GESTRA®

Conductivity Controller

LRR 1-50
LRR 1-51

EN
English

Original Installation &
Operating Manual

819224-06

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Important notes

Usage for the intended purpose

The LRR 1-50, LRR 1-51 conductivity controller is used in combination with the LRG 1.-.. conductivity electrodes and the LRGT 1.-.. conductivity transmitter as a conductivity controller and limit switch, e.g. in steam boilers and hot water installations and in condensate and feedwater tanks. The conductivity controller indicates when MAX conductivity is reached and opens or closes a continuous blowdown valve.

Conductivity controllers can be combined in a circuit with conductivity electrodes or transmitters as follows: LRR 1-50 conductivity controller with LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1 and LRG 19-1 conductivity electrodes; LRR 1-51 conductivity controller with LRGT 16-1, LRGT 16-2, LRGT 16-3, LRGT 16-4, LRGT 17-3 and LRGT 17-1 conductivity transmitters.

Glossary

Continuous blowdown
As the boiler water begins to evaporate, the concentration of non-volatile total dissolved solids (TDS) left behind in the boiler increases over time as a function of steam consumption. If the TDS concentration exceeds the limit defined by the boiler manufacturer, foaming and priming occurs as the density of the boiler water increases, resulting in a carry-over of solids with vapour into steam lines and superheaters. The consequences are adverse effects on reliability and severe damage to steam generating units and pipes. To keep the TDS concentration within admissible limits, a certain portion of boiler water must be removed continuously or periodically (by means of a continuous blowdown valve) and fresh feedwater must be added to the boiler feed to compensate for the water lost through blowdown. To determine the TDS in the boiler water, its electrical conductivity is measured in µS/cm, although some countries also use ppm (parts per million) as the unit of measurement.
Conversion 1 µS/cm = 0.5 ppm.

Operating position of the continuous blowdown valve
It is common practice to use the continuous blowdown valve to remove a certain amount of water from the boiler to keep the TDS within the desired limits. This means that the valve must be slightly open during operation, so that this water can be discharged (valve in OPERATING position). This operating position can be adjusted and the amount of boiler blowdown can be established with the aid of the valve capacity charts.

Switching hysteresis
The controller works as a 2-position controller, which means that the continuous blowdown valve is moved into OPEN position when the set point is reached. The conductivity must then decrease. Once it has fallen to a level that is lower than the set point minus the defined hysteresis, the valve is moved into OPERATING position.

Temperature compensation
The electrical conductivity of water changes as the temperature falls or rises. To obtain meaningful readings, it is therefore necessary to base the measurements on the reference temperature of 25 °C, and to correct the measured conductivity using the temperature coefficient tC.

Cell constant and correction factor
The geometric variable (cell constant) of the conductivity electrode is taken into account when calculating the conductivity. However, this constant may change during operation, e.g. due to dirt deposits on the measuring electrode. Deviations can be compensated by changing the correction factor CF.

Flushing the continuous blowdown valve
The continuous blowdown valve can be flushed automatically to prevent it from sticking. In this case, the continuous blowdown valve is actuated at intervals (flushing interval Si) and opened for a certain time (flushing time Sd). After the flushing time, the valve is moved into the OPERATING position or into the required control position.

Function

In combination with the LRG 1.-.. conductivity electrode, the **LRR 1-50 conductivity controller** measures the electrical conductivity of conductive fluids. The LRG 1.-.. conductivity electrode or the LRG 16-9 electrode with integrated resistance thermometer is connected for measuring the fluid temperature. A separate Pt100 resistance thermometer may also be used to measure the temperature.

The **LRR 1-51 conductivity controller** processes the current signal from the LRGT 1.-.. conductivity transmitter, which varies depending on the conductivity. This signal is normalised in the conductivity controller as a function of the adjusted measuring range and shown as an actual value on the 7-segment LED display.

LRR 1-50 conductivity controller: When the **LRG 1.-.. conductivity electrode** is connected, a reference measurement is taken and the conductivity reading is then adapted to the installation conditions by adjusting correction factor CF.

If a resistance thermometer is connected, the water temperature is measured as well as the conductivity. The conductivity reading is then automatically compensated in the conductivity controller based on the adjusted temperature coefficient **tC** (%/°C). If the temperature changes, thanks to linear temperature compensation the reading is referenced to 25 °C across the entire measurement range, and shown as an actual value on the 7-segment LED display.

The **LRR 1-50, LRR 1-51 conductivity controller** works as a **2-position controller,** i.e. the continuous blowdown valve is moved into OPEN position when the set point is reached. After the conductivity has fallen by the set hysteresis, the valve returns to OPERATING position (provided that the OPERATING position has been activated). To avoid loss of boiler water, the controller will automatically close the valve when the boiler is shut down. Two flashing LEDs indicate whether the continuous blowdown valve is opening or closing.

The MAX limit can be adjusted as long as it remains within the measuring range.

If the MAX limit is reached, the MAX output contact switches and the MAX LED lights up. It switches back when the conductivity has fallen below the set hysteresis.

Faults or malfunctions in the conductivity electrode or conductivity transmitter, the electrical connection or the settings are indicated as error codes on the 7-segment LED display. In the event of a malfunction, the MAX alarm is triggered and the continuous blowdown valve moves into OPERATING position.

If malfunctions occur only in the **LRR 1-50, LRR 1-51 conductivity controller**, the MAX alarm is triggered, the continuous blowdown valve moves into OPERATING position and the equipment is restarted.

Parameters can be changed or the MAX alarm simulated using the rotary knob.

Electrical conductivity is measured in µS/cm. In some countries, ppm (parts per million) is used instead. Conversion 1 µS/cm = 0.5 ppm. The conductivity controller can be set as appropriate.

Important notes continued

Safety note

The equipment may only be installed, wired and brought into service by qualified and competent staff.

Maintenance and setup work may only be performed by authorised staff who have undergone specific training.

Danger

The terminal strips of the equipment are live during operation.
There is a risk of serious injury due to electric shock!
Always **cut off power** to the equipment before working
on the terminal strips (installation, removal, connecting cables).

Attention

The name plate indicates the technical features of the equipment. Do not bring into service or operate any equipment that does not bear its own specific name plate.

Potentially explosive areas

The equipment must **not** be used in potentially explosive atmospheres.

