



Conductivity Controller

LRR 1-50

LRR 1-51

EN
English

Original Installation Instructions
819224-04

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Important notes

Usage for the intended purpose

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

The conductivity controllers are designed for use with conductivity electrodes and transmitters in the following equipment combinations: Conductivity controller LRR 1-50 together with conductivity electrodes LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1 and LRG 19-1; Conductivity controller LRR 1-51 together with conductivity transmitters LRGT 16-1, LRGT 16-2, LRGT 16-3, LRGT 16-4, LRGT 17-3 and LRGT 17-1.

Glossary

Continuous boiler blowdown (top blowdown)

As the boiler water evaporates, the concentration of non-volatile dissolved solids (TDS) left behind in the boiler increases over time as a function of steam consumption. If the TDS (= total dissolved solids) 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. As a consequence, the operational safety is impaired and severe damage to boiler and tubes may occur. To keep the TDS concentration within admissible limits, a certain portion of boiler water must be removed continuously or periodically (by means of a blowdown valve) and fresh make-up water must be added to the boiler feed to compensate for the water lost through blowdown. Electrical conductivity - here as a result of the TDS content of boiler water - is measured in microSiemens/cm ($\mu\text{S}/\text{cm}$). However, in some countries ppm (parts per million) is used for conductivity readings. Conversion: $1\mu\text{S}/\text{cm} = 0.5 \text{ ppm}$.

Operating position of the continuous blowdown valve

Continuous blowdown (also known as top blowdown) is the process where boiler water is removed from the water's surface in order to reduce the concentration of dissolved solids. As the name implies, continuous or top blowdown is done on a continuous basis, which means that the blowdown valve remains in a slightly open position (valve position "OPERATING") in order to allow the required amount of boiler water to be discharged. For close control and accurate regulation this operating position must be adjusted in the continuous blowdown valve. The amount of boiler blowdown can be determined by using the capacity charts for the valve.

Switching hysteresis

The controller works as 2-position controller, which means that the continuous blowdown valve is motored into the OPEN position when the setpoint is reached. The conductivity must then decrease until a new value that is lower than the setpoint minus the adjusted hysteresis HySt is reached. Once this value is reached the valve will be motored into the operating position.

Temperature compensation

The electrical conductivity changes as the temperature falls or rises. To obtain meaningful readings it is therefore necessary that the measurements are based on the reference temperature of 25 °C and that the measured conductivity values are corrected by the temperature coefficient factor tC.

Cell constant and correction factor

The cell constant is a geometric quantity characteristic of the conductivity electrode and is taken into account when calculating the conductivity. However, in the course of time this constant may change, e. g. due to dirt deposits accumulated on the measuring electrode. Deviations can be compensated by changing the correction factor CF.

Important notes – continued –

Glossary – continued –

Purging of the continuous blowdown valve

To prevent the continuous blowdown valve from getting stuck the valve can be rinsed automatically. At regular intervals (purging pulse Si) the continuous blowdown valve is motored into the open position and rinsed (purging time Sd). When the purging time is over, the valve is motored into the OPERATING position or into the required control position.

Function

The **conductivity controller LRR 1-50** in conjunction with the conductivity electrode LRG 1.-.. measures the electrical conductivity in conductive liquids. The LRG 1.-.. is used as conductivity electrode or the LRG 16-9 with integrated resistance thermometer for detecting the fluid temperature. To measure the temperature you can also use a separate resistance thermometer Pt 100.

The **conductivity controller LRR 1-51** processes the conductivity-dependent current signal of the conductivity transmitter LRG 1.-.. This signal is then standardized in the conductivity controller according to the adjusted measuring range and indicated by the 7-segment LED display.

Conductivity controller LRR 1-50: If **conductivity electrode LRG 1.-..** is connected, a reference measurement is taken and by setting the correction factor CF accordingly the conductivity readings are adapted to the specific conditions of the installation.

If a resistance thermometer is used, not only the electrical conductivity but also the water temperature will be measured. The conductivity reading is automatically compensated in the conductivity controller as a function of the adjusted temperature coefficient **tC** (%/°C). Even if the temperature changes, thanks to the adjusted linear temperature compensation, the measured value is referenced to 25 °C over the whole measuring range and indicated on the 7-segment LED display.

The **conductivity controller LRR 1-50, LRR 1-51** works as **2-position controller**, which means that the continuous blowdown controller is motored into the OPEN position when the setpoint is reached. Once the conductivity has fallen below the adjusted hysteresis, the valve is motored into the OPERATING position. 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 variably adjusted within the measuring range.

Once the MAX limit is reached, the MAX output contact is switched over and the LED indicating MAX limit is illuminated. The equipment will be reset once the value has fallen below the preset hysteresis.

Any faults or malfunctions in the conductivity electrode, the conductivity transmitter, the electrical connection or the settings will be indicated as error code by the 7-segment LED display. In the event of a malfunction a MAX alarm will be raised and the continuous blowdown valve is motored into the OPERATING position.

If the malfunction occurs only **in the conductivity controller LRR 1-50, LRR 1-51** a MAX alarm will be raised, the continuous blowdown controller is motored into the OPERATING position and the system is re-started.

Parameter settings can be changed or a MAX alarm can be simulated by operating the rotary button.

The electrical conductivity is measured in $\mu\text{S}/\text{cm}$. In some countries ppm (parts per million) is used instead. Conversion: $1\mu\text{S}/\text{cm} = 0.5\text{ ppm}$. The conductivity controller can be adjusted accordingly.

Important notes – continued –

Safety note

The equipment must only be installed, wired and commissioned by qualified and competent staff. Retrofitting and maintenance work must only be performed by qualified staff who - through adequate training - have achieved a recognised level of competence.



