

Installation and Operating Instructions ENR 200 / ENR 300 level controllers

WG 40/11.10/

E-MBA 433a



Type designation

ENR 200

ENR 300

1 / 18



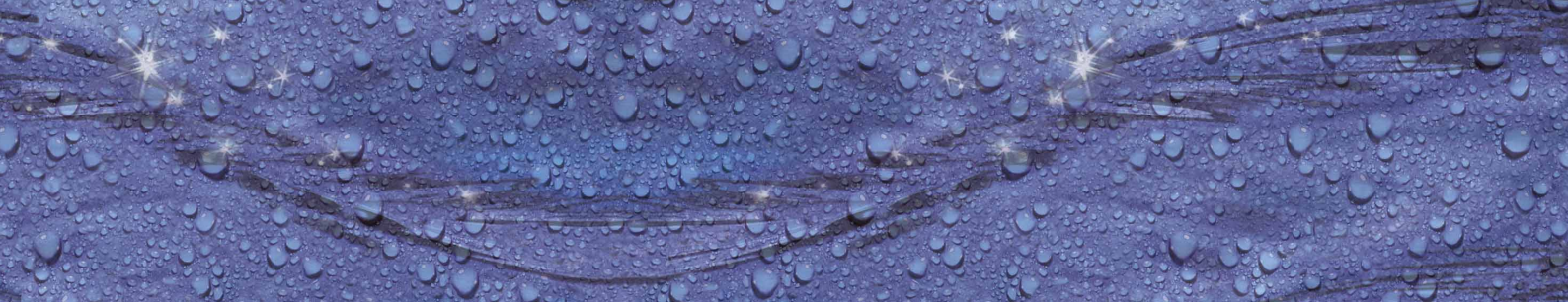
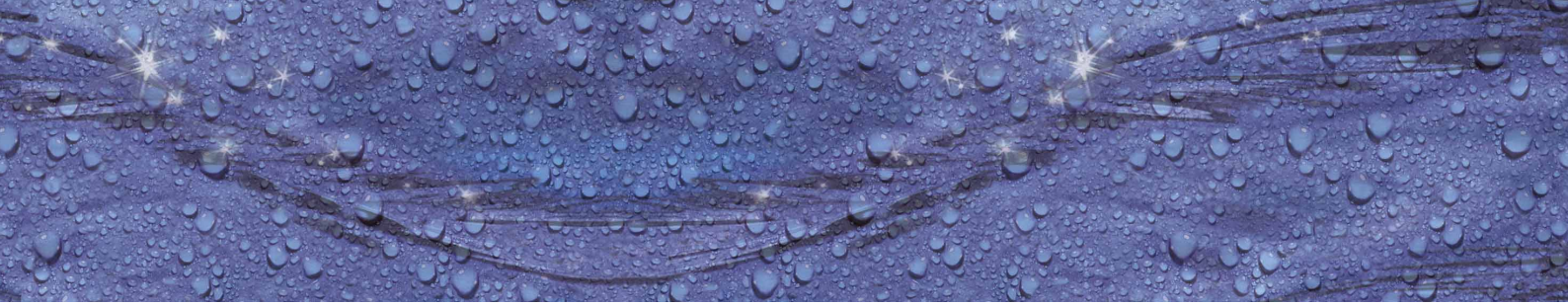


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1. General safety instructions, designated use

Please read these Operating Instructions carefully and comply with relevant country-specific standards, safety regulations and accident prevention guidelines. The Installation Instructions form part of the device and must be kept readily available throughout the operating life of the device. Propagation as well as duplication of this document, exploitation and communication of its content are forbidden, unless explicitly permitted. Violations will cause indemnities. All rights are reserved for the case of patent, utility model or design patent registration.

1.1. Warning

Warnings are indicated in this document as follows:

 DANGER	This symbol is used to warn the user of imminent danger. Failure to comply with the specific instructions and measures could result in death, serious injury or serious damage to equipment and property.
 CAUTION	This symbol is used to warn the user of possible dangers or hazardous situations. Failure to avoid such dangers or hazardous situations could result in damage to the product and/or the vicinity of the product.
	This symbol is used to highlight actions or procedures which, if not performed correctly, could have an indirect effect on operation or trigger an unexpected response on the part of the device.

1.2. Designated use

The ENR 200 and ENR 300 level controllers are intended only for commercial use. These devices are used for the following purposes:

- To evaluate an external electrode signal from level rod probes or float switches and to generate resulting switching states.

Designated use also comprises the following:

- The instructions in this manual must be adhered to.
- The technical limit values (see Chapter 6 "Technical data") must be observed.
- The devices are **not** suitable for use in hazardous areas.

The manufacturer does not accept any liability for damages resulting from incorrect use, unauthorised modifications, failure to comply with these Operating Instructions or the device being operated by unqualified staff. The manufacturer's warranty also no longer applies.

- **The ENR 200 and ENR 300 devices as well as the ETS 100 and ETS 200 devices with a level rod probe should *never* be used in conjunction with other conductive / capacitance sensor systems in a tank. If used in conjunction with other sensors, errors and malfunctions may result. This does not affect systems that are equipped with a float switch as a probe.**

1.3. Standards and guidelines

The device complies with the following regulations:

- EMC Directive 2004/108/EC
- EN 61000-6-1 (Interference immunity for residential, commercial and light-industrial environments)
- EN 61000-6-3 (Interference emission for residential, commercial and light-industrial environments)
- Low Voltage Directive 2006/95/EC
- EN 61010-1:2002 (Safety requirements for electrical equipment for measurement, control and laboratory use)

1.4. Safety instructions






- Assembly, electrical installation, commissioning and maintenance of the ENR level controller must only be carried out by a qualified electrical engineer. The instructions in this manual must be fully understood and adhered to.
- The electrical technician is responsible for ensuring that the device is correctly connected in accordance with the electrical wiring diagrams.
- The device does not require any maintenance. It is not permitted to open the housing. Electrical circuits posing a shock hazard are located inside the housing.
- The ENR level controller must only be operated by personnel who have been authorised and instructed on how to do so by the system operator
- Applicable standards and guidelines must be adhered to.
- Compliance with the EMC directives is required for the entire plant.

