



Conductivity Transmitter

LRGT 16-1

LRGT 16-2

LRGT 17-1

EN
English

Original Installation Instructions
818726-06

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Important notes

Intended use

Use conductivity transmitters LRGT 16-1, LRGT 16-2 and LRGT 17-1 only for measuring electrical conductivity in liquids.

Conductivity transmitters LRGT 16-1 / LRGT 16-2/17-1 can be used as conductivity limiters or continuous blowdown controllers in steam boilers in combination with the following equipment:

Conductivity controller LRR 1-51

Conductivity controller LRR 1-53

Industrial controller KS 90-1

To guarantee trouble-free operation, observe the requirements made on water as specified in the pertinent TRD and EN regulations.

The equipment may only be used within the admissible pressure and temperature ratings.

Function

The compact **conductivity transmitters LRGT 16-1, LRGT 16-2, LRGT 17-1** consist of a conductivity electrode, a temperature sensor for detecting the liquid temperature, and an electronic circuit board incorporated in the terminal box.

Conductivity transmitters LRGT 16-1, LRGT 17-1 use the conductometric measuring method with two measuring electrodes, while transmitter LRGT 16-2 uses the conductometric technique with four measuring electrodes. The equipment measures the electrical conductivity of electrically conductive fluids (TDS = Total Dissolved Solids content), and provides a 4-20 mA measuring current as a function of the detected conductivity value.

LRGT 16-1, LRGT 17-1

A measuring current of variable frequency passes through the fluid, creating a potential gradient between the measuring electrode and the measuring tube, which is then used as measuring voltage U_U .

LRGT 16-2

The conductivity electrode consists of two current and two voltage electrodes. The current electrodes direct the measuring current I_i into the fluid at a fixed frequency, thereby creating a potential gradient between these electrodes. This potential gradient is then picked up by the voltage electrodes and evaluated as measuring voltage U_U .

LRGT 16-1, LRGT 17-1 and LRGT 16-2

The electrical conductivity is a function of the temperature. In order to base the measured values on a reference temperature, a resistance thermometer integrated in the electrode therefore measures the fluid temperature.

The electrical conductivity is calculated from measuring voltages U_U and U_i and – as a function of the adjusted temperature coefficient T_k – based linearly on the reference temperature of 25°C. Once it has been converted into a current signal proportional to the conductivity, an output current of 4-20 mA is available for external further processing.

The cables leading to the measuring electrode, the measuring tube and the resistance thermometer are monitored and checked for open and short circuit. In addition, the circuit board is protected against excess temperatures in the terminal box. In the event of a malfunction, the LEDs light up or flash and the current signal is set to 0 or 0.5 mA.

The code switch enables configuration of the transmitter, the adaptation of the cell constant and activation of a function test. Electrical conductivity is measured in $\mu\text{S}/\text{cm}$. In some countries, ppm (parts per million) is used instead. $1 \mu\text{S}/\text{cm} = 0.5 \text{ ppm}$.

Important notes continued

Function continued

The conductivity transmitters are used as conductivity limiters and continuous blowdown controllers in steam boilers in combination with the following equipment:

Conductivity controller LRR 1-51

Conductivity controller LRR 1-53

Industrial controller KS 90-1

Conductivity transmitters LRGT 16-1, LRGT 17-1 are mainly used in steam boilers with low TDS content, e.g. steam regenerators, high-pressure boilers and condensate tanks.

Conductivity transmitter LRGT 16-2 is mainly used in industrial boilers up to PN 40 and max. admissible conductivities of 6000 $\mu\text{S}/\text{cm}$ in accordance with TRD/EN.

In steam and water boilers, conductivity transmitters/controllers can also be used to monitor the condensate, feedwater and the water circuit for the ingress of acids, alkalis or seawater (EN 12952-7, EN 12953-6, TRD 604, page 1).

Safety note

The equipment may only be installed, wired and commissioned by qualified and competent staff.

