

Translation of the Original Operating Manual

Differential Pressure Transmitter

DMU 21 D

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READ THOROUGHLY BEFORE USING THE DEVICE
KEEP FOR FUTURE REFERENCE

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1. General and Safety-Related Information on This Operating Manual

This operating manual enables safe and proper handling of the product, and forms part of the device. It should be kept in close proximity to the place of use, accessible for staff members at any time.

All persons entrusted with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the device must have read and understood the operating manual and in particular the safety-related information.

The following documents are an important part of the operating manual:

- Data sheet

For specific data on the individual sensors, please refer to the respective data sheet.

Download these by accessing www.afriso.com or request them by e-mail or phone: info@afriso.com | Fon: +49 7135 102-211

In addition, the applicable accident prevention regulations, safety requirements, and country-specific installation standards as well as the accepted engineering standards must be observed.

1.1 Symbols Used

	- Type and source of danger - Measures to avoid the danger
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Warning word	Meaning
	- Imminent danger! - Non-compliance will result in death or serious injury.
	- Possible danger! - Non-compliance may result in death or serious injury.
	- Hazardous situation! - Non-compliance may result in minor or moderate injury.

NOTE – draws attention to a possibly hazardous situation that may result in property damage in case of non-compliance.

- ✓ Precondition of an action

1.2 Staff Qualification

Qualified persons are persons that are familiar with the mounting, installation, putting into service, operation, maintenance, removal from service, and disposal of the product and have the appropriate qualification for their activity.

This includes persons that meet at least one of the following three requirements:

- They know the safety concepts of metrology and automation technology and are familiar therewith as project staff.
- They are operating staff of the measuring and automation systems and have been instructed in the handling of the systems. They are familiar with the operation of the devices and technologies described in this documentation.
- They are commissioning specialists or are employed in the service department, and have completed training that qualifies them for the repair of the system. In addition, they are authorized to put into operation, to ground, and to mark circuits and devices according to the safety engineering standards.

All work with this product must be carried out by qualified persons!

1.3 Intended Use

The devices are used to convert the physical parameter of pressure into an electric signal.

The **pressure transmitter** is suited to measure the differential pressure, inter alia, in machinery and plant construction for filter monitoring and flow measurement as well as in hydraulic applications.

The user must check whether the device is suited for the selected use. In case of doubt, please contact our sales department (info@afriso.com | Fon: +49 7135 102- 211). AFRISO assumes no liability for any wrong selection and the consequences thereof!

The fluids that can be measured are gases and liquids that are compatible with the sealing material and with stainless steel 316L (1.4404 and 1.4435).

1.4 Limitation of Liability and Warranty

Failure to observe the instructions or technical regulations, improper use and use not as intended, and alteration of or damage to the device will result in the forfeiture of warranty and liability claims.

1.5 Safe Handling

NOTE – Treat the device with care both in the packed and unpacked condition!

NOTE –The device must not be altered or modified in any way.

NOTE –Do not throw or drop the device!

NOTE – The display and the plastic housing are equipped with a turning limiter. Do not attempt to overturn the display or housing by exerting increased force.

The device is state-of-the-art and is operationally reliable. Residual hazards may originate from the device if it is used or operated improperly.

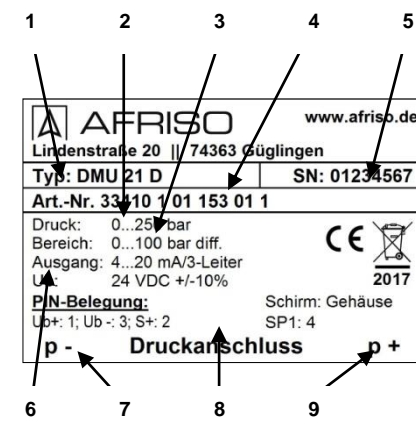
1.6 Scope of Delivery

Check that all parts listed in the scope of delivery are included free of damage, and have been delivered according to your purchase order:

- pressure transmitter DMU 21 D
- fastening bracket + 2 screws
- this operating manual

2. Product Identification

The device can be identified by means of the type plate with order code. The most important data can be gathered therefrom.