Danger

The terminal strips of the equipment are live during operation. This presents the danger of electric shock! Always **cut off power supply** to the equipment before mounting, removing or connecting the terminal strips!



Attention

The name plate specifies the technical features of the equipment. Note that any piece of equipment without its specific name plate must neither be commissioned nor operated.

Directives and standards

EU Pressure Equipment Directive 2014/68/EU

The conductivity control & monitoring equipment LRG 1.-...,LRGT 1.-..., LRS 1-5..., LRR 1-5.. meets the safety requirements of the Pressure Equipment Directive (PED). The conductivity control & monitoring equipment is EU type approved according to EN 12952/EN 12953. These Directives state, among other things, the requirements made on limiting systems and equipment for steam boiler plants and (pressurised) hotwater installations.

VdTÜV Bulletin “Water Monitoring 100”

The conductivity controller LRR 1-50, LRR 1-51 in conjunction with conductivity electrode LRG 1.-.. and conductivity transmitter LRGT 1.-.. is type approved according to VdTÜV Bulletin “Wasserüberwachung (= Water Monitoring) 100”. The VdTÜV Bulletin “Water Monitoring 100” states the requirements made on water monitoring equipment.

LV (Low Voltage) Directive and EMC (Electromagnetic Compatibility)

The equipment meets the requirements of the Low Voltage Directive 2014/35/EU and the EMC Directive 2014/30/EU.

ATEX (Atmosphère Explosible)

According to the European Directive 2014/34/EU the equipment must **not** be used in explosion risk areas.



Note

The conductivity electrodes LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1 and LRG 19-1 are simple items of electrical equipment as specified in EN 60079-11 section 5.7. According to the European Directive 2014/34/EU the equipment must be equipped with approved Zener barriers if used in potentially explosive areas. Applicable in Ex zones 1, 2 (1999/92/EC). The equipment does not bear an Ex marking.

Note on the Declaration of Conformity / Declaration by the Manufacturer **CE**

For details on the conformity of our equipment according to the European Directives see our Declaration of Conformity or our Declaration of Manufacturer.

The current Declaration of Conformity / Declaration of Manufacturer are available in the Internet under www.gestra.com/documents or can be requested from us.

Technical data

LRR 1-50, LRR 1-51

Supply voltage

24 VDC +/- 20%

Fuse

external 0.5 A (semi-delay)

Power consumption

4 VA

Reset hysteresis

MAX limit: - 3 % of the adjusted MAX limit, fixed setting

Outputs

2 volt-free change-over contacts, 8 A 250 V AC / 30 V DC $\cos \varphi = 1$
(continuous blowdown valve OPEN, OPERATING, CLOSED).

1 volt-free change-over contact, 8 A 250 V AC / 30 V DC $\cos \varphi = 1$
(MAX alarm, switch-selectable).

Provide inductive loads with RC combinations according to manufacturer's specification to ensure interference suppression

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

Indicators and adjustors

1 rotary button with integrated pushbutton for parameter setting and testing MAX alarm

1 seven-segment LED display, four digits, green

1 red LED for MAX alarm,

2 amber LEDs indicating continuous blowdown valve opens/closes

1 four-pole code switch for configuration settings

Housing

Housing material: base: polycarbonate, black; front: polycarbonate, grey

Conductor size: 1 x 4,0 mm² solid per wire or 1 x 2.5 mm² per stranded wire with sleeve to DIN 46228
or 2 x 1.5 mm² per stranded wire with sleeve to DIN 46228 (min. \varnothing 0.1 mm)

terminal strips can be detached separately

Fixing of housing: Mounting clip on supporting rail TH 35, EN 60715

Electrical safety

Pollution degree 2 for installation in control cabinet with protection IP 54, completely insulated

Protection

Housing: IP 40 to EN 60529

Terminal strip: IP 20 to EN 60529

Weight

approx. 0.2 kg

Technical data – continued –

Only LRR 1-50

Connection of conductivity electrode

- 1 input for conductivity electrode LRG 1.-... (cell constant 1 cm⁻¹), 3 poles with screen or
- 1 input for conductivity electrode LRG 16-9 (cell constant 0.5 cm⁻¹), with integrated resistance thermometer Pt 100, 3 poles with screen.

Measuring voltage

0.8 V_{ss}, pulse duty factor $t_v = 0.5$, frequency 20-10000 Hz.

Measuring range

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

Only LRR 1-51

Connection of conductivity transmitter

1 analogue input 4-20 mA, e. g. for conductivity transmitter LRGT 1.-..., 2 poles with screen.

Lower end of measuring range SinL

0.5 - 100.0 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 µS/cm, adjustable.

LRR 1-50, LRR 1-51

Ambient temperature

when system is switched on: 0 ... 55 °C,
during operation: -10 ... 55 °C

Transport temperature

-20 ... +80 °C (<100 hours), defrosting time of the de-energized equipment before it can be put into operation: 24 hours.

Storage temperature

-20 ... +70 °C, defrosting time of the de-energized equipment before it can be put into operation: 24 hours.