Note

LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1 and LRG 19-1 conductivity electrodes are simple items of electrical equipment as specified in EN 60079-11 section 5.7. The equipment may be used in potentially explosive atmospheres only in combination with approved Zener barriers. Suitable for use in Ex zones 1 and 2 (1999/92/EU).
The equipment does not have Ex classification.

Technical data

LRR 1-50, LRR 1-51

Supply voltage
24 VDC +/– 20%

Fuse
External semi-delay 0.5A

Power consumption
4 W

Reset hysteresis
MAX limit: –3% of set MAX limit, fixed.

Outputs
2 volt-free relay contacts, 8 A 250 V AC / 30 V DC cos φ = 1
(continuous blowdown valve OPEN, OPERATING, CLOSED).
1 volt-free relay contact, 8 A 250 V AC / 30 V DC cos φ = 1 (MAX alarm, switch-selectable).

Inductive loads must have interference suppression (RC combination) as per the manufacturer's specification.

1 analogue output 4-20 mA, max. output load 500 ohms, e.g. for actual value indication.

Indicators and controls
1 rotary knob with integrated pushbutton for testing the MAX alarm and setting parameters,
1 seven-segment, four-digit LED display,
1 red LED for MAX alarm,
2 amber LEDs for continuous blowdown valve opening/closing,
1 four-pole code switch for configuration.

Housing
Housing material: base of black polycarbonate; front of grey polycarbonate
Conductor size: 1 x 4.0 mm^2 solid per wire, or
1 x 2.5 mm^2 per stranded wire with sleeve to DIN 46228 or
2 x 1.5 mm^2 per stranded wire with sleeve to DIN 46228 (min. ∅ 0.1 mm)
Terminal strips can be removed separately
Housing attachment: Mounting clip on support rail TH 35, EN 60715

Electrical safety
Pollution degree 2 for installation in control cabinet with protection rating IP 54, fully insulated

IP rating
Housing: IP 40 to EN 60529
Terminal strip: IP 20 to EN 60529
With panel adapter: IP 65 to EN 60529

Weight
Approx. 0.2 kg

Technical data continued

LRR 1-50 only

Connecting a conductivity electrode
1 input for LRG 1.-.. conductivity electrode (cell constant 1 cm^{-1}), 3-pole with shield, or
1 input for LRG 16-9 conductivity electrode (cell constant 0.5 cm^{-1}), with integrated resistance thermometer Pt100, 3-pole with shield.

Measuring voltage
0.8 Vss, pulse duty factor tv=0.5, frequency 20 – 10000 Hz.

Measuring range
1 to 10000 µS/cm at 25 °C or 1 to 5000 ppm at 25 °C.

LRR 1-51 only

Connecting a conductivity transmitter
1 analogue input 4-20 mA, e.g. for LRGT 1.-.. conductivity transmitter, 2-pole with shield.

Lower end of measuring range SinL
0 - 0.5 - 50 - 100 µS/cm, adjustable.

Upper end of measuring range SinH
20.0 - 100.0 - 200.0 - 500.0 -1000.0 - 2000.0 - 3000.0 - 5000.0 - 6000.0 - 7000.0 - 10000.0 - 12000.0 µS/cm, adjustable.

LRR 1-50, LRR -51

Ambient temperature
when system is switched on 0 ... 55 °C
in operation –10 ... 55 °C

Transport temperature
–20 ... +80 °C (< 100 hours), only switch on after a defrosting period of 24 hours.

Storage temperature
–20 ... +70 °C, only switch on after a defrosting period of 24 hours.

Relative humidity
max. 95%, non-condensing

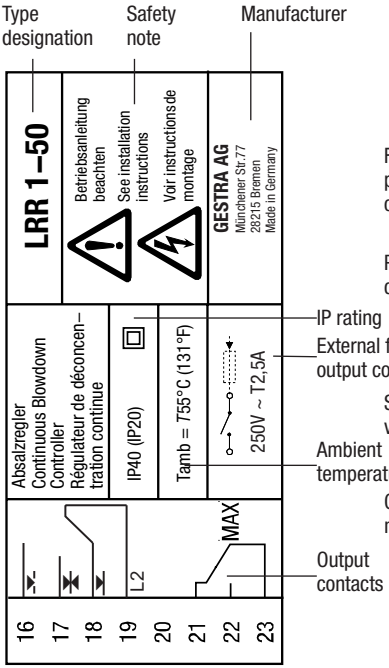
Product package

LRR 1-50
1 conductivity controller LRR 1-50
1 adhesive sign for ppm
1 Installation & Operating Manual

LRR 1-51
1 conductivity controller LRR 1-51
1 adhesive sign for ppm
1 Installation & Operating Manual

Example of name plate/identification

Name plate of LRR 1-50, LRR 1-51, top



Name plate of LRR 1-50, bottom

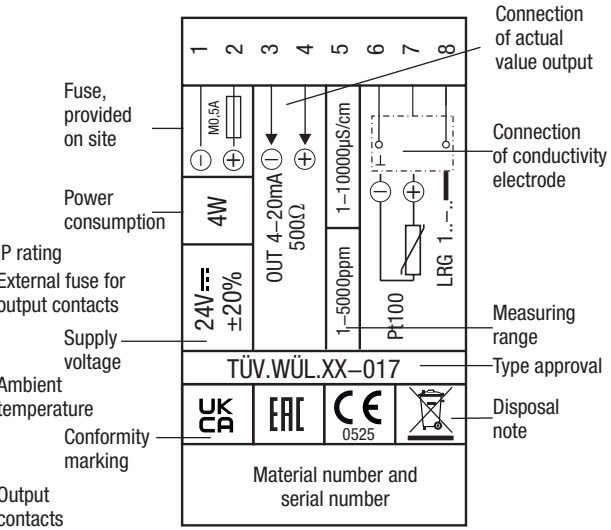
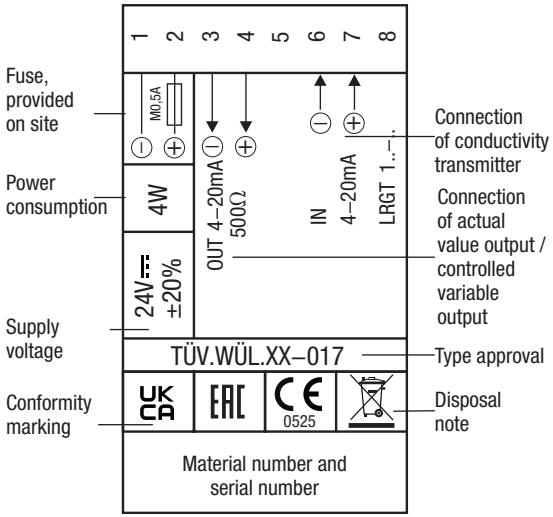


Fig. 1

Name plate of LRR 1-51, bottom



Installation

Installation in the door of the control cabinet

The small panel adapter with rotary knob, stock code 441553, enables the controller to be installed in the door of a control cabinet.