- 1 Type
- 2 Nominal pressure
- 3 Differential pressure range
- 4 Article number
- 5 Serial number
- 6 Signal / supply
- 7 Inlet p -
- 8 Terminal assignment
- 9 Inlet p +

Fig. 1: Type plate

3. Mounting

3.1 Mounting and Safety Instructions

	- Airborne parts, leaking fluid, electric shock - Always mount the device in a depressurized and de-energized condition!
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NOTE –When installing the device, do not use any force in order to prevent damage to the device or the system.

NOTE – Do not remove the packaging of the device until shortly before the mounting procedure in order to exclude any damage!

Dispose of the packaging properly!

Connect the reference pressures according to the following mounting steps that correspond to your mechanical connections. When doing so, the following must be observed:

- The higher pressure must be connected to the “+” inlet
- The lower pressure must be connected to the “-” inlet

3.2 Mounting Steps for Connections According to DIN 3852

NOTE –Do not use any additional sealing material such as tow, hemp or Teflon tape!

- ✓ The O-ring is undamaged and seated in the designated groove.
- ✓ The sealing face of the mating component has a flawless surface. (RZ6.3)

- 1 Screw the device into the mating thread by hand.
- 2 Hold the DMU 21 D with one hand on the wrench flat (wrench size 27) of the respective pressure port and tighten your fittings successively (for wrench flat made of steel: G1/4: approx. 5 Nm; G1/2: approx. 10 Nm).

3.3 Mounting Steps for Connections According to EN 837

- ✓ A suitable seal for the measured fluid and the pressure to be measured is available. (e.g. a copper seal)
- ✓ The sealing face of the mating component has a flawless surface. (RZ 6.3)

- 1 Screw on your fittings hand-tight onto the mating thread.
- 2 Then tighten the connection using an open-end wrench: G1/4: approx. 20 Nm; G1/2: approx. 50 Nm.

3.4 Mounting Steps for NPT Connections

- ✓ Suitable fluid-compatible sealing material, e.g. PTFE tape, is available.

- 1 Screw on your fittings hand-tight onto the mating thread.
- 2 Then tighten the connection using an open-end wrench: 1/4" NPT: approx. 30 Nm; 1/2" NPT: approx. 70 Nm.

3.5 Mounting by Means of the Fastening Bracket

By means of the fastening bracket, the DMU 21 D can be mounted onto a smooth surface or wall.

The fastening bracket is screwed to the bottom of the plastic housing of the DMU 21 D. To do so, remove the dummy caps and use the screws/bolts included in the delivery.

4. Electrical Connection

4.1 Connection and Safety Instructions

	- Improper installation may result in electric shock - Always mount the device in a depressurized and de-energized condition!
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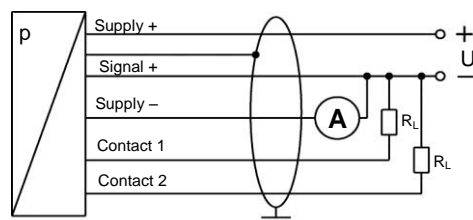
NOTE –If the device is equipped with a **cable gland** and/or **cable box**, it must be ensured that the outer diameter of the line used is within the permissible clamping range. Additionally it must be ensured that this is seated firmly and gaplessly in the cable gland!

NOTE –Use a shielded and twisted multicore cable for the electrical connection.

4.2 Electrical Connections

Electrical connections	M12x1 (5-pole)	Cable outlet
Supply +	1	wh (white)
Supply -	2	bn (brown)
3-wire: signal +	3	gn (green)
Contact 1	4	gy (grey)
Contact 2	5	pk (pink)
Shield	via pressure port	ye/gn (yellow/green)

Connection diagram:



5. Commissioning

- ✓ The device has been installed properly
- ✓ The device does not have any visible defect

NOTE – When putting your differential pressure transmitter into service it must be ensured that the device is pressurized on both pressure ports simultaneously. Otherwise, the sensor can be damaged. In case of pressurization on one side only, the maximum permissible static pressure (on one side) must be observed. Please gather this from the data sheet.

6. Operation

6.1 Control and Display Elements

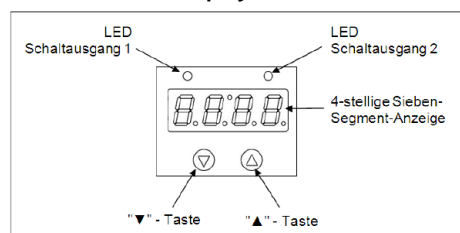


Fig. 3: Control panel

The display has a green LED for showing the active contact for switching point 1 and a yellow LED for switching point 2 (optional). If one of these LEDs is illuminated the respective switching point has been reached, and the contact is active.

