßzeichnung / DIMENSION DRAWING

SERIAL NUMBER	
MATERIAL NUMBER	SHEET
101235311M	1 / 1

© MASCHINENFABRIK REINHAUSEN GMBH, 2018
 THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DOCUMENT AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO OTHERS WITHOUT EXPRESS AUTHORIZATION IS PROHIBITED. OFFENDERS WILL BE HELD LIABLE FOR THE PAYMENT OF DAMAGES. ALL RIGHTS RESERVED IN THE EVENT OF A PATENT, UTILITY MODEL OR DESIGN.

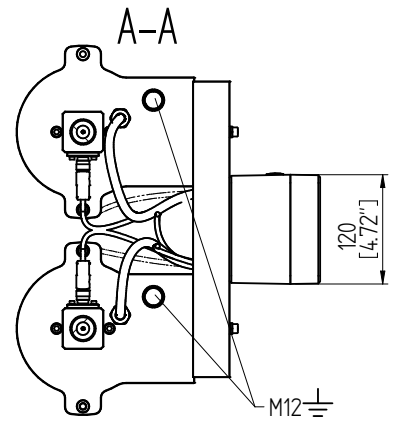
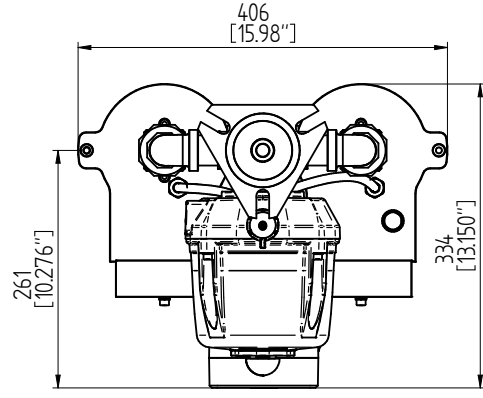
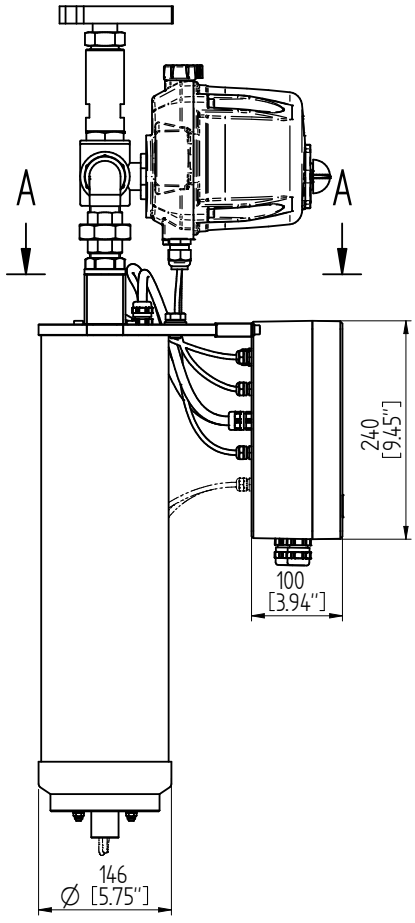
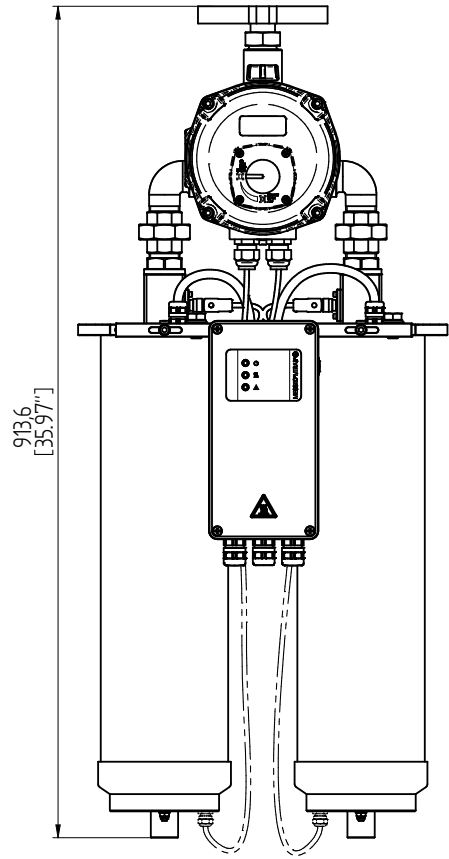
DATE	NAME	DOCUMENT NO.
DFTR. 20.01.2020	SCHAEFFER	SED 6368543 000 01
CHKD. 21.01.2020	REINHELT	CHANGE NO.
STAND. 22.01.2020	KLEYN	10988810
		SCALE 1:4