Relative humidity

max. 95%, no moisture condensation

Approvals:

TÜV certificate

VdTÜV Bulletin "Wasserüberwachung" (= Water Monitoring 100):
Requirements made on water monitoring equipment
Type approval no. TÜV · WÜL · XX-017 (see nameplate)

Scope of supply

LRR 1-50

- 1 Conductivity switch LRR 1-50
- 1 Adhesive plate ppm
- 1 Installation manual

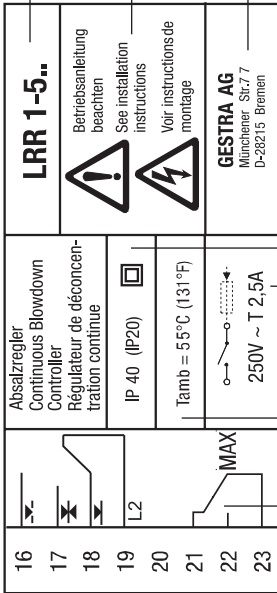
LRR 1-51

- 1 Conductivity switch LRR 1-51
- 1 Adhesive plate ppm
- 1 Installation manual

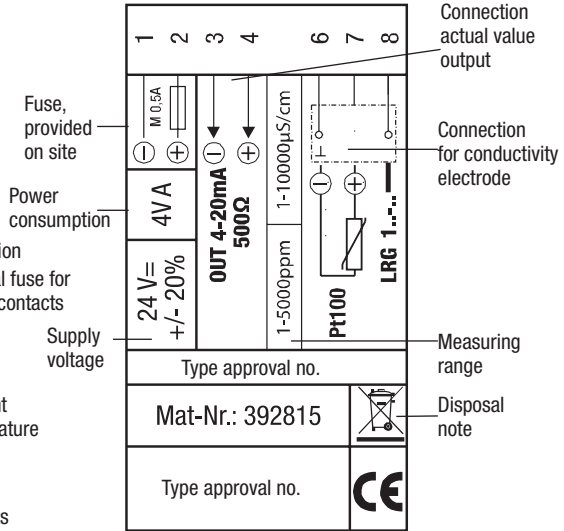
Name plate / marking

Nameplate LRR 1-50, LRR 1-51 on top

Type designation Safety note Manufacturer



Nameplate LRR 1-50 below



Nameplate LRR 1-51 below

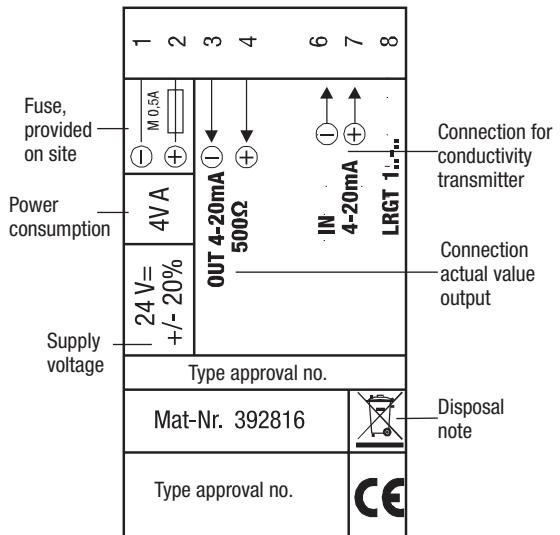


Fig. 1

In control cabinet: Installing the conductivity controller

Dimensions LRR 1-50, LRR 1-51

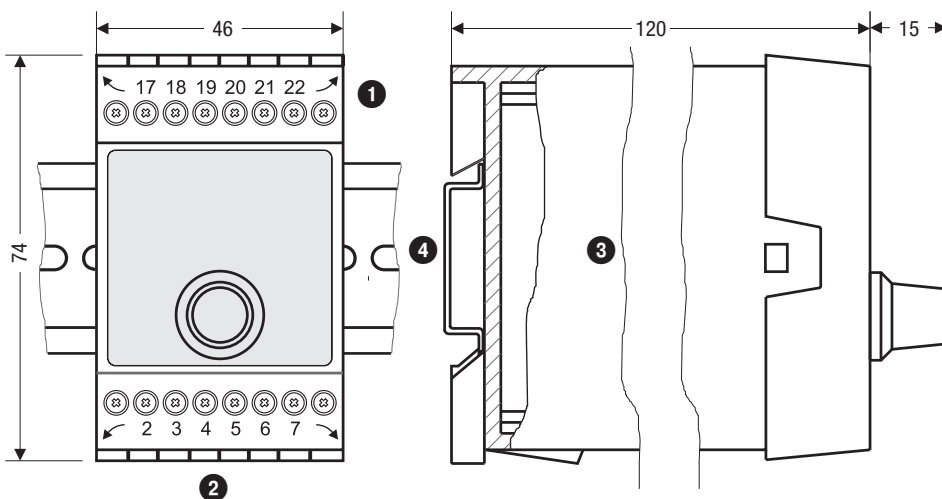


Fig. 2

Key

- | | |
|------------------------|--|
| ① Upper terminal strip | ③ Housing |
| ② Lower terminal strip | ④ Supporting rail type TH 35, EN 60715 |

Installation in control cabinet

The conductivity controller LRR 1-50, LRR 1-51 is clipped onto the support rail type TH 35, EN 60715 in the control cabinet. Fig. 1 ④