Retrofitting and maintenance work may only be performed by authorised staff who have achieved a recognised level of competence through specific training.



Danger

Steam or hot water can escape when the conductivity transmitter is loosened.

This presents a risk of severe scalding all over the body!

Therefore, only dismantle the conductivity transmitter when the boiler pressure is 0 bar.

The conductivity transmitter becomes hot during operation.

Risk of severe burns to hands and arms.

Make sure that equipment is cold before carrying out installation and maintenance work.



Attention

The name plate specifies the technical features of the equipment. Do not commission or operate any item of equipment that does not bear its own specific name plate.

Directives and standards

EU Pressure Equipment Directive 2014/68/EU

The conductivity control & monitoring equipment LRGT 1...-, LRR 1-5..., KS 90-1 meets the safety requirements of the EU Pressure Equipment Directive (PED).

VdTÜV Bulletin "Wasserüberwachung 100" (= Water Monitoring 100)

Conductivity transmitter LRGT 16-1, LRGT 16-2, LRGT 17-1 is certified to VdTÜV Bulletin "Wasserüberwachung 100" in combination with the following conductivity controllers: LRR 1-51, LRR 1-53, industrial controller KS 90-1.

The VdTÜV Bulletin "Wasserüberwachung 100" (Water Monitoring 100) describes the requirements for water monitoring equipment.

Approval for Marine Use

Conductivity transmitter LRGT 16-1 is certified for marine use.

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

Conductivity transmitters LRGT 16-1, LRGT 16-2, LRGT 17-1 conform to the requirements of the Low Voltage Directive 2014/35/EU and the EMC Directive 2014/30/EU.

ATEX (Atmosphère Explosible)

According to European Directive 2014/34/EU, the equipment must **not** be used in potentially explosive atmospheres.

UL/cUL (CSA) approval

The equipment conforms to standards: UL 508 and CSA C22.2 No. 14-13, Standards for Industrial Control Equipment. File E243189.

Notes on the Declaration of Conformity/Manufacturer's Declaration

For details on the conformity of our equipment with European Directives, please refer to our Declaration of Conformity or our Manufacturer's Declaration.

The current Declaration of Conformity/Manufacturer's Declaration is available at www.gestra.com ► documents, or can be requested from us.

Technical data

LRGT 16-1, LRGT 16-2, LRGT 17-1

Service pressure

LRGT 16-1: 32 bar at 238°C

LRGT 16-2: 32 bar at 238°C

LRGT 17-1: 60 bar at 275°C

Mechanical connection

Thread G1 A, ISO 228

Materials

Screw-in body: 1.4571, X6CrNiMoTi17-12-2

Measuring electrode(s): 1.4571, X6CrNiMoTi17-12-2

Electrode rod insulation: PTFE

Terminal box: 3.2161 G AISi8Cu3

LRGT 16-1, LRGT 17-1: Measuring tube/screw 1.4571, X6CrNiMoTi17-12-2

LRGT 16-1, LRGT 16-2: Spacer discs PTFE / PEEK

LRGT 17-1: Spacer discs PEEK HT

Measuring length and installed length (electrode rod cannot be cut)

LRGT 16-1, LRGT 17-1: 200, 300, 400, 500, 600, 800, 1000 mm (for marine applications: max. 400 mm)

LRGT 16-1: 180, 300, 380, 500, 600, 800, 1000 mm

Temperature sensor

Resistance thermometer Pt 1000

Electronic circuit board

Supply voltage

24 V DC +/- 20%

Power consumption

4.5 W

Fuse

Electronic thermal fuse $T_{max} = 85\text{ °C}$, hysteresis – 2 K.

Cycle of measurement

1 sec.

Temperature compensation

Linear, T_k adjustable via code switch:

- 0 % per °C,
- 1.6 – 3.0 % per °C in increments of 0.1.

Time constant T (measured using the two-bath process)

Temperature: 9 sec., conductivity: 14 sec.