DIMENSION
 IN mm
 EXCEPT AS
 NOTED

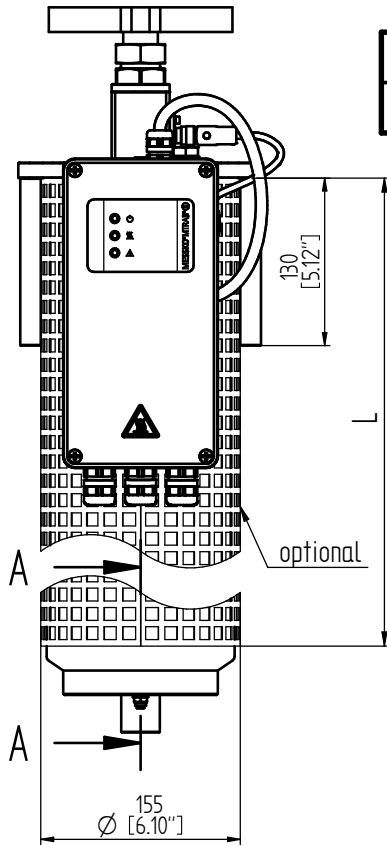


MTRAB® DB200G mit Gammasteuerung /
 MTRAB® DB200G WITH GAMMA CONTROL
 Maßzeichnung / DIMENSION DRAWING

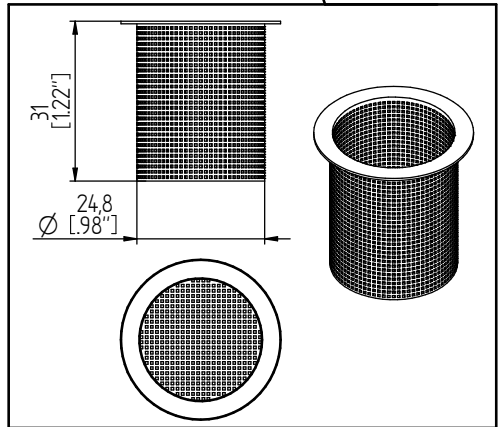
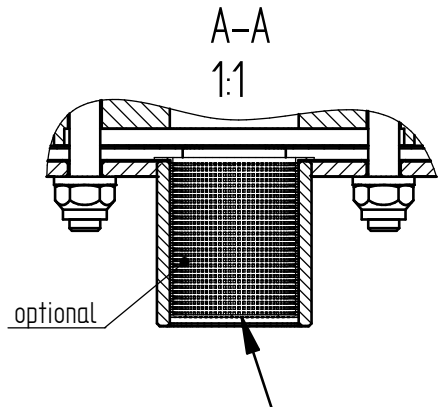
SERIAL NUMBER	
MATERIAL NUMBER	SHEET
101213181M	1 / 1



© MASCHINENFABRIK REINHAUSEN GMBH 2018
 THE REPRODUCTION, DISTRIBUTION AND UTILIZATION OF THIS DOCUMENT AS WELL AS THE COMMUNICATION OF ITS CONTENTS TO OTHERS WITHOUT EXPRESS AUTHORIZATION IS
 PROHIBITED. OFFENDERS WILL BE HELD LIABLE FOR THE PAYMENT OF DAMAGES. ALL RIGHTS RESERVED IN THE EVENT OF THE GRANT OF A PATENT, UTILITY MODEL OR DESIGN.