The display of the measured value and the configuration of the individual parameters is performed through the menu, via a 4-digit seven-segment display.

- “▲” button: with this button you can move forward in the menu system or increase the displayed value
- “▼” button: with this button you can move backwards in the menu system or reduce the displayed value
- Both buttons simultaneously: If you press both buttons simultaneously, you can toggle between display mode and configuration mode and acknowledge a menu item or a set value
- When adjusting values, you can increase the counting speed by pressing and holding the respective button (“▲” or “▼”) for more than 5 seconds.

6.2 Configuration

The menu system is a closed system allowing you to scroll both forth and back through the individual set-up menus to navigate to the desired setting item. All settings are permanently stored in an EEPROM and are therefore available again even after a disconnection from the supply voltage. The structure of the menu system is the same for all device variants, regardless of the number of switching points. The structure only differs by the absence of the superfluous menu items. The following illustrations and menu description show all possible menu items.

NOTE –Please adhere to the description exactly and remember that changes to the adjustable parameters (switch-on point, switch-off point, etc.) only become effective after pressing both buttons simultaneously and exiting the menu item.

6.3 Password System

The terminal box has an access protection so that the menu system can only be accessed and operated by the authorized person.

- If you activate the password, the entire menu system will be blocked.
- If the access protection is cancelled by the password, the entire menu system is enabled.
- You can activate and deactivate the password via the menu “PAon” or “PAof”.
- You can change the password via the special menu 4.
- In case that the password has been lost there is a possibility to reset the password. This can be done by restoring the factory settings via the special menu 3.

6.4 Unit

The unit of the measured value is already determined at the time of ordering by the desired measuring range.

6.5 Configuration Example of the Analog Output

The analog output (if existing) can be configured by means of the menus ZP and EP. The function of these menus is explained below by means of an example:

Let’s assume that you have a pressure transmitter having a nominal pressure range of 0 to 6 bars which is connected to P1. The analog signal has 4 to 20 mA / 3-wire and was configured for “P1” in the menu 26 “SiAn”.

Ex works, the following signal behavior has been set:

- 0 bar = 4.00 mA, 3 bars = 12.00 mA, 6 bars = 20 mA

If you change the value in the menu ZP from 0 to 1 and the value in the menu EP from 6 to 5, the following signal behavior will result:

- 1 bar = 4.00 mA, 3 bars = 12.00 mA, 5 bars = 20 mA

The values of the menus ZP and EP can be adjusted up to the ratio of 1:10 of the nominal pressure range.

6.6 Explanation of Hysteresis Mode and Compare Mode

In order to invert the respective mode, the values for switch-on and switch-off points must be interchanged.