Indicators and controls

2 LEDs for status messages

1 ten-pole code switch for setting:

- Measuring range
- Temperature coefficient
- Cell constant
- Function test

Electrical connection

EMC cable gland with integrated cable clamp, M 20 x 1.5

five-pole screw-type terminal strip, detachable, conductor size 1.5 mm²

LRGT 16-1, LRGT 16-2, LRGT 17-1 continued

LRGT 16-1, LRGT 17-1

Measuring ranges*) ($\mu\text{S}/\text{cm}$ at 25 °C)		Current output mA = $\mu\text{S}/\text{cm}$	
Preferred measuring range up to 500 $\mu\text{S}/\text{cm}$		4 mA corresponds to	20 mA corresponds to
0.5	20	0.5	20
	100		100
	200		200
	500		500
	1000		1000
	2000		2000
	6000		6000
	12000		12000

LRGT 16-2

Measuring ranges*) ($\mu\text{S}/\text{cm}$ at 25 °C)		Current output mA = $\mu\text{S}/\text{cm}$	
		4 mA corresponds to	20 mA corresponds to
100	3000	100	3000
	5000		5000
	7000		7000
	10000		10000

Selected via code switch. Maximum load for actual-value output 750 ohm.

*) **Conversion** $\mu\text{S}/\text{cm}$ in ppm (parts per million): $1 \mu\text{S}/\text{cm} = 0.5 \text{ ppm}$

Protection

IP 65 to EN 60529

Admissible ambient temperature

Max. 70°C

Storage and transport temperature

– 40 to + 80°C

Weight

Approx. 2.5 kg

Approvals

TÜV Certificate

 VdTÜV Bulletin "Wasserüberwachung 100" (= Water Monitoring 100):
 Requirements for water monitoring equipment.

Type approval no.: TÜV · WÜL · XX-003, XX-017 (see name plate)

UL/cUL (CSA) certification

 UL 508 and CSA C22.2 No. 14-13, Standards for Industrial Control
 Equipment. File E243189.

Marine applications

In accordance with the guidelines of Germanischer Lloyd GL 33254-06 HH

Scope of supply

LRGT 16-1

- 1 Conductivity transmitter LRGT 16-1
- 1 Sealing ring 33 x 39, form D, DIN 7603, 1.4301, bright annealed
- 1 Installation & Operating Instructions












LRGT 16-2

- 1 Conductivity transmitter LRGT 16-2
- 1 Sealing ring 33 x 39, form D, DIN 7603, 1.4301, bright annealed
- 1 Installation & Operating Instructions

LRGT 17-1

- 1 Conductivity transmitter LRGT 17-1
- 1 Sealing ring 33 x 39, form D, DIN 7603, 1.4301, bright annealed
- 1 Installation & Operating Instructions

Name plate/markings

 <p>Betriebsanleitung beachten See installation instructions Voir instructions de montage</p>	 <p>Betriebsanleitung beachten See installation instructions Voir instructions de montage</p>	<p>Safety note</p>
LRGT 16-1	LRGT 16-2	Equipment designation
Leitfähigkeitstransmitter Conductivity Transmitter Transmetteur de mesure de conductibilité	Leitfähigkeitstransmitter Conductivity Transmitter Transmetteur de mesure de conductibilité	
PN40 G1 1.4571 IP65	PN40 G1 1.4571 IP65	Pressure rating, thread type, material number
 <p>P_{max} 32 bar (464psi) T_{max} 238°C (460°F)</p>  <p>T_{amb} = 70°C (158 °F)</p>	 <p>P_{max} 32 bar (464psi) T_{max} 238°C (460°F)</p>  <p>T_{amb} = 70°C (158 °F)</p>	Information on area of application
24 V DC 4,5 W	24 V DC 4,5 W	Key electrical data
0,25-6000ppm 0,5-12000µS/cm	50-5000ppm 100-10000µS/cm	Measuring range
OUT: 4-20 mA / 750 Ω		Actual value output data
TÜV . WÜL . xx-003/xx-017  33254-06-HH	TÜV . WÜL . xx-003 TÜV . WÜL . xx-017	CE marking
 0525	 0525	
GESTRA AG Münchener Str. 77 D-28215 Bremen	GESTRA AG Münchener Str. 77 D-28215 Bremen	Disposal note
		