Maß / DIMENSION	DB100	DB200
L	260 [10.24"]	485 [19.10"]



DATE	NAME	DOCUMENT NO.
12.12.2018	RAEDLINGER	SED 6356099 000 00
17.12.2018	HUBERTHO	CHANGE NO.
03.01.2019	KLEYN	1090594
		SCALE
		1:4

DIMENSION
 IN mm
 EXCEPT AS
 NOTED



MTRAB® mit Schutzgitter und Insektenschutzgitter /
 WITH PROTECTIVE GRATE AND INSECT PROTECTIVE GRATE
 Maßzeichnung / DIMENSION DRAWING

SERIAL NUMBER

MATERIAL NUMBER
 101213190M

SHEET
 1 / 1

14.1 Modbus RTU

Status information

Function code "02" for reading the information

No.	Value	Designation	DB100/200/200D	DB200G
0	ON/ OFF	Error present	Yes	Yes
1	ON/ OFF	Left SiO ₂ heating error	Yes	Yes
2	ON/ OFF	Right SiO ₂ heating error	DB200D only	Yes
3	ON/ OFF	Voltage supply error	Yes	Yes
4	ON/ OFF	Left sensor error	Yes	Yes
5	ON/ OFF	Right sensor error	DB200D only	Yes
6	ON/ OFF	Right gamma error	No	Yes
7	ON/ OFF	Left gamma error	No	Yes
8	ON/ OFF	RTC battery low	Yes	Yes
9	ON/ OFF	Analog output 1 open	Yes	Yes
10	ON/ OFF	Analog output 2 open	Yes	Yes
11	ON/ OFF	Alpha controller info	Yes	No
12	ON/ OFF	Beta controller info	Yes	No
13	ON/ OFF	Info two cylinders	DB200D	Yes
14	ON/ OFF	Gamma controller info	No	Yes
15	ON/ OFF	Left cylinder closed	No	Yes

14 Appendix

No.	Value	Designation	DB100/200/200D	DB200G
16	ON/ OFF	Right cylinder closed	No	Yes
17	ON/ OFF	Left regeneration	Yes	Yes
18	ON/ OFF	Right regeneration	DB200D only	Yes
19	ON/ OFF	Left sensor status	Yes	Yes
20	ON/ OFF	Right sensor status	DB200D only	Yes

Analog values (input register)

Function code "04" for reading the information

No.	MSW/ LSW*	Value	Designation	DB100/200/200D	DB200G
0	MSW	float32	Left humidity sensor	Yes	Yes
1	LSW				
2	MSW	float32	Left temperature sensor	Yes	Yes
3	LSW				
4	MSW	float32	Right humidity sensor	DB200D only	Yes
5	LSW				
6	MSW	float32	Right temperature sensor	DB200D only	Yes
7	LSW				

*) MSW=most significant word; LSW=least significant word

Analog values (input register)

Function code "04" for reading the information

No.	Value	Designation	DB100/200/200D	DB200G
16	sint16 / factor 10	Left humidity sensor	Yes	Yes
17	sint16 / factor 10	Left temperature sensor	Yes	Yes
18	sint16 / factor 10	Right humidity sensor	DB200D only	Yes
19	sint16 / factor 10	Right temperature sensor	DB200D only	Yes

14.2 RS485 communication settings

ADR po- sition	Address	Baud rate	Parity	Description
0	247	9,600	EVEN	Address, baud rate and parity cannot be changed
1 - D	1 - 13	19,200	EVEN	The addresses 1 - 13 can be set via HEX rotary switch 1 - D; baud rate and parity cannot be changed
E	*)	*)	*)	*) Settings via MSET MTRAB data logger software
F	None	115,200	NONE	For service purposes

Factory settings

ADR po- sition	Address	Baud rate	Parity	Description
3	3	19,200	EVEN	Delivery status

Duplex mode: HALF

BUS termination 120 ohms: OFF

Glossary

Ambient air temperature

Permissible temperature of the air in the surroundings of the equipment in operation on which the device is installed.

EMC

Electromagnetic compatibility

Operating temperature

Permissible temperature in the immediate surroundings of the device during operation taking ambient influences, for example due to the equipment and installation location, into consideration.

Storage temperature

Permissible temperature for storing the device in an unmounted state or in a mounted state so long as the device is not in operation.

Maschinenfabrik Reinhausen GmbH

Falkensteinstrasse 8
93059 Regensburg

☎ +49 (0)941 4090-0

✉ sales@reinhausen.com

www.reinhausen.com

6820378/04 EN - MESSKO® MTRAB® -
F0377904 - 12/22 - Maschinenfabrik Reinhausen GmbH 2022

THE POWER BEHIND POWER.