2. Product description

2.1. Nameplate

The nameplate is located on the right-hand side of the housing.

Name plate example

			
Niveauregler			
Art.No.	4020120001	←	Article number
Type	ENR 200	←	Device type, here ENR 200
Sensitivity	0,05 - 250 kOhm	←	Measuring range
t	2 sec / 8 sec	←	Response time
Relais	1 Wechsler / c/o	←	Type of output
Aux	250 V / 5 AAC	←	Rated voltage
P-Nr.	20 - 230 V AC / DC	←	Production number
IP20	←	←	Reference to Operating Instructions
		←	Ingress protection
		←	CE mark as per EC conformity

2.2. Structure of the measuring system

The measuring system consists of a conductive level rod probe (NS ...) or a float switch (MTS ...) and the ENR level controller.

2.3. Principle of operation

The ENR 200 and ENR 300 level controllers are based on the principle of conductivity (conductive level measurement). The electronics deliver a low alternating voltage to the signal transmitters. In the case of level rod probes, the electric circuit is closed by means of the conductive liquid. Float switches close the circuit by means of magnetically energised reed contacts.

In the case of minimum/maximum control systems, the relay integrated into the controller alternately switches between the highest and lowest level.

3. Mounting and installation



Before mounting the device, make sure that it does not exhibit any damage, including damage due to damp, which could have resulted from incorrect transportation or storage.

The ingress protection of the housing is IP20. Ensure that the ETS housing remains free from build-up and moisture. The terminals and connecting cables should be checked regularly to ensure they are firmly seated and free from vibrations.

The ambient temperature limits indicated in the technical data must be observed.

3.1. Mounting on a bearing rail

The device is mounted on a 35 mm bearing rail/EN50022 in a cabinet or switch box. The application of force, which results in the deformation of the plastic housing, could damage the electronics and should be avoided.



To mount the device, the device is set on top of the bearing rail and snapped into place by applying a slight amount of pressure.

To disassemble the device, use a screwdriver to press down and unlock the catch underneath the rear device wall and remove the device.

3.2. Electrical connection



The rated voltage (aux) and other electrical data are indicated on the nameplate of the device and in Chapter 6 "Technical data". The conductor cross-section of the auxiliary power (aux) and the main fuse used must suit one another in accordance with local standards and guidelines.

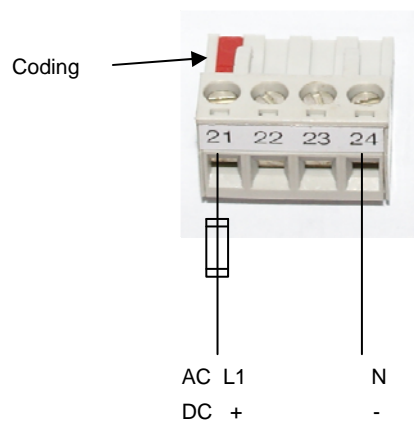
The 4-pin terminal blocks can be plugged in and thus make it easier to mount the device. The terminal blocks can be levered off from the housing using a screwdriver. The terminal blocks are distinctively coded to avoid any confusion and to prevent them from being connected incorrectly.

3.2.1. Connecting the auxiliary power



The auxiliary power (aux) is connected to terminal "21" (alternatively "22") for 'L1' (phase) in the case of alternating voltage systems or '+' in the case of direct current systems, and to terminal "24" (alternatively "23") for 'N' (zero) or '-'. Observe the limit values of the auxiliary energy supply (for information, see the technical data). The size of the upstream fuse element must be in accordance with the standards and guidelines generally applicable.

Any work in the area of the auxiliary power connection may only be performed if no current is supplied to the device.



ENR 200 and ENR 300 auxiliary power connection

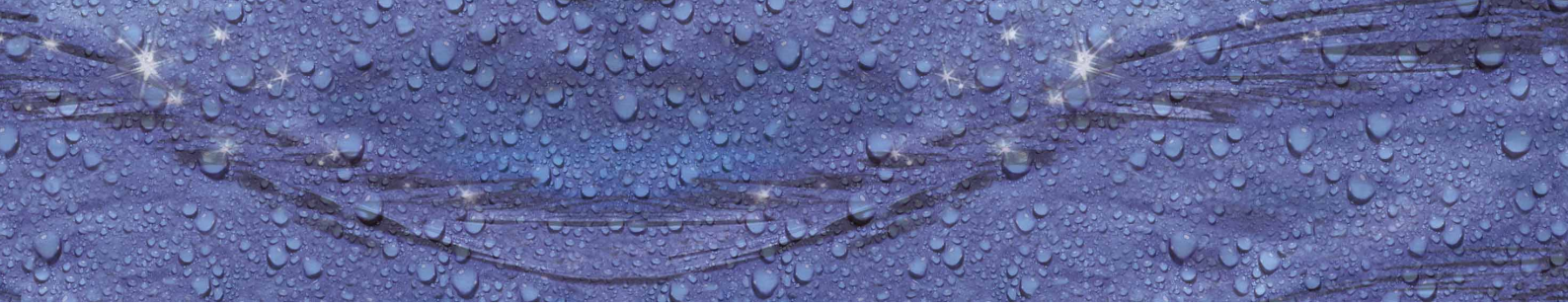
3.2.2. Probe connection



The sensor cable (of level rod probe NS... or float switch MTS...) carries an alternating voltage ranging from a few millivolts to up to 6 volts. For this reason, this cable should be routed in the shortest way possible. Avoid routing the cable near large electric machines and switching elements that cause stray fields, switching pulses and induction. Use a screened cable with low intrinsic capacitance. The maximum permissible cable length can be up to 100 m, provided the points above are observed.

If connecting the cable screening to earth at one side, please earth the screening at the ground probe of the level rod probe or at the tank potential.

If using conductive NS level rod probes, the reference potential is at the measuring potential "M" (terminal 11) of the device and is connected to functional earth in accordance with VDE 0100.