Range

L: 180

200

300

380

400

500

600

700

800

1000

Label stating measuring length & installed length

Manufacturer Type-approval number

Fig. 1

Installation

Dimensions of LRGT 16-1, LRGT 16-2, LRGT 17-1

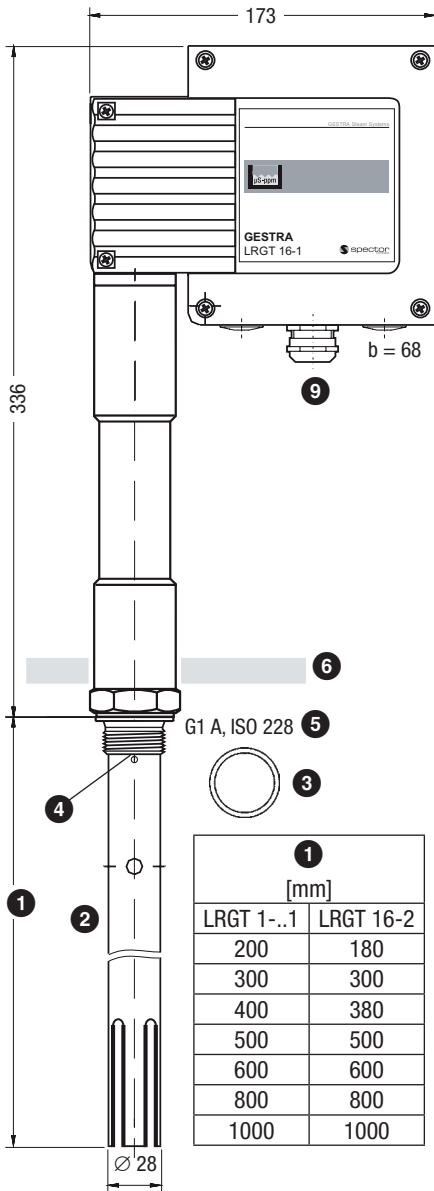


Fig. 2 LRGT 16-1, LRGT 17-1
(shown: LRGT 16-1)