The advantage of using the adapter is that the status is visible and alarms can be tested without opening the control cabinet door. When installed, the adapter has a rating of IP65. Please refer to the panel adapter Installation & Operating Manual 850625-xx for further information.

Fig. 2

Dimensions of the LRR 1-50, LRR 1-51

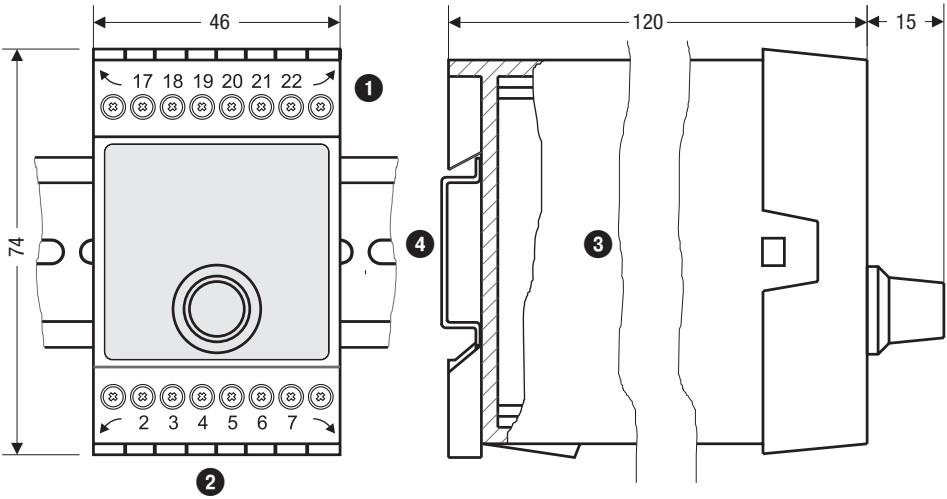


Fig. 3

Key

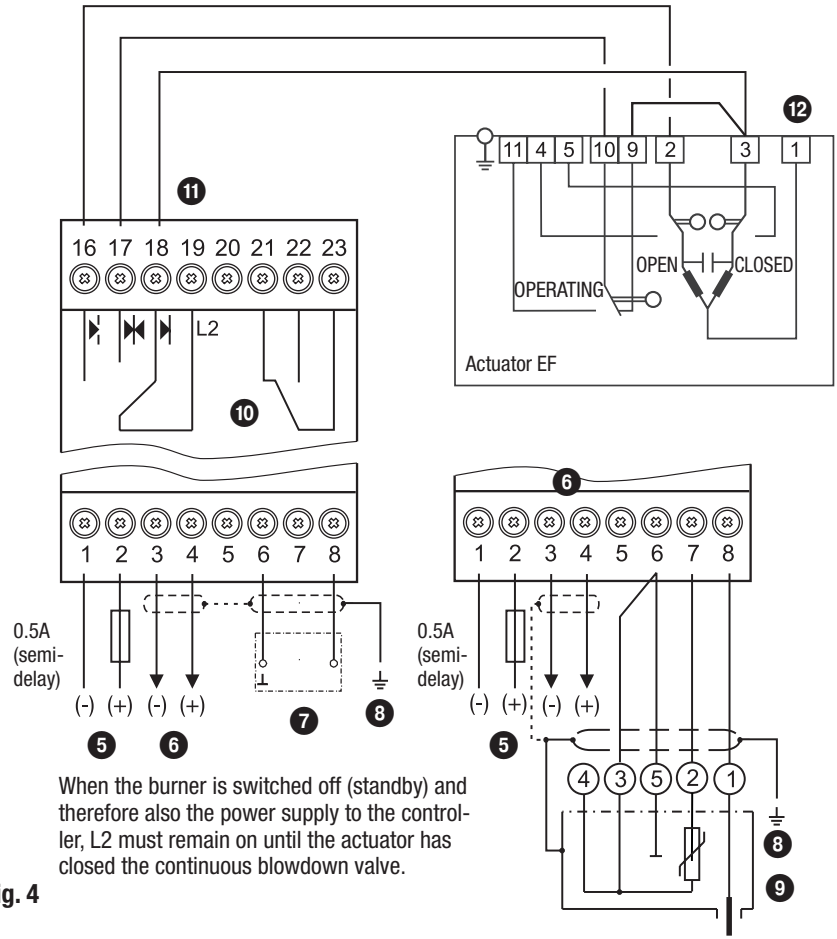
1. Upper terminal strip
2. Lower terminal strip
3. Housing
4. Support rail TH 35, EN 60715

Installation in a control cabinet

The LRR 1-50, LRR 1-51 conductivity controller is clipped onto a type TH 35, EN 60715 support rail in the control cabinet. **Fig. 3** ❹

In the control cabinet: Wiring the conductivity controller

Wiring diagram for LRR 1-50 conductivity controller



When the burner is switched off (standby) and therefore also the power supply to the controller, L2 must remain on until the actuator has closed the continuous blowdown valve.