Caution:

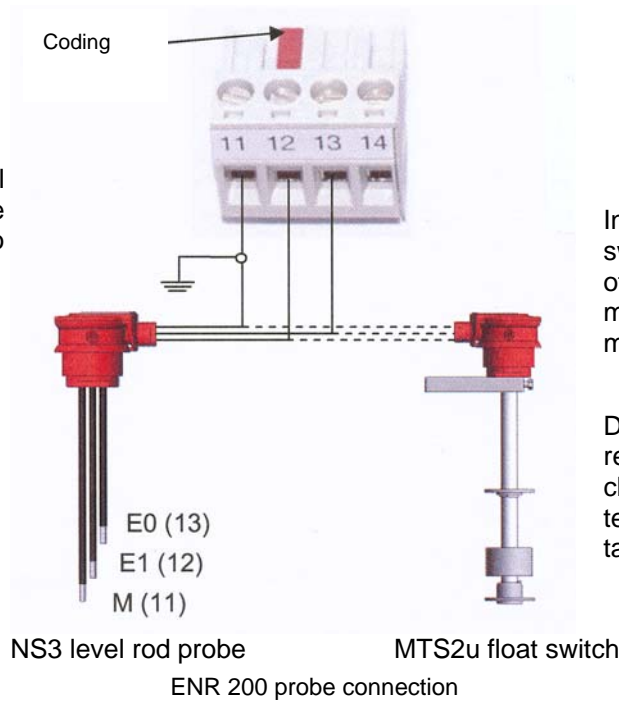
The ground probe (longest probe rod) must always be connected to terminal 11.
To ensure the system works as safely as possible, we recommend wiring the device in accordance with the closed circuit current principle.

Note:

If insulated MTS float switches are used, functional earthing is not required.

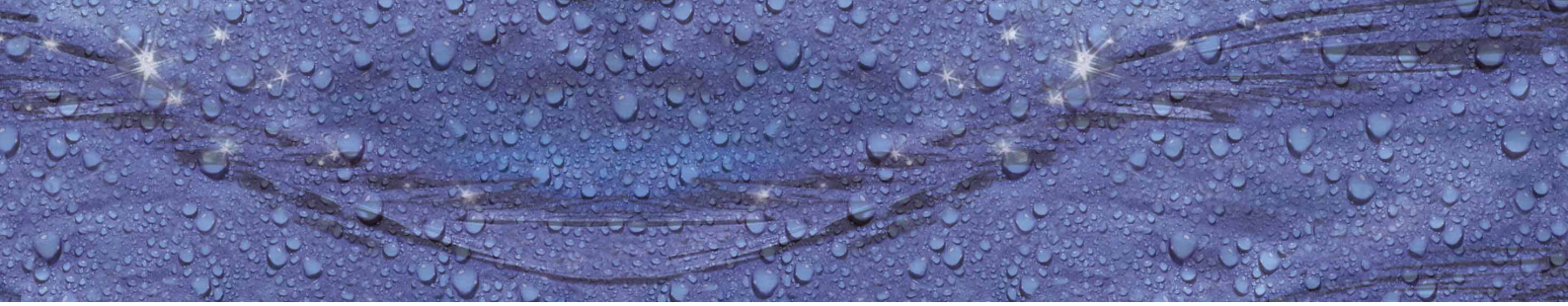
**Probe connection for level controller ENR 200
(minimum/maximum control)**

Level rod probe
In the case of the NS3 level rod probe, the ground probe rod must be connected to terminal 11.



Float switch
In the case of MTS2u float switches, the centre tapping of the changeover contact must be connected to terminal 11.

Depending on the function required, connect the changeover contacts to terminal 12/13 as NC contacts or NO contacts.



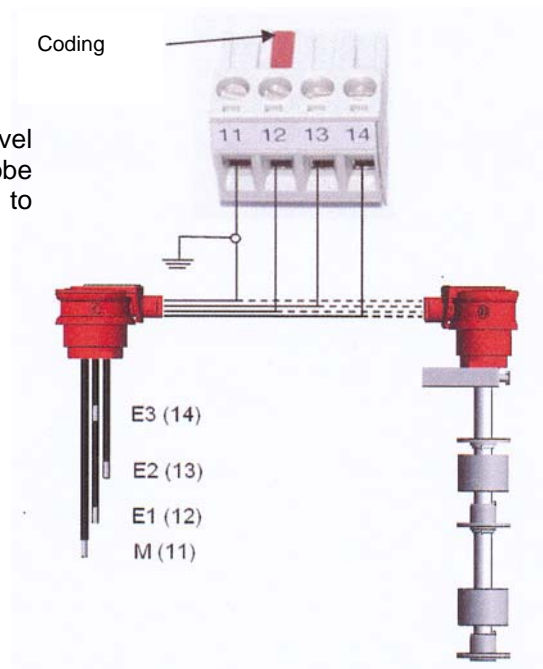
**Probe connection for level controller ENR 300
(minimum/maximum control with additional switching contact)**

Level rod probe

In the case of the NS4 level rod probe, the ground probe rod must be connected to terminal 11.

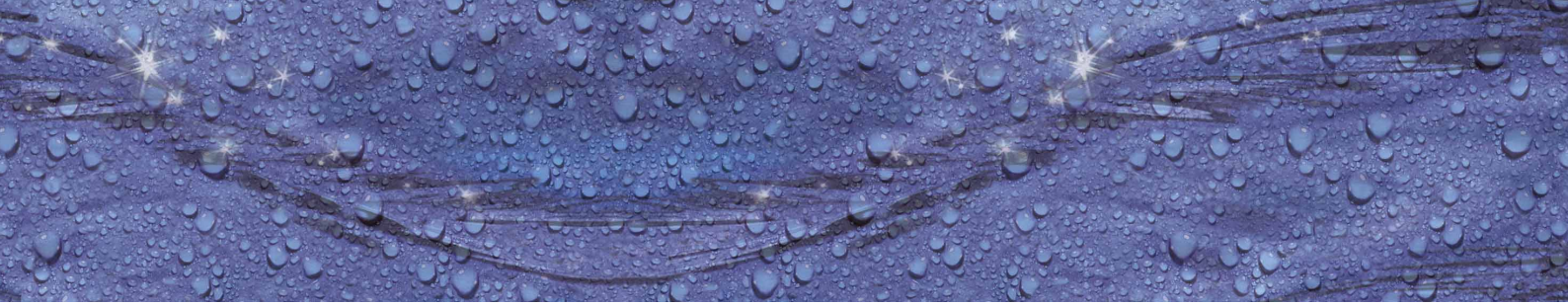
Float switch

In the case of MTS3u float switches, the centre tapping of the changeover contact must be connected to terminal 11.