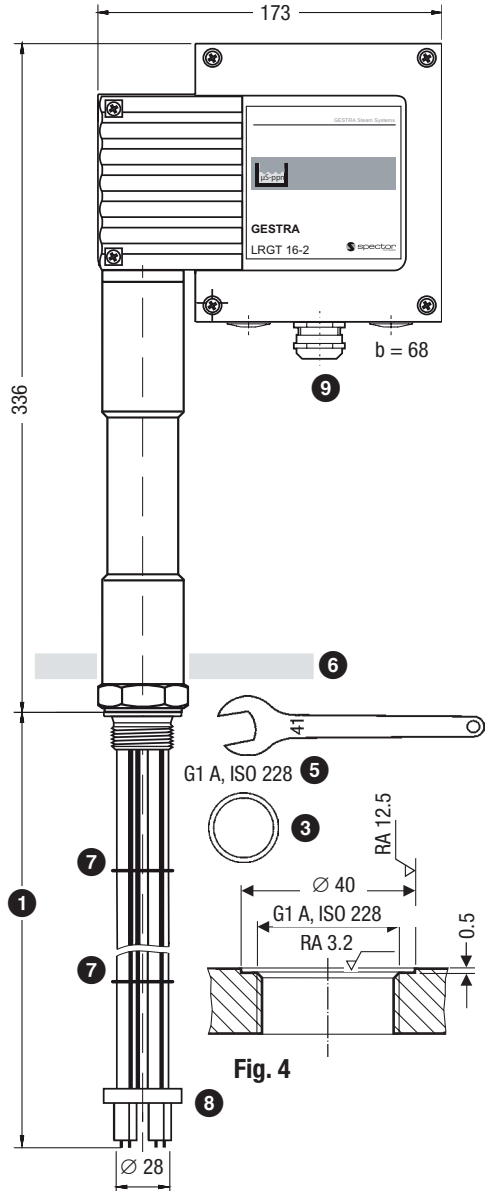


Fig. 3 LRGT 16-2



Note

- The boiler connection with flange must be tested during the preliminary boiler inspection.
 - Refer to pages 13 and 14 for typical installation examples.
- LRGT 16-1** (for marine applications)
- Max. admissible measuring/installed length: 400 mm.
 - When installing the conductivity transmitter in a steam boiler, make sure it is securely fixed in place and cannot be unscrewed inadvertently.



Attention

- Install the conductivity transmitter horizontally or with a vertical inclination. The measuring surface(s) must be permanently submerged.
- The seating surfaces of vessel threads and flange covers must be accurately machined.
- Use only the supplied sealing ring 33 x 39, form D, DIN 7603, 1.4301, bright annealed.
- Do not lag the terminal box along with the rest of the boiler!
- Do not insulate the electrode thread with hemp or PTFE tape!
- Do not apply conductive paste or grease to the electrode thread!
- The specified torques must be strictly observed.

Key

- | | | | |
|---|---|---|---|
| 1 | Measuring length and installed length | 6 | Thermal insulation, provided on site, d = 20 mm, outside thermal insulation of steam boiler |
| 2 | Measuring tube | 7 | Spacer disc PTFE (only LRGT 16-2 from 800 mm onwards) |
| 3 | Sealing ring 33 x 39, form D, DIN 7603, 1.4301, bright annealed | 8 | Spacer disc PEEK (only LRGT 16-2) |
| 4 | Grub screw M 2.5 DIN 913 | 9 | EMC cable gland M 20 x 1.5 |
| 5 | Electrode thread G 1 A, ISO 228 | | |

Tools

- Open-end spanner 41 mm A.F.
- Screwdriver for hexagon socket head screws, size 1.3
- Screwdriver, size 1 and 2

Installation



Attention

LRGT 16-1, LRGT 17-1

- Provide spacing of **approx. 30 mm** between the lower end of the measuring tube and the boiler wall, the smoke tubes and any other metallic fittings, and the low water level (LW).
- Do not cut the measuring electrode or measuring tube!

LRGT 16-2

- Provide spacing of **approx. 60 mm** between the lower end of the measuring tube and the boiler wall, the smoke tubes and any other metallic fittings, and the low water level (LW).
- Do not cut the measuring electrodes!
- Do not subject measuring electrodes to physical shocks!
- Do not bend electrode rods when mounting!

Mounting the conductivity transmitter

1. Check seating surfaces. **Fig. 4**
2. Place the supplied sealing ring **③** onto the seating surface of the threaded coupling or flange.
3. Apply a light smear of heat-resistant silicone grease (e.g. WINIX® 2150) to the electrode thread **⑤**.
4. Screw the conductivity transmitter into the threaded coupling or flange and tighten with an open-end spanner 41 mm A.F. The torque required for tightening **when cold is 240 Nm**.

Additionally for **LRGT 16-2**

5. Distribute the spacer discs **⑦** evenly (length 800 mm onwards).
6. Check that the lower spacer disc PEEK **⑧** is correctly seated. **Fig. 5**