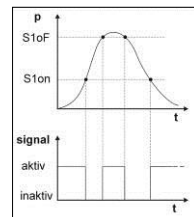


Fig. 4: Compare mode inverted

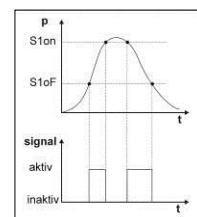


Fig. 5: Compare mode

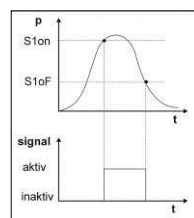


Fig. 6 Hysteresis mode

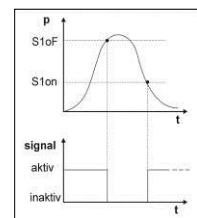
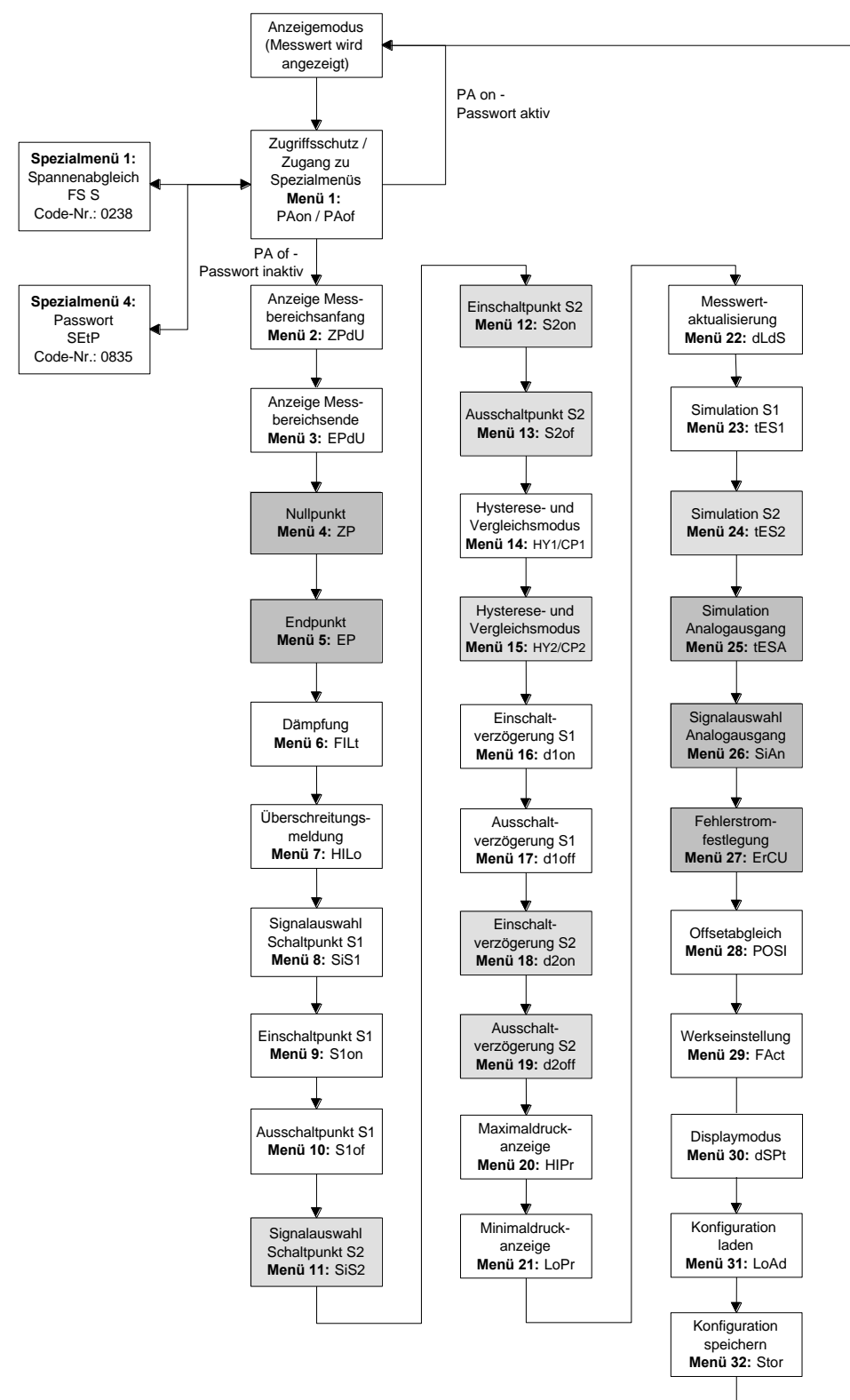