NS4 level rod probe MTS3u float switch
ENR 300 probe connection

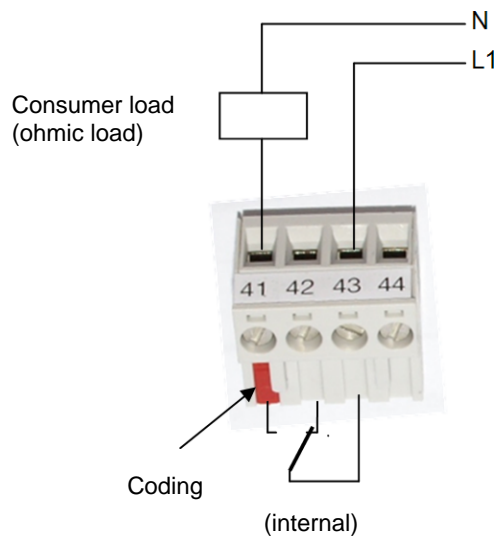
Depending on the function required, connect the changeover contacts to terminal 12/13/14 as NC contacts or NO contacts.



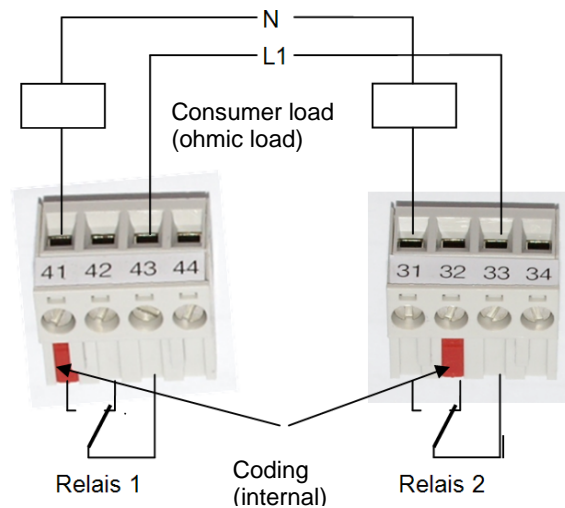
3.2.3. Connecting the switch output



The ENR 200 and ENR 300 devices are equipped with floating relay outputs which can be switched as NC or NO contacts (full/empty) depending on the application. The maximum switching voltage is 250 V~. The maximum switching current is 5 A for ohmic loads. Fuse protection for the consumer load has to be implemented in accordance with the standards and guidelines specified. **Any work in the area of the terminals may only be performed if no current is supplied to the device.**



Connecting ENR 200 switch output (relay in quiescent state, ENR 200 de-energised)

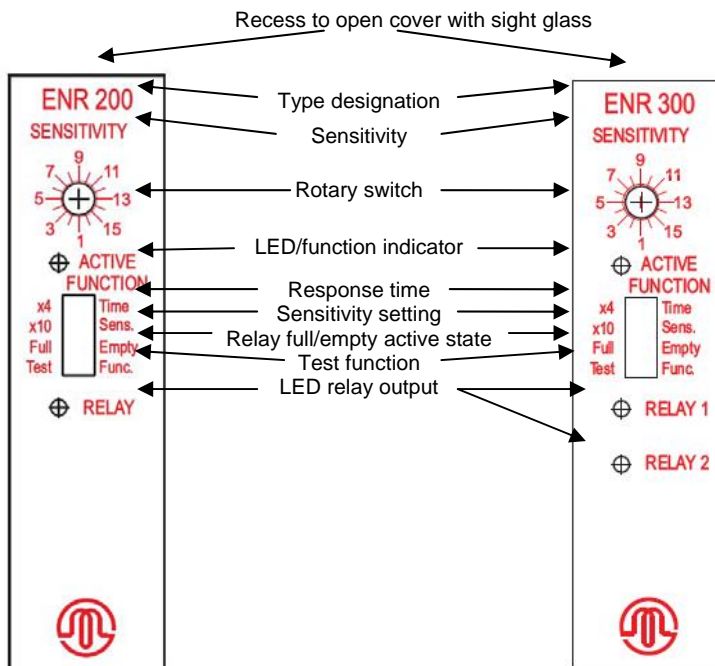


Connecting ENR 300 switch output (relay in quiescent state, ENR 300 de-energised)

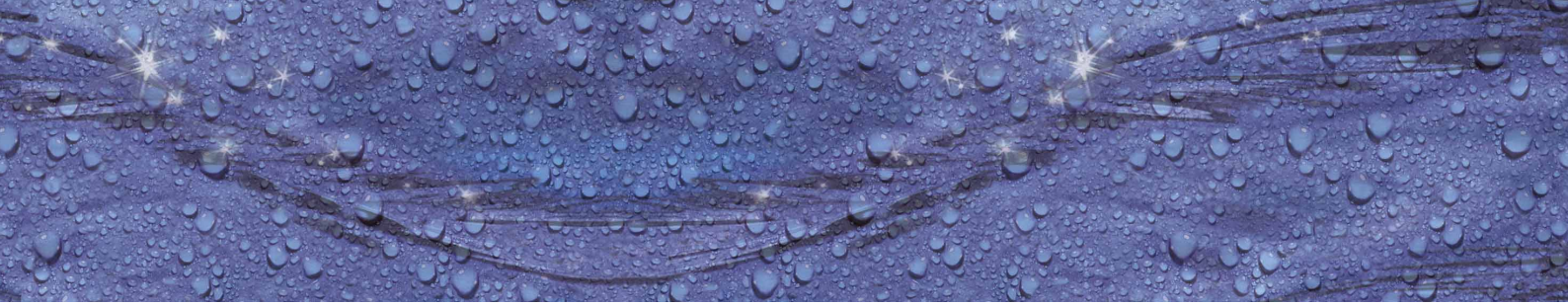
4. Operating functions and elements



All the functions of the device are configured by means of the operating elements of the front panel. For this purpose, insert a screwdriver into the upper recess of the cover with a sight glass, snap the cover open and fold it down. Use a small screwdriver to operate the rotary switch and the slide switch.