In control cabinet: Wiring the conductivity controller

Wiring diagram for conductivity controller LRR 1-50

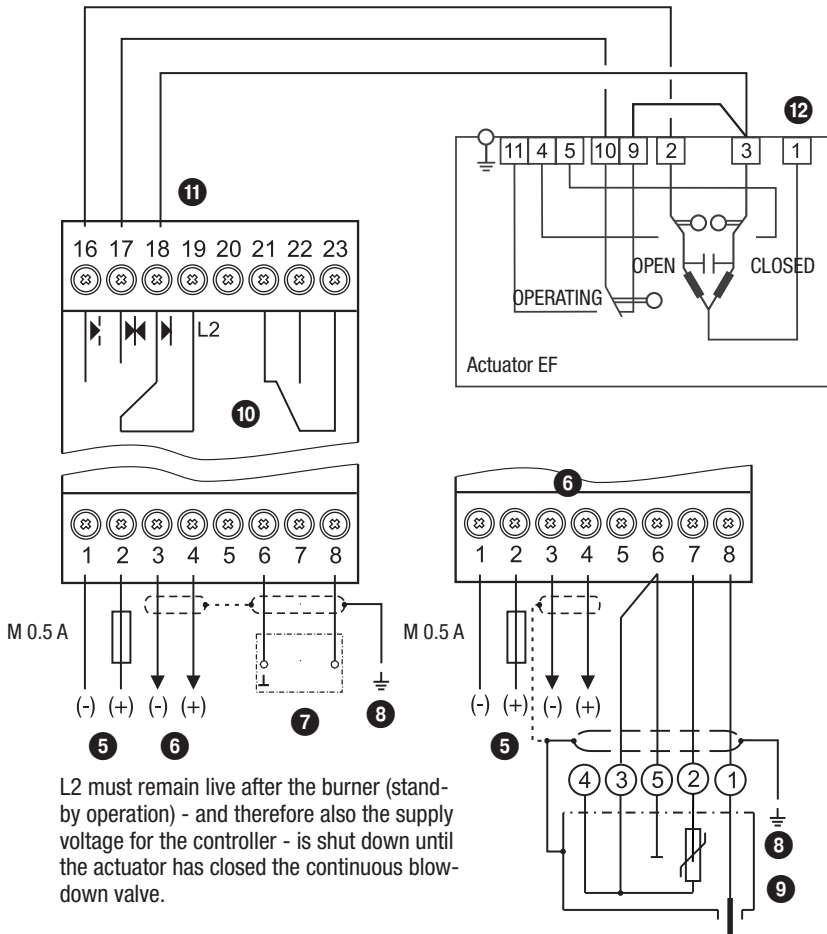
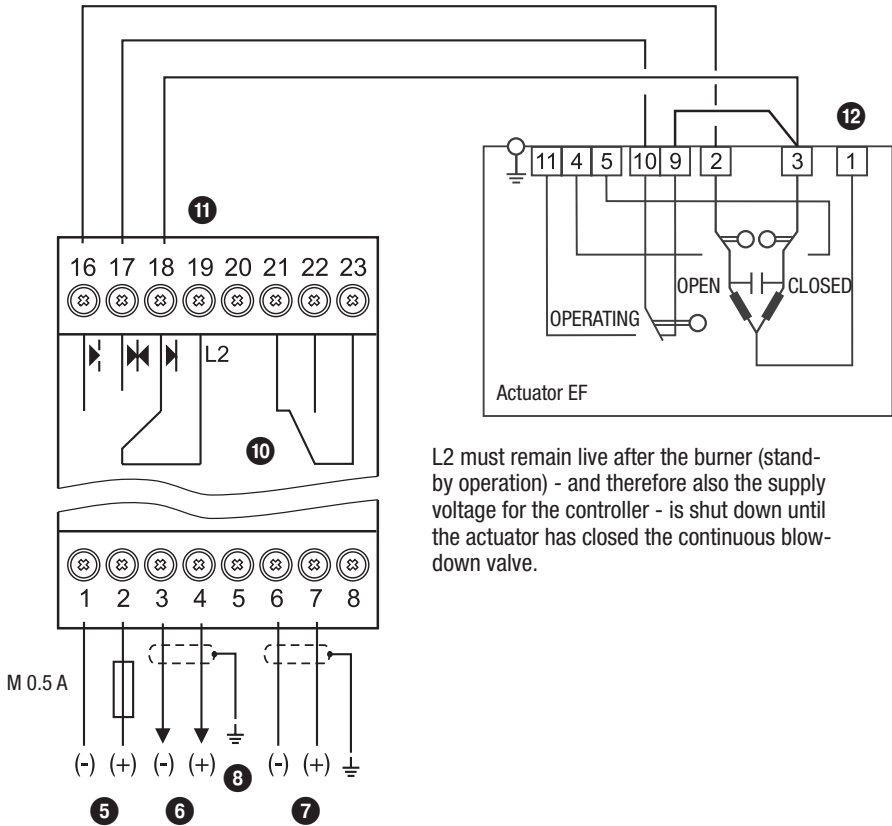


Fig. 3

Key

- 5** Connection of supply voltage **24 V DC** with fuse 0.5 A (semi-delay) provided on site
- 6** Actual value output 4-20 mA
- 7** Conductivity electrode LRG 1-... (Terminal 6/7: resistance thermometer can be connected)
- 8** Central earthing point (CEP) in control cabinet
- 9** Conductivity electrode LRG 16-9 with integrated resistance thermometer
- 10** MAX output contact
- 11** Supply voltage L 2
- 12** Supply voltage N

Wiring diagram for conductivity controller LRR 1-51



L2 must remain live after the burner (stand-by operation) - and therefore also the supply voltage for the controller - is shut down until the actuator has closed the continuous blow-down valve.

Fig. 4

Key

- 5 Connection of supply voltage 24 V DC with fuse 0.5 A (semi-delay) provided on site
- 6 Actual value output 4-20 mA
- 7 Conductivity transmitter LRGT 1-..., 4-20 mA, with earthing point
- 8 Central earthing point (CEP) in control cabinet
- 10 MAX output contact
- 11 Supply voltage L 2
- 12 Supply voltage N

In control cabinet: Wiring the conductivity controller – continued –

Connection of supply voltage

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

The power supply unit must be electrically isolated from dangerous contact voltages and must meet at least the requirements on double or reinforced isolation according to one of the following standards: DIN EN 50178, DIN EN 61010-1, DIN EN 60730-1 or DIN EN 60950.

Connecting output contacts

Wire the upper terminal strip ❶ (terminals 16 - 23) according to the desired switching functions.

Provide an external slow-blow fuse 2.5 A for the output contacts. When switching off inductive loads, voltage spikes are produced that may impair the operation of control and measuring systems. Connected inductive loads must be provided with suppressors such as RC combinations as specified by the manufacturer.