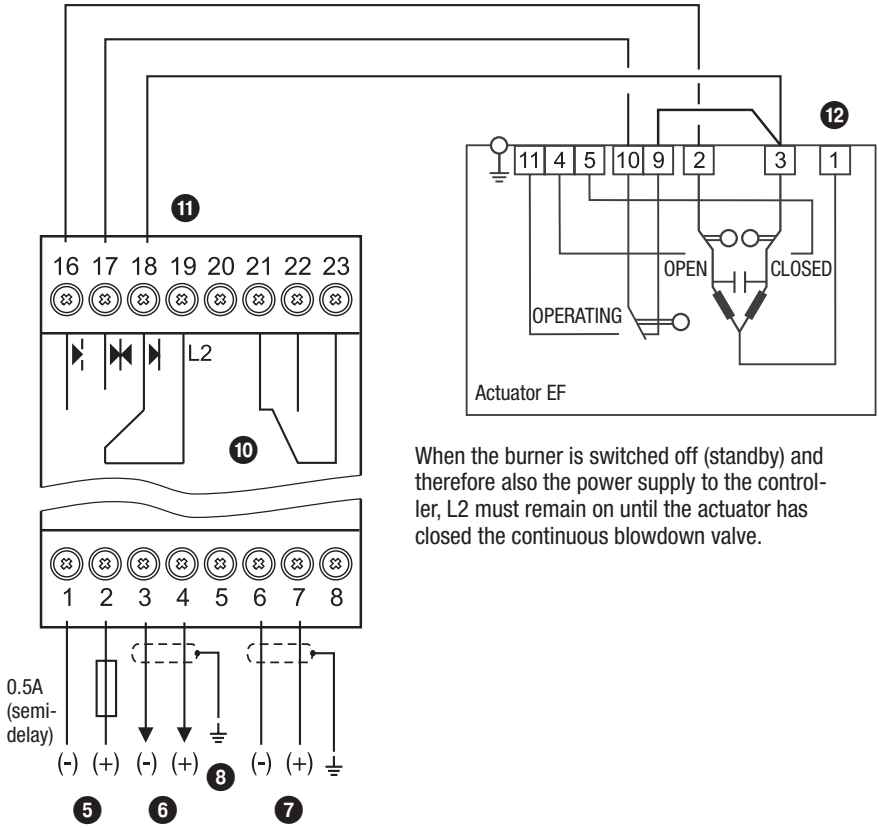
Fig. 4

Key

- **5** Connection of supply voltage 24 V DC with semi-delay fuse 0.5A provided on site
- **6** Actual value output/controlled variable output 4-20 mA (switch selectable)
- **7** LRG 1.-.. conductivity electrode (terminal 6/7: resistance thermometer can be connected)
- **8** Central earthing point (CEP) in control cabinet
- **9** LRG 16-9 conductivity electrode with integrated resistance thermometer
- **10** MAX output contact
- **11** Supply voltage L2
- **12** Supply voltage N

In the control cabinet: Wiring the conductivity controller continued

Wiring diagram for LRR 1-51 conductivity controller



When the burner is switched off (standby) and therefore also the power supply to the controller, L2 must remain on until the actuator has closed the continuous blowdown valve.

Fig. 5

Key

- **5** Connection of supply voltage 24 V DC with semi-delay fuse 0.5A provided on site
- **6** Actual value output/controlled variable output 4-20 mA (switch selectable)
- **7** LRGT 1.-.. conductivity transmitter, 4-20 mA, with earthing point
- **8** Central earthing point (CEP) in control cabinet
- **10** MAX output contact
- **11** Supply voltage L2
- **12** Supply voltage N

In the control cabinet: Wiring the conductivity controller continued

Supply voltage connection

The equipment is supplied with 24 V DC and has an external semi-delay 0.5A fuse. Please use a safety power supply unit with reliable electrical isolation.

This power supply unit must provide a level of isolation from dangerous contact voltages that at least meets the requirements for double or reinforced insulation in accordance with one of the following standards: EN 61010-1, EN 60730-1, EN 60950-1 or EN 62368-1.

Connection of output contacts

Wire the upper terminal strip ❶ (terminals 16-23) in line with the desired switching functions.
Provide an external slow-blow 2.5A fuse for the output contacts.
Switching off inductive loads produces surges that can have a major adverse effect on the operation of open and closed-loop control systems. Connected inductive loads must therefore have interference suppression (RC combination) as per the manufacturer's specifications.

If used as a conductivity limiter, the LRR 1-50, LRR 1-51 conductivity controller does not interlock automatically when the MAX limit is exceeded.

If the installation requires a lockout function, this must be implemented in the downstream (safety) circuit. This circuit must conform to the requirements of EN 50156.

Connecting an LRG 12-2, LRG 16-4, LRG 17-1 or LRG 19-1 conductivity electrode and TRG 5-.. resistance thermometer

To connect the equipment, please use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm^2, e.g. LiYCY 4 x 0.5 mm^2.

Wire the terminal strip as shown in the wiring diagram. **Fig. 4**
Connect the shield to the central earthing point (CEP) in the control cabinet.

Route the connecting cable between items of equipment separately from power lines.

Connecting an LRG 16-9 conductivity electrode

The LRG 16-9 conductivity electrode features an M12 A-coded, 5-pole sensor connector, see pin assignment in **Fig. 4.** A pre-wired control cable (with plug and socket) is available in various lengths as an accessory for connecting the equipment.

To connect the LRR 1-50 conductivity controller, please remove the connector and wire the terminal strip as shown in the wiring diagram. **Fig. 4.** Due to different cable manufacturers we cannot specify the wire colour. Please check the cable pin assignment before connecting.

Connect the shield to the central earthing point (CEP) in the control cabinet.

If you are not using the pre-wired control cable, use a 5-core shielded control cable as a connecting cable, e.g. LiYCY 5 x 0.5 mm^2. In addition, connect a shielded socket to the control cable at the electrode end.

Route the connecting cable between items of equipment separately from power lines.

In the control cabinet: Wiring the conductivity controller continued

Wiring diagram for LRGT 1.-.. conductivity transmitter

To connect the equipment, please use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm2, e.g. LiYCY 4 x 0.5 mm^2, maximum length 100 m.

Wire the terminal strip as shown in the wiring diagram. **Fig. 5**
Connect the shield as shown in the wiring diagram.

Route the connecting cable between items of equipment separately from power lines.

Connecting the actual value output/controlled variable output (4 - 20 mA)

For connection, please use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm^2, e.g. LiYCY 2 x 0.5 mm^2, maximum length 100 m.

Please note the maximum output load of 500 ohms.

Wire the terminal strip as shown in the wiring diagram. **Fig. 4,5**
Connect the shield **just once** to the central earthing point (CEP) in the control cabinet.

Route the connecting cable between items of equipment separately from power lines.

Any item of equipment that you wish to connect to the terminals for the 4-20 mA actual value output/ controlled variable output (4 - 20 mA) must be certified to have at least double or reinforced insulation to EN 61010-1, EN 60730-1, EN 60950-1 or EN 62368-1 between the current loop and live parts of the equipment that are not supplied with safety extra-low voltage (SELV).