Labelling on front plate of ENR 200 and ENR 300



4.1. "SENSITIVITY" and "Sens." switches

A total of 32 measuring ranges can be defined with the aid of the "SENSITIVITY" rotary switch and the "Sens." slide switch. Two values are associated with each switch position (see Table). One value defines the switch-on threshold (liquid is in contact with electrodes) while the other defines the switch-off threshold (no contact between the liquid and electrodes). This prevents the system from switching frequently if the measured value is close to the switch point (hysteresis).

The following switch points are defined:

Slide switch in position	Sens.	x10
Rotary switch position	1 ... 8 ... 16	1 ... 8 ... 16
Switch-on value [Ohm]	50 ... 1600 ... 15000	18000 ... 63000 ... 176000
Switch-off value [Ohm]	100 ... 2500 ... 20000	23000 ... 80000 ... 250000

High → Conductivity of liquid Low

For information on setting the response sensitivity, see Chapter 5.3

4.2. "Time" switch

The device can be set to two different response times. This is particularly advantageous if severe wave movement of the surface of the liquid can be expected. At the "Time" switch position, the response time is approx. 2 seconds. At the "x4" position, the response time is approx. 8 seconds. This means that the electrode has to be in contact with the liquid (or not have any contact with the liquid) for the set interval at least before the switching state of the output relay changes.

4.3. "Full"/"Empty" switch

The active state of the relay is specified by the "Full"/"Empty" slide switch. In the case of "Full", the relay is excited if the liquid wets the probes (ground and switching probe). In the case of the MTS float switch, the relay is excited if the reed switch is closed. The function is the reverse for "Empty".

4.4. "Test"/"Func." switch

The device can be set to the test mode to check the wiring and the function of the downstream devices during commissioning. The slide switch is set to the "Test" position for this purpose.

The test function does not apply in practice if using ENR devices in conjunction with float switches. The "ACTIVE" LED flashes slowly in the test mode (approx. 1 second on, 1 second off).

Note:

Switch to the "Func." switch position for normal operation.

4.4.1. ENR 200 test mode

The "SENSITIVITY" rotary switch can be used to simulate the "E1/E2 electrode not wet" (setting "1") or "E1/E2 electrode wet" (setting "2") states.

Note:

The relay and LED states indicated refer to states where power is supplied and the "Empty" function is selected. The LED states are not changed if "Full" is selected as the function. The relay states output are reversed, however. See Chapter 3.2.3.

"Sensitivity" rotary switch	ENR 200 function	LED display	Relay contact
1	E1 electrode not wet E2 electrode not wet	„RELAY“ off	Relay: 41/43 closed
2	E1 electrode wet E1 electrode wet	„RELAY“ on	Relay: 41/43 open
3 - 16	E1 electrode not wet E2 electrode not wet	„RELAY“ off	Relay: 41/43 closed

Test states for ENR 200

4.4.2. ENR 300 test mode

The "SENSITIVITY" rotary switch can be used to simulate the "E1/E2/E3 electrode not wet" (setting "1") or "E1/E2/E3 electrode wet" states.

Note:

The relay and LED states indicated refer to states where power is supplied and the "Empty" function is selected. The LED states are not changed if "Full" is selected as the function. The relay states output are reversed, however. See Chapter 3.2.3.

"Sensitivity" rotary switch	Function ENR 300	LED display	Relay contact
1	E1 electrode not wet E2 electrode not wet E3 electrode not wet	"RELAY 1" off "RELAY 2" off	Relay 1: 41/43 closed Relay 2: 31/33 closed
2	E1 electrode wet E2 electrode wet E3 electrode not wet	"RELAY 1" on "RELAY 2" off	Relay 1: 41/43 open Relay 2: 31/33 closed
3	E1 electrode not wet E2 electrode not wet E3 electrode wet	"RELAY 1" off "RELAY 2" on	Relay 1: 41/43 closed Relay 2: 31/33 open
4	E1 electrode wet E2 electrode wet E3 electrode wet	"RELAY 1" on "RELAY 2" on	Relay 1: 41/43 open Relay 2: 31/33 open
5 - 16	E1 electrode not wet E2 electrode not wet E3 electrode not wet	"RELAY 1" off "RELAY 2" off	Relay 1: 41/43 closed Relay 2: 31/33 closed

Test states for ETS 300

4.5. "ACTIVE" LED

The "ACTIVE" red LED is lit permanently during normal operation. If no operating voltage is supplied to the device, or if the device is no longer operational due to a critical error, the LED is not lit. If the device detects an internal error (memory assignment, program memory, data overflow), this is indicated by the LED flashing quickly (approx. 0.5 seconds on, 0.5 seconds off). Please contact the device manufacturer if the message persists even after restarting the device (switching device off and then on again). The "ACTIVE" LED flashes slowly in the test mode (approx. 1 second on, 1 second off).

4.6. "RELAY" or "RELAY1" and "RELAY2" LED

4.6.1. ENR 200 "RELAY" LED

This red LED indicates the status of electrode wetting (for level rod probes) or the reed contact (for float switches).

The "RELAY" LED is lit if the ground probe rod (M) and both switching probe rods (E1, E2) are wet and is not lit if both switching probe rods (E1, E2) are not in contact with the liquid. In the case of float switches, the LED is lit if the reed contact is closed and is not lit if the switching state is open. If only one switching probe rod (E1 or E2) is wet, the switching state remains until the second switching probe (E1 or E2) is wet. The active state of the relay differs from the LED message if the slide switch is set to "Empty" (see Chapter 4.3).

4.6.2. ENR 300 "RELAY1" and "RELAY2" LED

The red LED indicates the status of electrode wetting (for level rod probes) or the reed contact (for float switches).

The "RELAY" LED is lit if the ground probe rod (M) and both switching probe rods (E1, E2) are wet and is not lit if both switching probe rods (E1, E2) are not in contact with the liquid. In the case of float switches, the LED is lit if the reed contact is closed and is not lit if the switching state is open. If only one switching probe rod (E1 or E2) is wet, the switching state remains until the second switching probe (E1 or E2) is wet.