When used as conductivity limiter the conductivity controller LRR 1-50, LRR 1-51 does not interlock automatically when the readings exceed the MAX limit.

If an interlock function is required for the installation it must be provided in the follow-up circuitry (safety circuit). The circuitry must meet the requirements of the EN 50156.

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

To connect the equipment use screened multi-core control cable with a min. conductor size 0.5 mm² e.g. LiYCY 4 x 0.5 mm².

Wire terminal strip in accordance with the wiring diagram. **Fig. 3**

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

Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.

Connection of conductivity electrode LRG 16-9

The conductivity electrode LRG 16-9 is equipped with a sensor plug-in connection type M 12, with 5 poles, A-coded, pin assignment see **Fig. 3**. For connecting the equipment preconfigured control cable assemblies (with male and female connectors) of various lengths are available as add-on equipment.

To connect the conductivity controller LRR 1-50 remove the connector and wire the terminal strip according to the wiring diagram. **Fig. 3**.

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

If you do not use the prefabricated control cable assembly, use screened five-core control cable, e. g. LiYCY 5 x 0.5 mm² for connecting the equipment. In addition, connect at the electrode end a screened female connector to the control cable.

Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.

In control cabinet: Wiring the conductivity controller – continued –

Connection of conductivity transmitter LRGT 1.-..

To connect the equipment use screened multi-core control cable with a min. conductor size 0.5 mm², e. g. LiYCY 4 x 0.5 mm², max. length 100 m.

Wire terminal strip in accordance with the wiring diagram. **Fig. 4**

Wire screen in accordance with the wiring diagram.

Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.

Connection of actual-value output

To connect the equipment use screened multi-core control cable with a min. conductor size 0.5 mm², e. g. LiYCY 2 x 0.5 mm², max. length: 100 m.

Please observe the max. load of 500 ohm.

Wire terminal strip in accordance with the wiring diagram. **Fig. 3, 4**

Connect the screen **only once** to the central earthing point (CEP) in the control cabinet.

Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.

Any item of equipment that you want to connect to the terminals for the actual-value output 4 - 20 mA (option) must be certified to have at least double or reinforced isolation according to DIN EN 50178 or DIN EN 61010-1 or DIN EN 60730-1 or DIN EN 60950 (safe electrical isolation) 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 point terminals.

Tools

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

In the plant: Wiring the conductivity electrode / transmitter

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

To connect the equipment use screened multi-core control cable with a min. conductor size 0.5 mm² e.g. LiYCY 4 x 0.5 mm².

Wire terminal strip in accordance with the wiring diagram. **Fig. 3**

Connect the screen only once to the central earthing point (CEP) in the control cabinet.

Max. cable length between conductivity electrode / resistance thermometer and conductivity controller: 30 m, with conductivities from 1 to 10 µS/cm: max. 10 m.

Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.

Connection of conductivity electrode LRG 16-9

The conductivity electrode LRG 16-9 is equipped with a sensor plug-in connection type M 12, with 5 poles, A-coded, pin assignment see **Fig. 3**. For connecting the equipment preconfigured control cable assemblies (with male and female connectors) of various lengths are available as add-on equipment.

Note that the recommended control cable is not UV-resistant and, if installed outdoors, must be protected by a UV-resistant plastic tube or cable duct.

To connect the conductivity controller LRR 1-50 remove the connector and wire the terminal strip according to the wiring diagram. **Fig. 3**

Connect the screen only once to the central earthing point (CEP) in the control cabinet.

If you do not use the prefabricated control cable assembly, use screened five-core control cable, e. g. LiYCY 5 x 0.5 mm² for connecting the equipment. In addition, connect at the electrode end a screened female connector to the control cable.

Max. cable length between conductivity electrode and controller: 30 m, with conductivities from 1 to 10 µS/cm: max. 10 m.

Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.

Connection of conductivity transmitter LRGT 1-..

To connect the equipment use screened multi-core control cable with a min. conductor size 0.5 mm² e.g. LiYCY 4 x 0.5 mm², max. length: 100 m.

Wire terminal strip in accordance with the wiring diagram. **Fig. 4**

Wire screen in accordance with the wiring diagram.

Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.



Attention

- To commission the equipment please refer to the installation & operating manuals for LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1, LRG 19-1, TRG 5-.. and LRGT 1-..
- Make sure that connecting cables leading to the equipment are segregated and run separately from power cables.
- Check the connection of the screen to the central earthing point (CEP) in the control cabinet.
- The conductivity transmitter must be separately connected to its own voltage supply.

Factory settings

Conductivity controller LRR 1-50

- MAX switchpoint AL.Hi = 6000 $\mu\text{S}/\text{cm}$
- Setpoint SP = 3000 $\mu\text{S}/\text{cm}$
- Dead band: $\pm 5\%$ of setpoint
- Reset hysteresis:
Setpoint: -10% of the setpoint
MAX limit: -3% (fixed setting)
- Correction factor CF = 1
- Temperature compensation inP: No
- Temperature coefficient tC = 2.1 % / $^{\circ}\text{C}$
- Standardizing the current output Sout = 6000 $\mu\text{S}/\text{cm}$
- Purging pulse Si = 0 h
- Purging duration Sd = 3 minutes (valve opens 3 min and closes 3 min)
- Code switch **①**: S 2 ON, S1, S3, S4 OFF

Conductivity controller LRR 1-51

- MAX switchpoint AL.Hi = 6000 $\mu\text{S}/\text{cm}$
- Setpoint SP = 3000 $\mu\text{S}/\text{cm}$
- Dead band: $\pm 5\%$ of setpoint
- Reset hysteresis:
Setpoint: -10% of the setpoint
MAX limit: -3% (fixed setting)
- Lower end of measuring range SinL = 0.5 $\mu\text{S}/\text{cm}$
- Upper end of measuring range = SinH 6000 $\mu\text{S}/\text{cm}$
- Standardizing the current output Sout = 6000 $\mu\text{S}/\text{cm}$
- Purging pulse Si = 0 h
- Purging duration Sd = 3 minutes (valve opens 3 min and closes 3 min)
- Code switch **①**: S 2, S3 ON, S1, S4 OFF

Changing factory settings



Danger

The upper terminal strip of the equipment is live during operation. This presents the danger of electric shock!