Fig. 7: Hysteresis mode inverted

6.7 Menu System Structure



6.8 Menu System

PAon	Menu 1 – Access protection PAon → Password active → To deactivate: set/adjust the password
PAof	PAof → Password inactive → To activate: set/adjust the password ☞ The password is factory-set to "0005"; Adjusting the password – Special menu 2
ZPdU	Menu 2 – Display of measuring range start Display of measuring range start (predetermined upon ordering); no entry option
EPdU	Menu 3 – Display of measuring range end Display of measuring range end (predetermined upon ordering); no entry option
ZP	Menus 4 and 5 – Setting of zero point / end point The configuration causes a change of the analog output while the displayed value remains unchanged (zero point and end point can only be adjusted within the limits of the measuring range according to the type plate)
EP	
FILt	Menu 6 – Setting of damping (filter) To achieve a stable indication when measured values fluctuate considerably: setting the time constant of a simulated analog low-pass filter (adjustable from 0.3 to 30 s)
HILO	Menu 7 – Activation of range-exceeding message Set to "on" or "off"
5.51	Menu 8 – Signal selection for contact 1 "P1", "P2" (the contact responds to the static pressure at the corresponding inlet) or "DIFF" (differential pressure between P1 and P2)
5.1on	Menu 9 – Setting of switch-on point for contact 1 Set the value for the activation of the contact 1 (S1on)
5.1of	Menu 10 – Setting of switch-off point for contact 1 Set the value for the deactivation of the contact 1 (S1of)
5.52	Menu 11 – Signal selection for contact 2 "P1", "P2" or "DIFF"
5.2on	Menu 12 – Setting of switch-on point for contact 2 Set the value for the activation of the contact 2 (S2on)
5.2of	Menu 13 – Setting of switch-off point for contact 2 Set the value for the deactivation of the contact 2 (S2of)
HY1	Menu 14 – Selection of hysteresis mode or compare mode for switching point 1 Set the hysteresis mode (HY1) or compare mode (CP1) for contact 1 ☞ See "6.6 Explanation of Hysteresis Mode and Compare Mode"
CP1	
HY2	Menu 15 – Selection of hysteresis mode or compare mode for switching point 2 Set the hysteresis mode (HY2) or compare mode (CP2) for contact 2 ☞ See "6.6 Explanation of Hysteresis Mode and Compare Mode"
CP2	
d1on	Menu 16 – Setting of switch-on delay for switching point 1 Set the value of the switch-on delay after reaching the switch-on point 1 (d1on); (adjustable from 0 to 100 s)
d1off	Menu 17 – Setting of switch-off delay for switching point 1 Set the value of the switch-off delay after reaching the switch-off point 1 (d1of); (adjustable from 0 to 100 s)
d2on	Menu 18 – Setting of switch-off delay for switching point 2 Set the value of the switch-on delay after reaching the switch-on point 1 (d2on); (adjustable from 0 to 100 s)
d2off	Menu 19 – Setting of switch-off delay for switching point 2 Set the value of the switch-off delay after reaching the switch-off point 1 (d2of); (adjustable from 0 to 100 s)
HIPr	Menus 20 and 21 – Display of maximum / minimum value Display of the maximum pressure (HIPr) or minimum pressure (LoPr) applied during the measurement (the value will be lost if the voltage supply is interrupted) ☞ For deletion: press both buttons again within one second
LoPr	
dLdS	Menu 22 – Measured-value update (display) Set the duration of cycles after which the measured value is updated in the display (adjustable from 0.0 to 10 s)
tES1	Menu 23 – Simulation of contact 1 The status of contact 1 can be simulated; the buttons "▲" and "▼" can be used to activate or deactivate the contact 1
tES2	Menu 24 – Simulation of contact 2 The status of contact 2 can be simulated; the buttons "▲" and "▼" can be used to activate or deactivate the contact 2
tESR	Menu 25 – Simulation of the analog output The signal value of the analog output can be simulated; you may choose between "oi 4" (4 mA / 2 V), "oi12" (12 mA / 6 V) and "oi20" (20 mA / 10 V)
5.5n	Menu 26 – Signal selection for analog output Allocation of the desired input signal; if "P1" or "P2" is set, the analog output will follow the static pressure at the corresponding inlet. If "DIFA", "DIFB" or "DIFC" is set the analog output will follow the calculated differential pressure between P1 and P2. If "DIFB" is set the analog signal will additionally be offset upwards by 50% FSO, the setting "DIFC" will result in a difference calculation with root extraction.
ErCU	Menu 27 – Error signal definition Definition of the error signal that will be output in case of a device fault; there is the choice between "OFF" (no error signal detection), "C 0" (0 mA / 0 V), "C LO" (3.5 mA / 1.75 V) and "C HI" (23 mA / 11.5 V) ☞ The error signal will only be output if "HILO" was set to "on" in the menu 6.
P0SI	Menu 28 – Position correction / offset alignment A position correction or an offset alignment can only be made if appropriate reference sources are available provided that the measured value deviation is within defined limits. Acknowledge the menu item "P0SI" by pressing both buttons. If the offset deviates from the ambient pressure the pressure reference corresponding to the lower measuring range value must be connected to P1. P2 must remain open! Subsequently, press both buttons again; this will store the signal currently being output by the pressure transmitter as offset. The set measuring range start (zero point) will now appear in the display although the sensor signal is displaced in the offset. ☞ If an analog output is available this will remain unaffected by the change made. Moreover, a shift of the range value (full scale) occurs simultaneously with the shift of the offset.
FAct	Menu 29 – Loading of factory default settings By means of this menu, previously made changes can be canceled. Please note that also the password will be reset.
dSPt	Menu 30 – Display mode Allocation of the desired input signal ("P1", "P2" or "DIFF")
LoAd	Menu 31 – Loading the configuration Loading of stored device configurations (choice between the numbers 1 to 5)
Stor	Menu 32 – Storing the configuration Storing of device configurations (the numbers 1 to 5 are available)
Special menus (Use the button ▲ and/or ▼ to select and acknowledge the menu item "PAof". The number "1" will appear in the display)	
FS5	Special menu 1 – Full scale compensation For full scale compensation (correction of the display) if the indicated value for full scale differs from the applied pressure value: a compensation is only possible if respective reference sources are available, provided that the measured value deviation is within defined limits; set "0238", acknowledge with both buttons, and "FS S" will appear in the display. Now the device must be pressurized using a pressure reference (the pressure must correspond to the measuring range end point). Press both buttons in order to store the signal being output by the pressure switch as full scale (range span) signal; the set end point will appear in the display, although the full scale sensor signal is offset. ☞ The analog output signal (in case of devices with analog output) remains unaffected by this change.
SEtP	Special menu 2 – Setting of password Set "0835" and acknowledge with both buttons. "SEtP" will appear in the display. Press the button ▲ or ▼ to set / change the password (adjustment range 0 ... 9999; the code numbers 0238, 0247, 0729, 0835 are excluded). Acknowledge the password by pressing both buttons simultaneously