The "RELAY2" LED is lit if the ground probe rod (M) and the third switching probe rod (E3) are wet and is not lit if the switching probe rod (E3) is not in contact with the liquid. In the case of float switches, the LED is lit if the reed contact is closed and is not lit if the switching state is open. The active state of the relay differs from the LED message if the slide switch is set to "Empty" (see Chapter 4.3).

5. Commissioning

5.1. Checks before switching on the auxiliary power



Prior to commissioning the device, check whether:

- The device has been wired correctly in accordance with the wiring diagram.
- The auxiliary power corresponds to the information on the nameplate.
- The ambient conditions match the details specified under technical data.

5.2. Checks after switching on the auxiliary power

After switching on the auxiliary power, check whether:

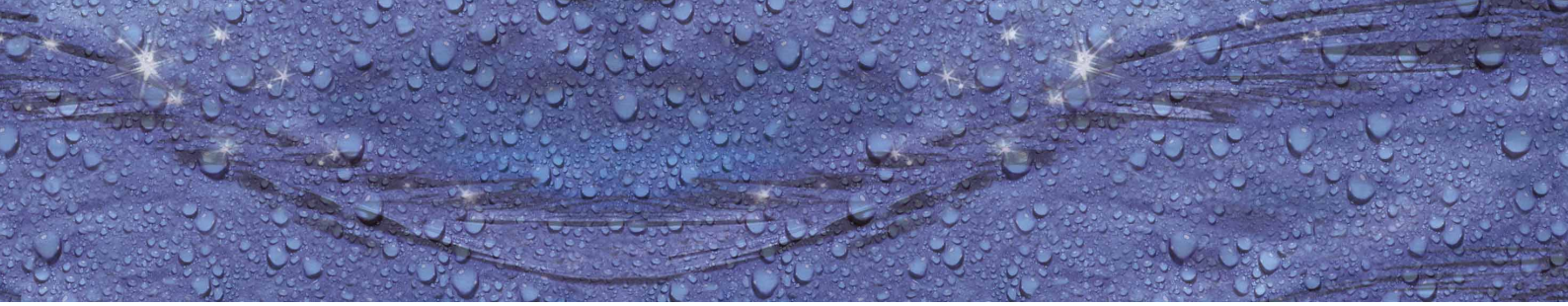
- The "ACTIVE" light emitting diode (LED) is permanently lit.
- The desired functions are switched on at the slide switch and rotary switch.

5.3. Setting the response sensitivity

5.3.1. ENR in conjunction with NS level rod probe



The response sensitivity is set to the lowest value at the factory, i.e. it is set for highly conductive liquids. The exact operating setting is based on the electrical conductivity of the liquid to be monitored. The sensitivity thus **has to be** adapted to the liquid in question.



The response sensitivity is set as follows:

1. Set the switch for the function test to "Func.", the reaction time to "Time", sensitivity switchover to "Sens." and the "SENSITIVITY" rotary switch to "1".
2. Immerse all the probe rods approx. 20 mm and wait a few minutes (a cover layer forms).
3. Slowly turn the "SENSITIVITY" switch clockwise step by step and wait approx. 5 seconds for the switching function in every step. If the "RELAY" LED or "RELAY1 or RELAY2" LED does not light up, turn the switch another step until the "RELAY" or "RELAY1 or RELAY2" LED is lit. If this does not happen by the time you reach rotary switch position "16", the sensitivity of the device must be increased. For this purpose, the "Sens." slide switch is changed to "x10" and the rotary switch is set to "1". Now continue turning the rotary switch as explained above until the "RELAY" or "RELAY1 or RELAY2" LED is lit.
4. To ensure that the switch function works correctly if the conductivity of the liquid changes, we recommend you turn the rotary switch one more graduation mark to the right.

Note:

Please note that an optimum sensitivity setting for the desired, safe response sensitivity of the measuring system is essential to ensure problem-free operation.

When using level rod probes, the following circumstances can require the response sensitivity setting to be readjusted:

- Change in the conductivity of the liquid due, for example, to a change in the temperature or concentration.
- Change in the conductivity by exchanging the liquid.
- Change in the conductivity of the probe rod material/liquid boundary layer. This occurs in the event of a passive layer or steam formation, for example.

Note:

If you require a longer response time (e.g. severe wave movement), change the setting at the "Time" slide switch to "x4" (approx. 8 seconds reaction time).

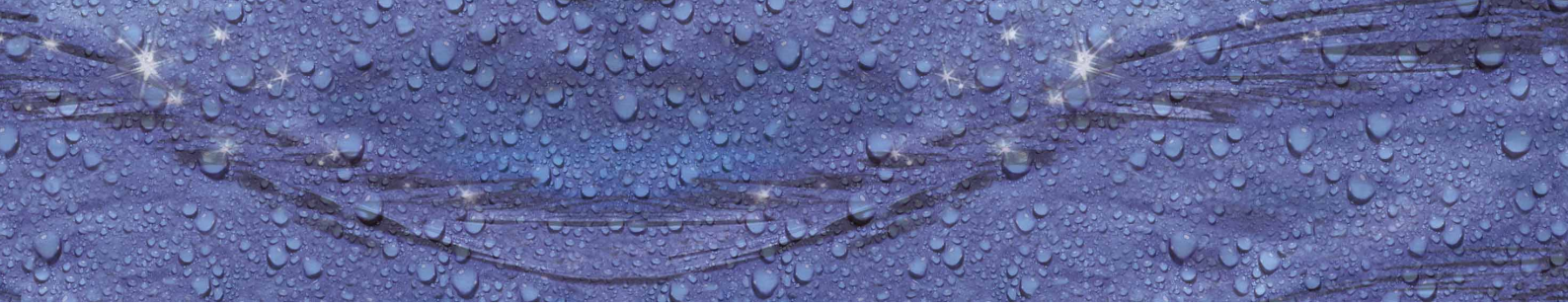
5.3.2. ENR in conjunction with MTS2u and MTS3u float switches



When using MTS float switches it only makes sense to set the response sensitivity to a specific setting value.

The response sensitivity is set as follows:

Set the switch for the function test to "Func.", the reaction time to "Time", sensitivity switchover to "Sens." and the "SENSITIVITY" rotary switch to "3".