Always **cut off power supply** to the equipment before mounting, removing or connecting the terminal strips!

Switch selection of unit of measurement

The electrical conductivity is measured in $\mu\text{S}/\text{cm}$. In some countries ppm (parts per million) is used instead. Conversion: $1 \mu\text{S}/\text{cm} = 0.5 \text{ ppm}$. Use code switch ① to set the desired unit of measurement. This unit setting is then applicable for all conductivity readings and settings. If you choose ppm as unit of measurement, please stick the adhesive label supplied with the equipment onto the unit specification on the housing.

To change the setting proceed as follows:

- Insert a screwdriver to the right and left of the arrow markings between the terminal strip and the front frame.
- Unlock terminal strip on the left and right side. For this purpose move screwdriver in direction of the arrow.
- Remove the terminal strip.
- Set switch S4 of code switch ① to ON = ppm (parts per million)
- Re-attach lower terminal strip.
- Apply supply voltage. Equipment is restarted.

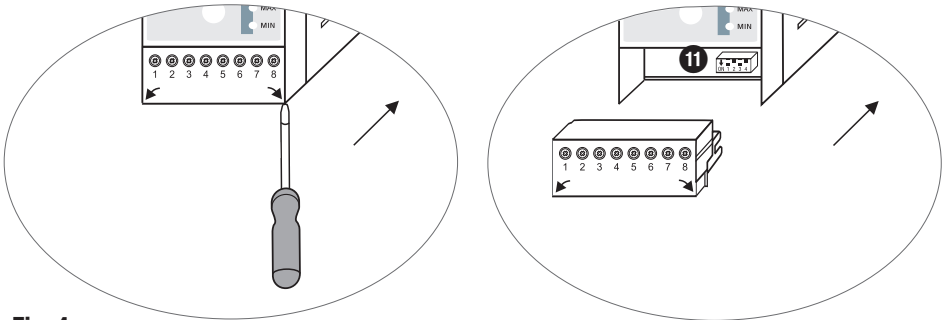


Fig. 4



Attention

Do **not** change the code switch ① settings of S1, S2 and S3.

Tool

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

Operating the conductivity controller

Key to codes on seven-segment display



Fig. 5

Code	Description	
Indicated when rotary button is turned to the right:		
AL.Hi	Alarm High	MAX switchpoint, adjustable between 1 and 9999 $\mu\text{S}/\text{cm}$
SP	Setpoint	Setpoint, adjustable between 1 and 9999 $\mu\text{S}/\text{cm}$
HySt	Hysteresis	Reset hysteresis, adjustable between 1 and 25 % of the setpoint
Only LRR 1-50		
CF	Correction Factor	Correction factor, adjustable between 0.05 and 5,000, adjustable in increments of 0.001
inP	input Pt 100	Temperature compensation YES (no)
tC	Temperature coefficient	Temperature coefficient Tk 0.0 – 3.0 % per °C, adjustable in increments of 0.1
Only LRR 1-51		
Sin.L	Lower end of measuring range, adjustable 0.0 - 0.5 - 100.0 $\mu\text{S}/\text{cm}$	
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 - 9999.0 $\mu\text{S}/\text{cm}$	
Sout		Standardization of current output adjustable between 1 and 9999 $\mu\text{S}/\text{cm}$
Si		Purging pulse, adjustable between 0 and 24 hrs in steps of 1 h.
Sd		Purging duration, adjustable between 1 and 4 minutes, in steps of 1 min.
tESt	Test	Tests output relays
Indicated when in parameterization mode:		
quit	Quit	Input not confirmed
done	Done	Input confirmed
Indicated if malfunctions occur:		
E.001	Error	Temperature sensor defective, temperature reading too low
E.002	Error	Temperature sensor defective, temperature reading too high
E.005	Error	Sensor defective, measured value too low
E.006	Error	Sensor defective, measured value too high

Commissioning procedure

Setting parameters

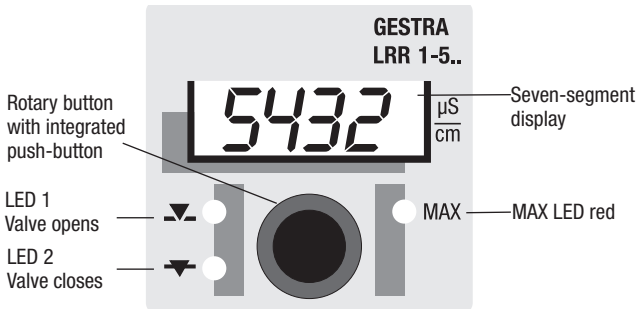


Fig. 5

Start		
Activity	Display	Function
Switch on supply voltage.	Seven-segment display shows equipment and software version	System test, takes approx. 3 sec.
	Seven-segment display shows actual value, LEDs are illuminated	System switches to operating mode
Actual value < setpoint	1. LED 1 (indicating "Valve opens") is flashing. 2. LED 2 (indicating "Valve closes") is flashing	The continuous blowdown valve opens during the purging pulse (Sd) and then moves back to the OPERATING position.
Actual value > setpoint	1. LED 1 (indicating "Valve opens") is flashing. 2. LED 2 (indicating "Valve closes") is flashing	The continuous blowdown valve opens. Once the conductivity has fallen below the adjusted hysteresis HySt, the valve is motored into the OPERATING position.