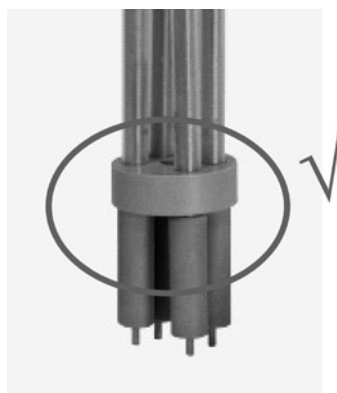
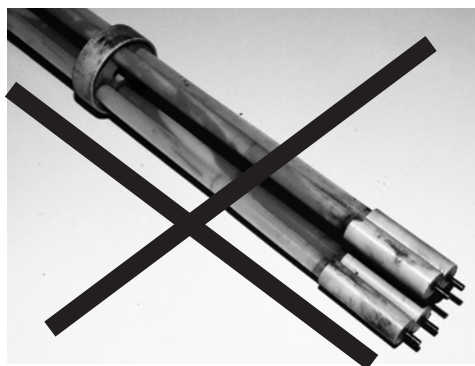


Fig. 5

Installation examples

LRGT 16-1, LRGT 16-2, LRGT 17-1

Conductivity monitoring, conductivity transmitter directly installed via flanged connection on side of boiler

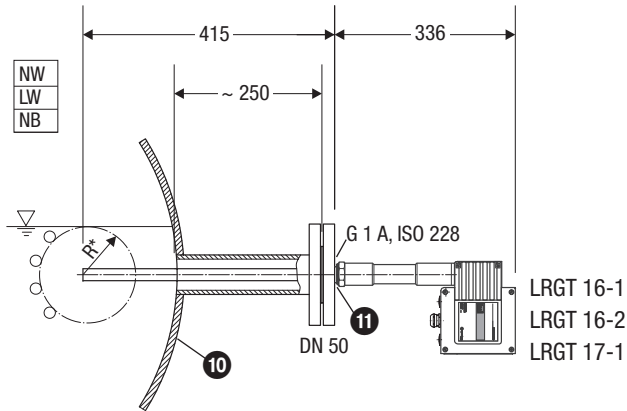


Fig. 6

R*: LRGT 16-1, LRGT 17-1 R = 30 mm
 LRGT 16-2 R = 60 mm

Conductivity monitoring and continuous boiler blowdown, direct installation of conductivity transmitter via T-type connector and connection of a continuous blowdown valve

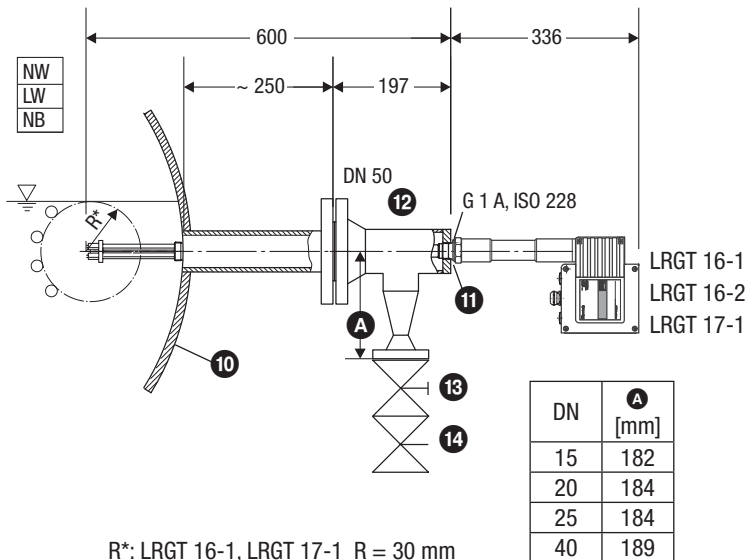


Fig. 7

R*: LRGT 16-1, LRGT 17-1 R = 30 mm
 LRGT 16-2 R = 60 mm

LRGT 16-1, LRGT 16-2, LRGT 17-1 continued

Conductivity monitoring and continuous boiler blowdown, installation of conductivity transmitter in the blowdown line via a separate level pot