6. Technical data

6.1. General

Mechanical design:

Design (housing)

Modular housing 22.5 x 111 x 115 mm³
for bearing rail 35 mm, EN 50022

Dimensions

See dimensioned drawing in Chapter 2.4

Weight

ENR 200: approx. 154 g

ENR 300: approx. 167 g

Material (housing)

Polyamide PA 6.6

Flammability class

V0 (UL94)

Overvoltage category

2

Ingress protection

IP20, EN 60529

Climatic load:

Ambient temperature range

-20 to +60 °C for individual mounting

-20 to +50 °C for series mounting without spacing

Transportation and storage
temperature

-40 to +60 °C

Relative humidity

< 75 %

Condensation

Not permitted

Electrical connection:

Terminals, plug-in

2.5 mm², screw terminals, distinctively coded

Energy supply:

Rated voltage

20 ... 230 V AC/DC

Rated consumption

< 2 VA

Output:

Contact

ENR 200

ENR 300

1 changeover / c/o,
floating

2 changeover / c/o,
floating

Switching voltage

≤ 250 V AC

≤ 250 V AC

Switching current

≤ 5 A (ohmic load)

≤ 5 A (ohmic load)

Sensor input:

Sensitivity level

Can be adjusted in 32 steps

0.05 ... 250 kOhm

Response time

2 s or 8 s

Probe voltage

0.1 ... 6 V_{SS}

Probe current

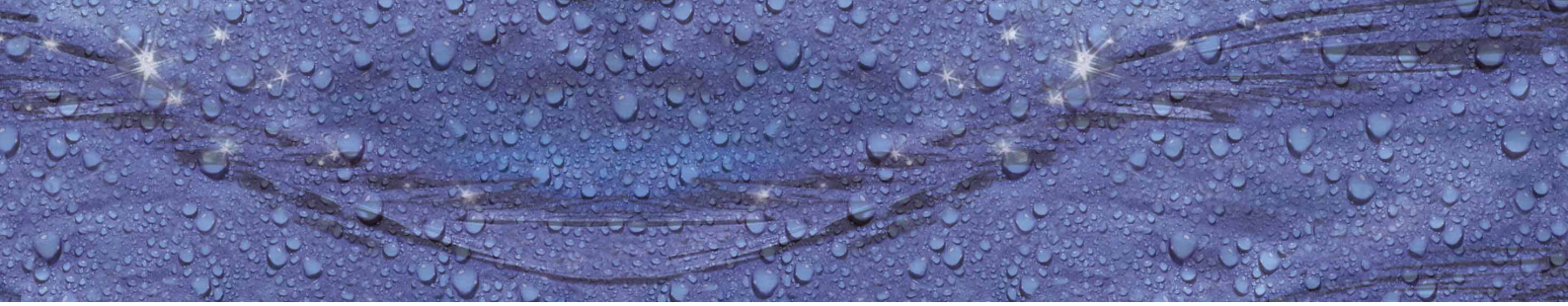
< 5 mA AC

Operating functions:

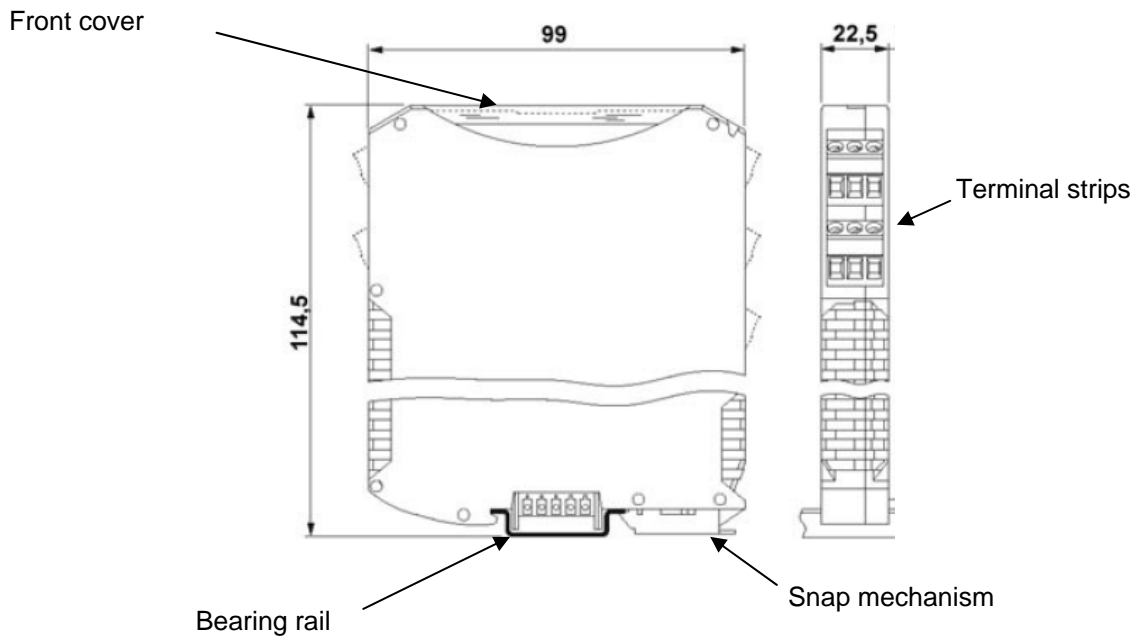
See Chapter 4

6.2. Planning for DC voltage systems

When using the device in DC voltage systems, please note that a high current flows at the moment the device is switched on. This current drops to the nominal value within the first 1 to 10 ms. Please bear this in mind when using power units with an electronic fuse.