Attention

- Do not use unused terminals as support terminals.

Tools

- Screwdriver size 3.5 x 100 mm, fully insulated to VDE 0680-1.

In the system:
Wiring the conductivity electrode/transmitter

Connecting an LRG 12-2, LRG 16-4, LRG 17-1 or LRG 19-1 conductivity electrode and TRG 5-.. resistance thermometer

To connect the equipment, please use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm^2, e.g. LiYCY 4 x 0.5 mm^2.

Wire the terminal strip as shown in the wiring diagram. **Fig. 4**
Connect the shield to the central earthing point (CEP) in the control cabinet.

The max. cable length between the conductivity electrode/resistance thermometer and conductivity controller is 30 m, or max. 10 m with a conductivity of 1-10 µS/cm.

Route the connecting cable between items of equipment separately from power lines.

Connecting an LRG 16-9 conductivity electrode

The LRG 16-9 conductivity electrode features an M12 A-coded, 5-pole sensor connector, see pin assignment in **Fig. 4.** A pre-wired control cable (with plug and socket) is available in various lengths as an accessory for connecting the equipment.

This control cable is not UV-resistant and must be protected with a UV-resistant plastic tube or cable duct if the equipment is installed outdoors.

To connect the LRR 1-50 conductivity controller, please remove the connector and wire the terminal strip as shown in the wiring diagram. **Fig. 4**

Connect the shield to the central earthing point (CEP) in the control cabinet.

If you are not using the pre-wired control cable, use a 5-core shielded control cable as a connecting cable, e.g. LiYCY 5 x 0.5 mm^2. In addition, connect a shielded socket to the control cable at the electrode end.

The max. cable length between the conductivity electrode and controller is 30 m, or max. 10 m with a conductivity of 1-10 µS/cm.

Route the connecting cable between items of equipment separately from power lines.

Wiring diagram for LRGT 1.-.. conductivity transmitter

To connect the equipment, please use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm^2, e.g. LiYCY 4 x 0.5 mm^2, maximum length 100 m.

Wire the terminal strip as shown in the wiring diagram. **Fig. 5**
Connect the shield as shown in the wiring diagram.

Route the connecting cable between items of equipment separately from power lines.

Attention

- Please start up the equipment as described in the Installation & Operating Manuals for the LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1, LRG 19-1, TRG 5-.. and LRGT 1.-..
- Route the connecting cable between items of equipment separately from power lines.
- Check the shield connection to the central earthing point (CEP) in the control cabinet.
- The conductivity transmitter must be connected to its own dedicated supply voltage.

Factory settings

Conductivity controller LRR 1-50

- MAX switchpoint AL.Hi = 6000 µS/cm
- Set point SP = 3000 µS/cm
- Dead band: +/– 5% of set point
- Reset hysteresis:
  Set point: –10% of set point
  MAX limit: –3% (fixed)
- Correction factor CF = 1
- Temperature compensation inP = NO (no)
- Temperature coefficient tC = 2.1%/°C
- Current output normalisation Sout = 6000 µS/cm
- Operating position oPP = 5%
- Flushing interval Si = 0 h
- Flushing time Sd= 3 min (valve opens for 3 min then closes for 3 min)
- Damping FiLt: oFF
- Password PW: oFF
- **Code switch** ⓭ :
  S1=OFF, S2=ON, S3=OFF, S4=OFF

Conductivity controller LRR 1-51

- MAX switchpoint AL.Hi = 6000 µS/cm
- Set point SP = 3000 µS/cm
- Dead band: +/– 5% of set point
- Reset hysteresis:
  Set point: –10% of set point
  MAX limit: –3% (fixed)
- Lower end of measuring range Sin.L = 0.5 µS/cm
- Upper end of measuring range Sin.H = 6000 µS/cm
- Operating position oPP = 5%
- Current output normalisation Sout = 6000 µS/cm
- Flushing interval Si = 0 h
- Flushing time Sd= 3 min (valve opens for 3 min then closes for 3 min)
- Damping FiLt: oFF
- Password PW: oFF
- **Code switch** ⓭ :
  S1=OFF, S2=ON, S3=OFF, S4=OFF

Changing the factory settings

Danger

The upper terminal strip of the equipment is live during operation.
There is a risk of serious injury due to electric shock!
Always **cut off power** to the equipment before working on the terminal strip (installation, removal, connecting cables).

Code switch ⓭ - sliding switch, white

To change the setting, proceed as follows:

- Insert a screwdriver between the terminal strip and the front frame, at the arrow markings on the right and left.
- Release the terminal strip on the right and left by turning the screwdriver in the direction of the arrow.
- Detach the terminal strip.
- Set switch ⓭ of the code switch to the desired position.
- Insert the lower terminal strip.
- Switch the supply voltage back on. The equipment restarts.

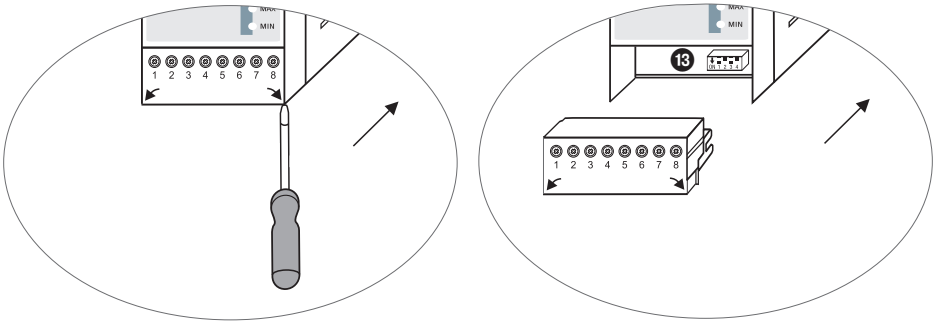


Fig. 6

Changing the factory settings continued

Conductivity controller LRR 1-50, LRR 1-51

Code switch ⑬				
S1	**S2**	**S3 ***	**S4**	**Configuration**
OFF				**Reserve (factory setting)**
ON				Reserve
	OFF			Reserve
	ON			**Reserve (factory setting)**
		OFF		**Terminal 3/4 (Out 2) as actual value output (X) (factory setting) ***
		ON		Terminal 3/4 (Out 2) as manipulated variable output (Yw) *
			OFF	**Electrical conductivity measured in µS/cm (factory setting)**
			ON	Electrical conductivity measured in ppm

* Controller software version 311178.13 or later

Attention

Do **not** change the settings of switches S1 and S2 on code switch ⑬!