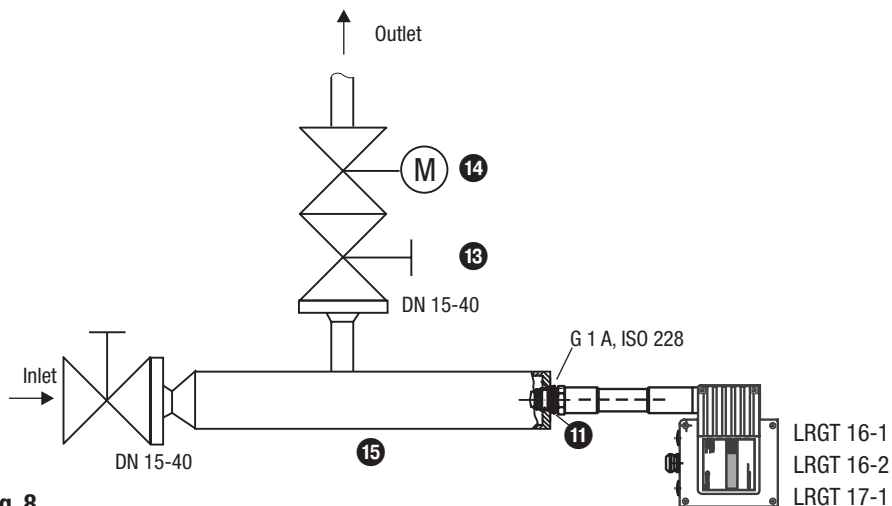


Fig. 8

Key

- | | |
|--|--|
| 10 Boiler drum | 19 Fixing nut for terminal box |
| 11 Sealing ring 33 x 39, form D, DIN 7603, 1.4301, bright annealed | 20 Code switch |
| 12 T-type connector, provided on boiler, DN 50 | 21 LED 1 green |
| 13 Shut-off valve GAV | 22 LED 2 red |
| 14 Continuous blowdown valve BAE | 23 Terminal lugs for electrode wires, functional earth |
| 15 Level pot | 24 Terminal strip |
| 16 Cover screws (cross recess head screws M4) | 25 Fixing screw for electronic circuit board |
| 17 Housing cover | 26 Connection for functional earth |
| 18 EMC cable gland M 20 x 1.5 | |

Electrical connection

LRGT 16-1, LRGT 16-2, LRGT 17-1

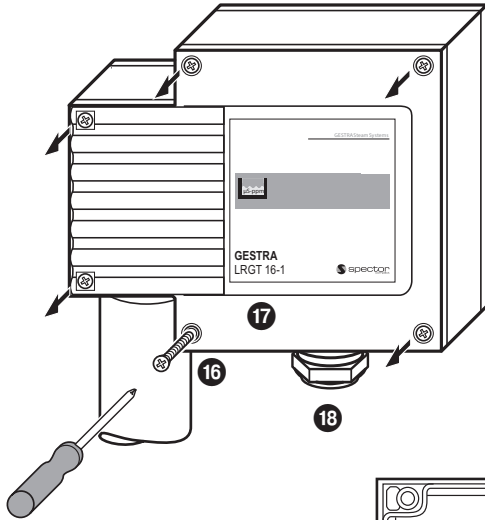


Fig. 9

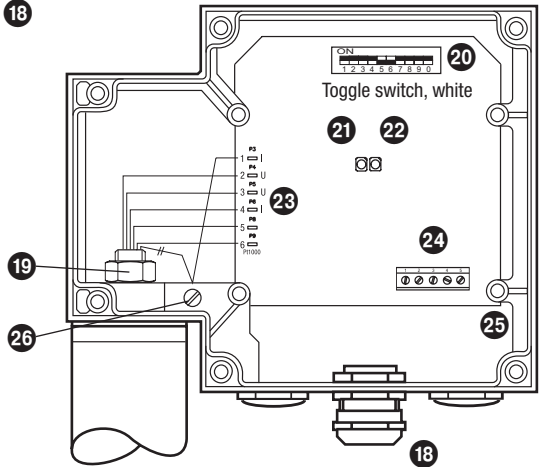


Fig. 10 Diagram of LRGT 16-1
(shown without cover plate)

Connection of conductivity transmitter

A self-locking fixing nut **19** connects the terminal box to the electrode part. Before establishing the electrical connection, you can therefore rotate the terminal box max. $\pm 180^\circ$ into the desired direction (cable outlet).