Setting parameters		
Activity	Seven-segment display	Function
Turn rotary button until the desired parameter is indicated.	Display toggles between parameter and the saved value setting.	For selecting the parameter
Press and hold down the push-button (of the rotary button)	First digit (000 <u>0</u>) flashing.	Parameterization mode active. You can change the first digit.
Turn rotary button.	A new value is indicated.	To increase the value turn rotary button to the right, to decrease turn it to the left.
Press push-button. Each time you press the button the system moves to the next digit.	2nd, 3rd or 4th digit is flashing. (from right to left)	2nd, 3rd or 4th digit can be changed by turning the rotary button. To increase the value turn rotary button to the right, to decrease turn it to the left.
<i>If no further operation is performed:</i>	"quit" is indicated for a moment. Then the display toggles between parameter and the old value setting.	The system switches automatically back to parameter and the input is not confirmed.
After the input has been finished: Press and hold down the push-button.	"done" is indicated for a moment. Then the display toggles between parameter and the new value setting.	The input is confirmed and the system switches automatically back to parameter.
Turn rotary button until the next parameter is indicated. Or turn the rotary button until the actual value is shown. If no operation is performed the actual value will be indicated automatically after 30 sec.		

Commissioning procedure – continued –

Conductivity controller LRR 1-50: Setting switchpoints and parameters

Setting the MAX switchpoint	
Activity	Function
Select parameter AL.HI, set the desired conductivity and save the setting.	Adjust MAX limit between 1 and 9999 $\mu\text{S}/\text{cm}$ or 1 and 5000 ppm.

Setting the setpoint	
Select parameter SP, set the desired conductivity and save the setting.	Adjust setpoint between 1 and 9999 $\mu\text{S}/\text{cm}$ or 1 and 5000 ppm.

Setting the reset hysteresis	
Select parameter HySt, set the required percentage value and save the setting.	Adjust reset hysteresis between 1 and 25 % of the setpoint

Conductivity electrode LRG 1.-.: Setting the correction factor	
Select correction factor CF, set the required value and save the setting.	Once the operating temperature is reached measure the electrical conductivity of a water sample (at 25°C). Set the correction factor (in increments) until the indicated actual value agrees with the reference measured value. As a result the conductivity readings will be adapted to the specific conditions of the installation and any deviations during operation will be compensated for.

Conductivity electrode LRG 1.-. with separate resistance thermometer and LRG 16-9	
Enable temperature compensation	
Select setting inP and turn rotary button to the right. The word "YES" appears. Save the setting.	
Setting the temperature coefficient	
Select temperature coefficient tC, set the required percentage value and save the setting.	Once the operating temperature is reached measure the electrical conductivity of a water sample (at 25°C). Set the temperature coefficient (in increments) until the indicated actual value agrees with the reference measured value.
If required: Select correction factor CF, set the required value and save the setting.	During operation the indicated conductivity reading may deviate from the reference value due to e. g. dirt deposits or contamination. Change the correction factor (in increments) until the indicated actual value agrees with the reference measured value.

Standardizing the current output	
Select parameter Sout, set the desired conductivity and save the setting.	Adjust current output between 1 and 9999 $\mu\text{S}/\text{cm}$

Setting the purging pulse and duration	
Select parameter Si, set the desired time and save the setting.	Adjust purging pulse between 0 and 24 hrs.
Select parameter Sd, set the desired time and save the setting.	Adjust purging duration between 1 and 4 minutes.

Conductivity controller LRR 1-51: Setting switchpoints and parameters



Fig. 5

Setting the MAX switchpoint	
Activity	Function
Select parameter AL.HI, set the desired conductivity and save the setting.	Adjust MAX limit between 1 and 9999 µS/cm or 1 and 5000 ppm.
Setting the setpoint	
Select parameter SP, set the desired conductivity and save the setting.	Adjust setpoint between 1 and 9999 µS/cm or 1 and 5000 ppm.
Setting the reset hysteresis	
Select parameter HySt, set the required percentage value and save the setting.	Adjust reset hysteresis between 1 and 25 % of the setpoint
Setting the upper and lower end of measuring range	
Select parameter Sin.L, set the desired conductivity and save the setting.	Adjust the lower end of the measuring range in steps of 0.0 - 0.5 - 100.0 µS/cm
Select parameter Sin.H, set the desired conductivity and save the setting.	Adjust the upper end of the measuring range in steps of 20.0 - 100.0 - 200.0 - 500.0 - 1000.0 - 2000.0 - 3000.0 - 5000.0 - 6000.0 - 7000.0 - 9999.0 µS/cm
Standardizing the current output	
Select parameter Sout, set the desired conductivity and save the setting.	Adjust current output between 1 and 9999 µS/cm
Setting the purging pulse and duration	
Select parameter Si, set the desired time and save the setting.	Adjust purging pulse between 0 and 24 hrs.
Select parameter Sd, set the desired time and save the setting.	Adjust purging duration between 1 and 4 minutes.

Operation, alarm and test

Conductivity controller LRR 1-50, LRR 1-51:

Indications and checking the functions of the MAX output contacts

Operation		
Activity	Display	Function
Actual value < setpoint	The actual value is shown on the seven-segment display. LED 2 (indicating "Valve closes") is flashing, MAX LED is not illuminated.	Valve output contact 19/17 closed. MAX output contacts 21/23 open, 22/23 closed.

Setpoint exceeded		
Actual value > setpoint	The actual value is shown on the seven-segment display. 1. LED 1 (indicating "Valve opens") is flashing 2. LED 2 (indicating "Valve closes") is flashing, MAX LED is not illuminated.	The continuous blowdown valve opens. Once the conductivity has fallen below the adjusted hysteresis HySt, the valve is motored into the 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		
Switchpoint "MAX conductivity" exceeded.	MAX LED illuminated red	MAX output contact 21/23 closed, 22/23 open.