Tools

■ Screwdriver size 3.5 x 100 mm, fully insulated to VDE 0680-1.

Operating the conductivity controller

Meaning of codes on the 7-segment display

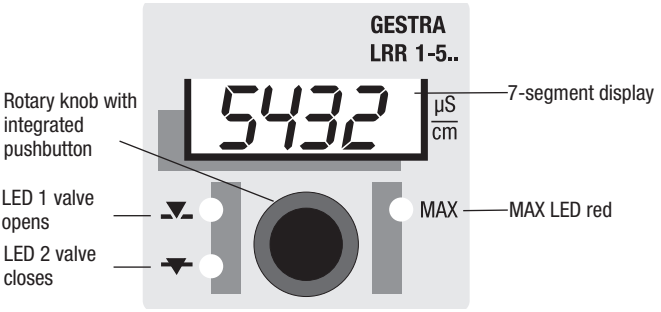


Fig. 7

Code	Meaning	
Appears when rotary knob is turned clockwise:		
AL.Hi	Alarm High	MAX switchpoint, adjustable between 1 and 9999 µS/cm
SP	Set point	Set point, adjustable between 1 and 9999 µS/cm
HySt	Hysteresis	Reset hysteresis, adjustable between 1 and 25% of set point
oPP	Operating position	Operating position of controlled variable Yw, adjustable between 0 and 25 %
FiLt	Filter	Filter is switched on/off (damping)
PW	Password	on = password protection is enabled oFF = password protection is disabled
	Factory setting	1902 (cannot be changed)

LRR 1-50 only		
CAL	Electrode calibration	Electrode calibration. Last reading is displayed
CF	Correction factor	Adjustable between 0.05 and 5.000 in increments of 0.001
inP	Input Pt100	Temperature compensation YES (no)
tC	Temperature coefficient	Tc 0.0 – 3.0% per °C, adjustable in increments of 0.1
LRR 1-51 only		
Sin.L	Lower end of measuring range, adjustable: 0 - 0.5 - 50 - 100 µS/cm	
Sin.H	Upper end of measuring range, adjustable: 20.0 - 100.0 - 200.0 - 500.0 -1000.0 - 2000.0 - 3000.0 - 5000.0 - 6000.0 - 7000.0 - 10000.0 - 12000 µS/cm	

Sout		Current output normalisation, adjustable between 1 and 9999 µS/cm
Si		Flushing interval, adjustable between 0 and 24 hours in increments of 1h
Sd		Flushing time, adjustable between 1 and 4 minutes in increments of 1min.
tESt	Test	Output relays are tested

Appears in parameterization mode		
quit	Quit	Input is not confirmed
done	Done	Input is confirmed

Appears in the event of malfunctions		
E.001	Error	Temperature sensor defective, temperature reading too low
E.002	Error	Temperature sensor defective, temperature reading too high
E.005	Error	Acquired reading defective, reading too low
E.006	Error	Acquired reading defective, reading too high

Bringing into service

Setting parameters

Fig. 7

Starting		
Action	**Indication**	**Function**
Switch on the supply voltage.	7-segment display shows software/ version	System test, takes approx. 3 sec.
	7-segment display shows actual value, LEDs light up.	System switches to operating mode
Actual value < set point	1. LED 1 flashes to indicate valve opening, 2. LED 2 flashes to indicate valve closing.	Continuous blowdown valve opens for the duration of Sd then goes into OPERATING position.
Actual value > set point	1. LED 1 flashes to indicate valve opening, 2. LED 2 flashes to indicate valve closing.	Continuous blowdown valve opens. After conductivity has fallen by the set hysteresis HySt, the valve moves into OPERATING position.

Setting parameters		
Action	**7-segment display**	**Function**
Turn rotary knob until desired parameter is shown	Display toggles between parameter and saved value.	Selecting the parameter
Press and hold the pushbutton (on rotary knob)	First digit (000**0**) flashes.	Parameterization mode active. First digit can be changed.
Turn rotary knob	A new value is displayed.	Turning clockwise increases the value, turning anti-clockwise reduces the value.
Briefly press the pushbutton. The number increases with each press	2nd, 3rd or 4th digit flashes. (from right to left)	2nd, 3rd or 4th digit can be changed using the rotary knob. Turning clockwise increases the value, turning anti-clockwise reduces the value.
If you do not take any further action:	quit is briefly displayed. After this, the display toggles between the parameter and the old value.	The parameter is automatically shown once more and your entry is not confirmed.
When your entries are complete: press and hold the pushbutton	done is displayed. After this, the display toggles between the parameter and the new value.	Your entry is confirmed and the parameter is automatically shown once more.
Turn the rotary knob until the next parameter is shown. Or turn the rotary knob until the actual value is displayed. Or after 30s, the actual value is displayed automatically.		

If **password protection** is enabled, you must enter the password before you can change parameters. For the password, see section “Password protection”.

LRR 1-50 conductivity controller: Setting switchpoints and parameters

Setting the MAX switchpoint	
Action	**Function**
Select parameter AL.Hi, enter and save the desired conductivity.	Set the MAX switchpoint between 1 and 9999 µS/cm or 1 and 5000 ppm.

Setting the set point	
Select parameter SP, enter and save the desired conductivity.	Set the set point between 1 and 9999 µS/cm or 1 and 5000 ppm.

Setting the reset hysteresis	
Select parameter HySt, enter and save the required value.	Set the reset hysteresis between 1 and 25% of the set point.

Conductivity electrode LRG 1.-.: Setting the correction factor	
Select correction factor CF, enter and save the required value.	Once operating temperature is reached, measure the conductivity of a water sample (at 25°C). In increments, set the correction factor until the displayed actual value matches the reference reading. This adapts the conductivity reading to the installation conditions or compensates for deviations during operation.

Conductivity electrode LRG 1.-.. with separate resistance thermometer and LRG 16-9	
Switching on temperature compensation	
Select setting inP and turn the rotary knob clockwise. YES is displayed. Save the setting.	
Setting the temperature coefficient	
Select temperature coefficient tC, enter and save the desired percentage.	Once operating temperature is reached, measure the conductivity of a water sample (at 25°C). In increments, set the temperature coefficient until the displayed actual value matches the reference reading.
If necessary: Select correction factor CF, enter and save the required value. Alternatively, use calibration function CAL (software version "S-13" and later).	During operation, the indicated conductivity may differ from the reference reading, e.g. due to soiling. In that case, set the correction factor in increments until the displayed actual value matches the reference reading.