7. Maintenance / Removal from Service

	<ul style="list-style-type: none"> - Airborne parts, leaking fluid, electric shock - Always service the device in a depressurized and de-energized condition!
	<ul style="list-style-type: none"> - due to aggressive fluids - Wear suitable protective clothing, e.g. gloves, safety goggles.

In principle, the device requires no maintenance. If necessary, clean the housing of the device using a moist cloth and a non-aggressive cleaning solution.

NOTE – After dismounting, mechanical connections must be fitted with protective caps.

8. Service/Repair

Information on service / repair:

- www.afriso.com
- info@afriso.com
- Service phone: +49 7135 102-211

9.1 Recalibration

The offset value or range value may shift during the life of the device. In this case, a deviating signal value in relation to the set lower or upper measuring range value is output. If one of these two phenomena occurs after extended use, a recalibration in the factory is recommended. Please note the chapter "Service/Repair" with regard to this.

9.2 Return

	<ul style="list-style-type: none"> - due to pollutants - Wear suitable protective clothing, e.g. gloves, safety goggles
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For every return shipment, whether for recalibration, decalcification, alteration or repair, the device must be cleaned thoroughly and packed in a break-proof manner. A return declaration with a detailed fault description must be added to the defective device. If your device has come into contact with pollutants, a declaration of decontamination is additionally required. Appropriate templates can be found on our homepage. Download these by accessing www.afriso.com or request them by e-mail or phone: info@afriso.com | Fon: +49 7135 102-211

In case of doubt regarding the fluid used, devices without a declaration of decontamination will only be examined after receipt of an appropriate declaration.

10. Disposal

	<ul style="list-style-type: none"> - due to pollutants - Wear suitable protective clothing, e.g. gloves, safety goggles
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The device must be disposed of according to the European Directive 2012/19/EU (WEEE – Waste electrical and electronic equipment). Waste equipment must not be disposed of in household waste!

NOTE – Dispose of the device properly!

11. Warranty terms

The warranty terms are subject to the legal warranty period of 24 months, valid from the date of delivery. If the device is used improperly, modified or damaged, we will rule out any warranty claim. Any damaged diaphragm will not be accepted as a warranty case. Likewise, there shall be no entitlement to any warranty claim if the defects have arisen due to normal wear and tear.

12. EU Declaration of Conformity / CE

The delivered device meets the legal requirements. The applied Directives, harmonized standards and documents are listed in the EC/EU Declaration of Conformity valid for the product. It can be found under www.afriso.com. In addition, the operational safety of the device is confirmed by the CE sign on the type plate.