Stand-by operation		
<p>Burner is switched off (stand-by operation). Supply voltage for conductivity controller is also switched off. When the system is switched on again a re-start is carried out. See page 18.</p>		Valve output contact 19/18 closed, Continuous blowdown valve closes.

Testing MIN alarm and MAX alarm		
Activity	Display	Function
During operation: Actual value < setpoint Select parameter Test. Press and hold down push-button. Seven-segment display: Test is flashing	MAX LED is illuminated red for 3 sec.	MAX output contact 21/23 closed, 22/23 open.
	After 3 sec.: MAX LED is not illuminated.	MAX output contact 21/23 open, 22/23 closed.
Test finished, release push-button. Seven-segment display: Test is indicated.	Note: If you continue to hold down the push-button, a new test is started. You can abort the test any moment by releasing the push-button.	
Turn the rotary button until the actual value is shown. If no operation is performed the actual value will be indicated automatically after 30 sec.		



Note

The continuous blowdown valve is equipped with three limit switches for the positions OPEN, CLOSED and OPERATING. In the adjustable OPERATING position the continuous blowdown valve is somewhat open. A certain amount of boiler blowdown is discharged from the boiler in order to keep the TDS (= total dissolved solids) level below the limit. The amount of boiler blowdown can be ascertained by means of the capacity charts for the continuous blowdown valve. Please observe the installation instructions of the GESTRA continuous blowdown valve.

Troubleshooting

Indication, diagnosis and remedy



Attention

Before carrying out the fault diagnosis please check:

Supply voltage:

Is the equipment supplied with the mains voltage specified on the name plate?

Wiring:

Is the wiring in accordance with the wiring diagram?

Faults indicated by the seven-segment display		
Error code	Error	Remedy
E.001	Temperature sensor defective, temperature reading too low	Check resistance thermometer, conductivity electrode LRG 16-9 and, if necessary, replace it with a new one. Check wiring (short circuit, interruption?)
E.002	Temperature sensor defective, temperature reading too high	
E.005	Conductivity electrode defective, measured value too low	Check conductivity electrode and, if necessary, replace it. Check electrical connection.
	Conductivity transmitter defective, measuring current < 4 mA	Check conductivity transmitter and, if necessary, replace it. Check electrical connection.
E.006	Conductivity electrode defective, measured value too high	Check conductivity electrode and, if necessary, replace it. Check electrical connection. Check boiler water.
	Conductivity transmitter defective, measuring current > 20 mA	Check conductivity transmitter and, if necessary, replace it. Check electrical connection.
<p>In the event of a malfunction a MAX alarm will be raised and the continuous blowdown valve is motored into the OPERATING position.</p>		

Malfunction without indication	
Error	Remedy
Actual value < setpoint. The continuous blowdown valve opens.	Check code switch S4. The switch must be set to ON.



Attention

- Please refer to the installation operating manuals for LRG 12-2, LRG 16-4, LRG 16-9, LRG 17-1, LRG 19-1, TRG 5-.. and LRGT 1-.. for further fault-finding and troubleshooting.



Note

If a malfunction occurs in the conductivity controller, a MAX alarm will be triggered and the equipment is restarted. Should this happen over and over again, replace the equipment with a new one.

Further notes

Action against high frequency interference

High frequency interference can occur for example as a result of out-of-phase switching operations. Should such interference occur and lead to sporadic failures, we recommend the following actions in order to suppress any interference.

- Provide inductive loads with RC combinations according to manufacturer's specification to ensure interference suppression.
- Make sure that all connecting cables leading to the conductivity electrode or to the conductivity transmitter are segregated and run separately from power cables.
- Increase the distance to sources of interference.
- Check the connection of the screen. Check the screens of the equipment as stipulated in the respective installation & operating manuals. If equipotential bonding currents are to be expected (e. g. in outdoor installations) connect screen only at one end.
- HF interference suppression by means of hinged-shell ferrite rings.

Decommissioning / replacing the equipment

- Switch off supply voltage and **cut off power supply** to the equipment.
- Remove the lower and upper terminal strips. **Fig. 6**
 - Insert a screwdriver to the right and left of the arrow markings between the terminal strip and the front frame.
 - Unlock terminal strip on the left and right side. For this purpose move screwdriver in direction of the arrow.
 - Remove the terminal strip.
- Release the white fixing slide at the bottom of the equipment and take the equipment off the supporting rail.

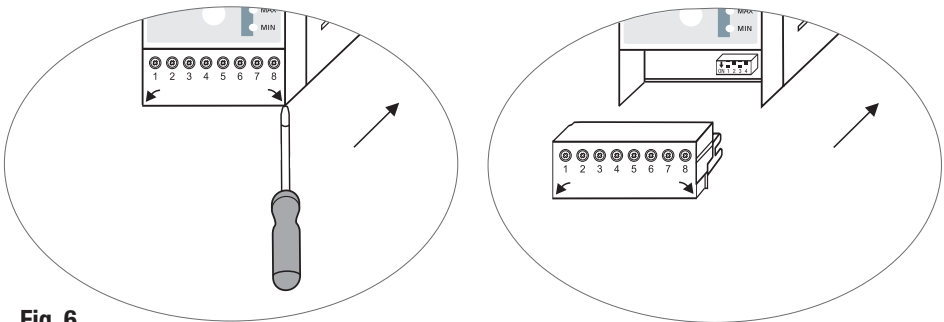


Fig. 6

Disposal

For the disposal of the equipment observe the pertinent legal regulations concerning waste disposal.

If faults occur that are not listed above or cannot be corrected, please contact our service centre or authorized agency in your country.

For your notes

For your notes



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