Normalising the actual value current output	
Select parameter Sout, enter and save the desired conductivity.	Set the current output between 1 and 9999 µS/cm

Setting the flushing interval and flushing time	
Select parameter Si, enter and save the desired time.	Set the flushing interval between 0 and 24 hours.
Select parameter Sd, enter and save the desired time.	Set the flushing time between 1 and 4 minutes.

LRR 1-50 conductivity controller: Setting switchpoints and parameters continued

Calibration		
Action	**Display**	**Function**
Turn the rotary knob until the entry CAL is shown.	CAL is displayed.	Calibration is selected.
Press and hold the pushbutton (on rotary knob)	The last reading is displayed and the digit on the right flashes (xxxX).	Enter the conductivity starting with the digit on the right.
Turn the rotary knob clock-wise or anti-clockwise to enter the required digit.	xxxX	The first digit is entered.
Briefly press the pushbutton.	Second digit from the right flashes (xxXx).	The second digit can be entered.
Repeat the last two steps to enter the conductivity in full.	The entered conductivity is displayed (xxxx).	The conductivity is entered in full.
	quit	Processing time has elapsed. System switches back to the parameter. Entry was discontinued due to lack of activity.
Press and hold the pushbutton (on rotary knob).	donE	New calibration value has been accepted and a corresponding CF value calculated.
	CF.Er	CF value is outside the admissible range. Previous calibration has been retained.

LRR 1-51 conductivity controller: Setting switchpoints and parameters

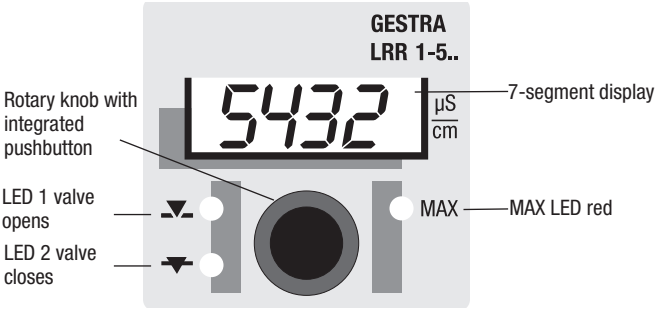


Fig. 7

Setting the MAX switchpoint	
Action	**Function**
Select parameter AL.Hi, enter and save the desired conductivity.	Set the MAX switchpoint between 1 and 9999 µS/cm or 1 and 5000 ppm.

Setting the set point	
Select parameter SP, enter and save the desired conductivity.	Set the set point between 1 and 9999 µS/cm or 1 and 5000 ppm.

Setting the reset hysteresis	
Select parameter HySt, enter and save the required value.	Set the reset hysteresis between 1 and 25% of the set point.

Setting the lower and upper ends of the measuring range	
Select parameter Sin.L, enter and save the desired conductivity.	Set the lower end of the measuring range in stages 0 - 0.5 - 50 - 100 µS/cm
Select parameter Sin.H, enter and save the desired conductivity.	Set the upper end of the measuring range in stages 20.0 - 100.0 - 200.0 - 500.0 -1000.0 - 2000.0 - 3000.0 - 5000.0 - 6000.0 - 7000.0 - 10000.0 - 12000.0 µS/cm

Normalising the actual value current output	
Select parameter Sout, enter and save the desired conductivity.	Set the current output between 1 and 9999 µS/cm

Setting the flushing interval and flushing time	
Select parameter Si, enter and save the desired time.	Set the flushing interval between 0 and 24 hours.
Select parameter Sd, enter and save the desired time.	Set the flushing time between 1 and 4 minutes.

Operation, alarm and testing

Conductivity controllers LRR 1-50, LRR 1-51: Checking the displays and the function of the MAX output contact

Operation		
Action	**Indication**	**Function**
Actual value < set point	The actual value is shown on the 7-segment display. LED 2 flashes to indicate valve closing, MAX LED is not lit.	Valve output contact 19/17 closed, MAX output contact 21/23 open, 22/23 closed.

Set point exceeded		
Actual value > set point	The actual value is shown on the 7-segment display. 1. LED 1 flashes to indicate valve opening, 2. LED 2 flashes to indicate valve closing. MAX LED is not lit.	Continuous blowdown valve opens. After conductivity has fallen by the set hysteresis HySt, the valve moves into OPERATING position. 1. Valve output contact 19/16 closed, 2. Valve output contact 19/17 closed. MAX output contact 21/23 open, 22/23 closed.

MAX alarm		
MAX conductivity switchpoint exceeded.	MAX LED lights up red	MAX output contacts 21/23 closed, 22/23 open.

Standby	
Burner is switched off (standby) Supply voltage to the conductivity controller is also switched off. When it is switched back on, the system is restarted.	Valve output contact 19/18 closed. Continuous blowdown valve closes.

Test of MIN alarm and MAX alarm		
Action	**Indication**	**Function**
In operating mode: Actual value < set point. Select Test parameter. Press and hold the pushbutton. 7-segment display: Test flashes.	MAX LED lights up red for 3 seconds	MAX output contact 21/23 closed, 22/23 open.
	After 3 seconds: MAX LED goes out.	MAX output contact 21/23 open, 22/23 closed.
Test complete, release pushbutton. 7-segment display: Test is displayed.	Note: If you continue holding the pushbutton, the test sequence will start again. You can interrupt the test sequence at any time by releasing the pushbutton.	
Turn the rotary knob until the actual value is displayed. Or after 30s, the actual value is displayed automatically.		

Note

The continuous blowdown valve is equipped with three limit switches for the positions CLOSED, OPEN and OPERATING. In the adjustable OPERATING position, the continuous blowdown valve is slightly open. This enables a certain amount of boiler blowdown to be removed, to keep the TDS below the set limit. The appropriate amount of boiler blowdown is determined using the capacity charts of the continuous blowdown valve. Please pay attention to the Installation & Operating Manual for GESTRA continuous blowdown valves.

Password protection

Parameters can be password-protected from software version “S-13” onwards. The default password is 1902 and cannot be changed.