6.3. Dimensional drawing

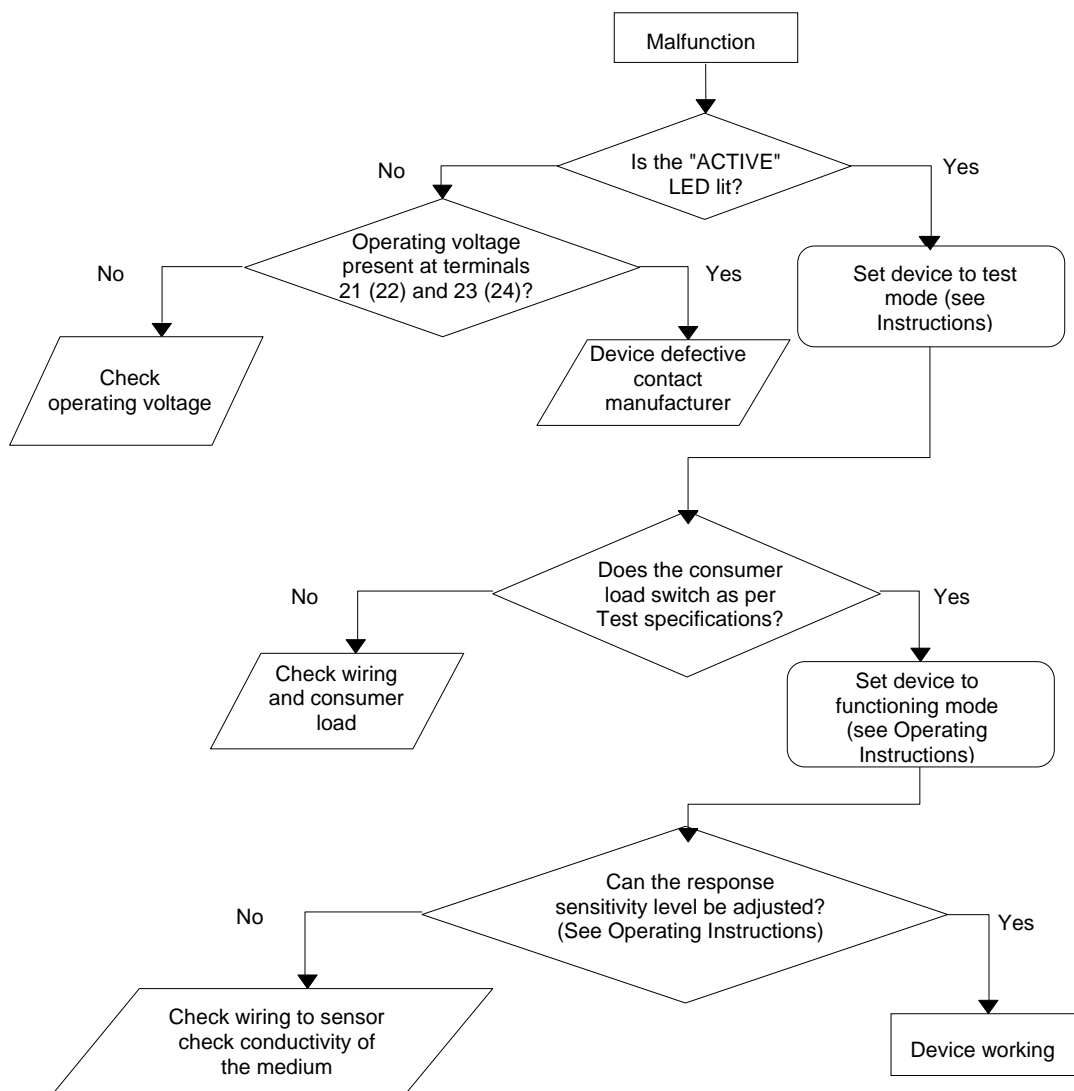


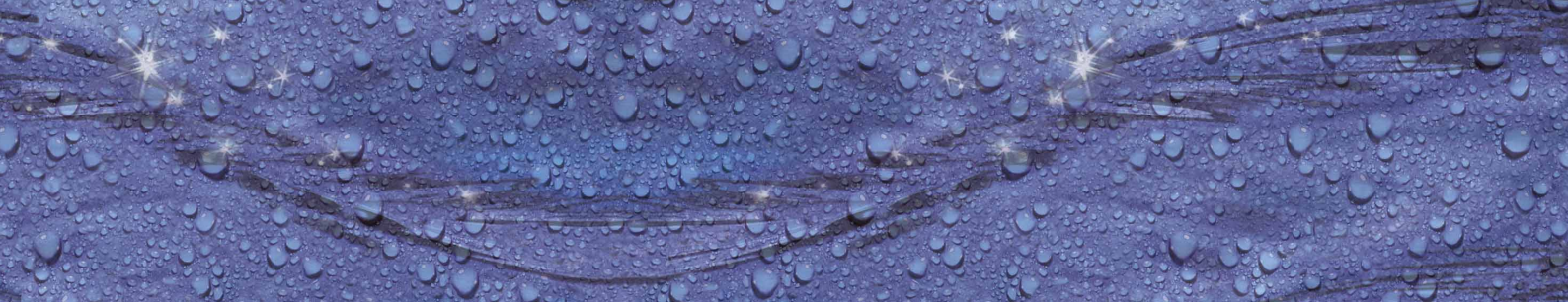
ENR 200 and ENR 300 housing dimensions

7. Troubleshooting and maintenance and repair

7.1. Troubleshooting

When troubleshooting, please proceed as illustrated in the flowchart below:





7.2. Maintenance



The operability of the ENR level controller must be checked prior to commissioning and at regular intervals when used in conjunction with the level transmitter (level rod probe, float switch). The designated effect (e.g. protecting the heating against running dry) must also be checked here. If cleaning the exterior of the ENR, please ensure that the cleaning agent used does not corrode the surface of the plastic housing and the aluminium front plate. **No** liquid or powder substance should ever penetrate the housing as this could result in serious damage to the electronics and hazardous situations.

8. Transporting/storing the device

When transporting the device, make sure the housing is packaged such that it is fully protected and not exposed to impact or strain. The device must be stored in accordance with the ambient conditions specified in the technical data.

9. Return

The following measures must be implemented before returning the ENR level controller:

- If you are returning the device in conjunction with the level transmitter, remove all residue from the level transmitter.
- Enclose a description of the application.
- Enclose a description of the error that occurred.
- Specify how long the device has been in operation.
- Please cite your contact address and a contact person.

10. Disposal

When disposing of the device, separate the various materials and recycle the device components. Compliance with the legal regulations and guidelines applicable at the time of disposal is mandatory.