Enabling password protection		
Action	**Display**	**Function**
Turn the rotary knob until the entry PW is shown.	The display toggles between the parameter name and the parameter value.	Parameter selected.
Press and hold the pushbutton (on rotary knob).	PASS	Password entry is required.
Release and then press and hold the pushbutton once more.	First digit (000**0**) flashes.	Enter the password starting with the digit on the right.
Turn the rotary knob clockwise or anti-clockwise to enter the required digit.	000X	The first digit is entered.
Briefly press the pushbutton.	Second digit from the right flashes (00**0**X).	The second digit can be entered.
Repeat the last two steps until the password has been entered in full.	The entered password is displayed (XXXX).	The password is entered in full.
Press and hold the pushbutton.	donE	The correct password was entered. The parameter may be edited.
	FAiL	The wrong password was entered. The parameter is still password-protected.
	quit	Processing time has elapsed. System switches back to the parameter. Password entry is cancelled.
Disabled password protection is re-enabled after 30 minutes with no activity (rotary knob). The password must be entered again. When the equipment is restarted, the parameters are password-protected, if password protection was previously enabled.		

Troubleshooting

Indications, diagnosis and remedies

Attention

Please check the following before fault diagnosis:

Supply voltage:
Is the conductivity controller supplied with the voltage specified on the name plate?

Wiring
Does the wiring conform to the wiring diagram?

Error codes on the 7-segment display		
Error code	**Error**	**Remedy**
E.001	Temperature sensor defective, temperature reading too low	Check resistance thermometer of LRG 16-9 conductivity electrode and replace if necessary. Check electrical connection (short circuit, open circuit?).
E.002	Temperature sensor defective, temperature reading too high	
E.005	Conductivity electrode defective, reading too low.	Check conductivity electrode and replace if necessary. Check electrical connection.
	Conductivity transmitter defective, measuring current < 4 mA	Check conductivity transmitter and replace if necessary. Check electrical connection.
E.006	Conductivity electrode defective, reading too high.	Check conductivity electrode and replace if necessary. Check electrical connection. Check boiler water.
	Conductivity transmitter defective, measuring current > 20 mA	Check conductivity transmitter and replace if necessary. Check electrical connection.
E.097	Walkthrough application error	Internal error. Replace equipment.
E.098	Walkthrough test error	Internal error. Replace equipment.
E.099	Internal test error	Internal error. Replace equipment.
In the event of a malfunction, the MAX alarm is triggered and the continuous blowdown valve moves into OPERATING position.		

Error without a display	
Error	**Remedy**
Actual value < set point. Continuous blowdown valve opens.	Check code switch S4. Switch must be in ON position.
The conductivity changes but the 4 - 20 mA indication remains in the 4 - 8 m A range or at 20 mA.	Check code switch S3 (see table on page 19): The switch must be OFF.
The 4 - 20 mA controlled variable output (Yw) is proportional to the conductivity.	Check code switch S3 (see table on page 19): The switch must be ON.

All error codes not listed here are available as reserves.

Indications, diagnosis and remedies continued

Attention

- For further fault diagnosis, please refer to the Installation & Operating Manuals for the LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1, LRG 19-1, TRG 5-.. and LRGT 1.-..

Note

In the event of a malfunction in the conductivity controller, the MAX alarm is triggered and the equipment restarts. If the process is continually repeated, the equipment must be replaced.

Further information

Action against high-frequency interference

High-frequency interference can be caused by out-of-phase switching operations. If such interference occurs and results in sporadic failure, we recommend taking the following action to suppress interference:

- Provide inductive loads with RC combinations as per manufacturer's specifications.
- Route the connecting cable to the conductivity electrode or conductivity transmitter separately from power lines.
- Increase the distance from sources of interference.
- Check the shield connection. Check the equipment shielding with the aid of the Installation & Operating Manuals. If equalisation currents can be expected (outdoor installations), connect the shield to one side only.
- Suppress HF interference using hinged-shell ferrite rings.

Replacing/taking the equipment out of service

- Switch off the supply voltage and **cut off power to the equipment!**
- Remove the upper and lower terminal strips. **Fig. 8**
  - Insert a screwdriver on the right and left between the terminal strip and the front frame, as shown by the arrows.
  - Release the terminal strip on the right and left sides by turning the screwdriver in the direction of the arrow.
  - Remove the terminal strips.
- Release the white slider holder on the underside of the housing and detach the equipment from the support rail.

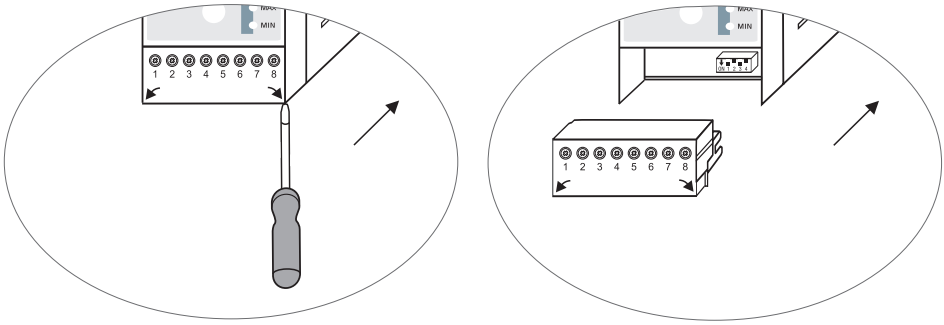


Fig. 8

Disposal

The equipment must be disposed of in accordance with statutory waste disposal regulations.

In the event of malfunctions or faults that cannot be remedied with the aid of this Installation & Operating Manual, please contact our service centre or authorised agent in your country.

Declaration of Conformity
Directives and Standards

For more information on the conformity of the equipment as well as applied Directives and Standards please refer to our Declaration of Conformity and associated certificates and/or approvals.

The Declaration of Conformity can be found online at www.gestra.com and associated certificates can be requested from:

GESTRA AG
Münchener Straße 77
28215 Bremen
Germany
Telefon +49 421 3503-0
Telefax +49 421 3503-393
E-mail info@de.gestra.com
Web www.gestra.com

Note that Declarations of Conformity and associated certificates lose their validity if equipment is modified without prior consultation with us.

For your notes

You can find our authorised agents around the world at: **www.gestra.com**

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