Connecting LRGT 16-1, LRGT 16-2, LRGT 17-1

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

Route connecting cables leading to the equipment separate from power cables.

1. Slacken the screws **16** and remove the housing cover **17**. The arrow on this cover points to the name plate. **Fig. 1, 9**
2. Detach the terminal strip **24** from the circuit board.
3. Unscrew the cap nut **31** of the cable gland **18** and remove the lamellar insert **29**.
Fig. 11
4. Strip the outer sheath of cable **32** and expose the braided screen **28** over a length of approx. 10 – 15 mm.
5. Push the cap nut **31** and lamellar insert **29** with the sealing ring **30** onto the cable.
6. Bend braided screen **28** outwards at right angles (90°).
7. Fold the braided screen **28** towards the outer sheath, i.e. by 180° in total.
8. Push the lamellar insert **29** with sealing ring **30** into the gland body **27**, turn briefly to and fro around the cable axis and snap anti-rotation element into place.
9. Firmly screw on the cap nut **31**.
10. Connect the individual cables to the terminal strip **24** as shown in the wiring diagram.
11. Re-attach the terminal strip **24** to the circuit board.
12. Replace the cover **17** and fasten the cover screws **16**.

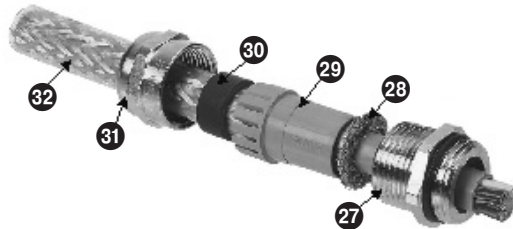


Fig. 11

Key

- | | |
|---|---------------------------|
| 20 Code switch | 28 Braided screen |
| 23 Terminal lugs for electrode wires, functional earth | 29 Lamellar insert |
| 24 Terminal strip | 30 Sealing ring |
| 26 Connection for functional earth | 31 Cap nut |
| 27 Gland body | 32 Screened cable |

Wiring diagram for conductivity transmitter LRGT 16-1, LRGT 17-1

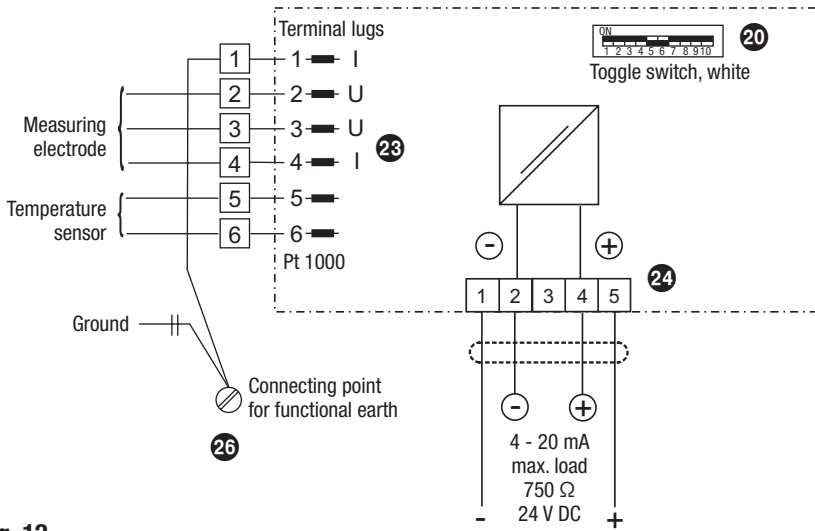


Fig. 12

Wiring diagram for conductivity transmitter LRGT 16-2

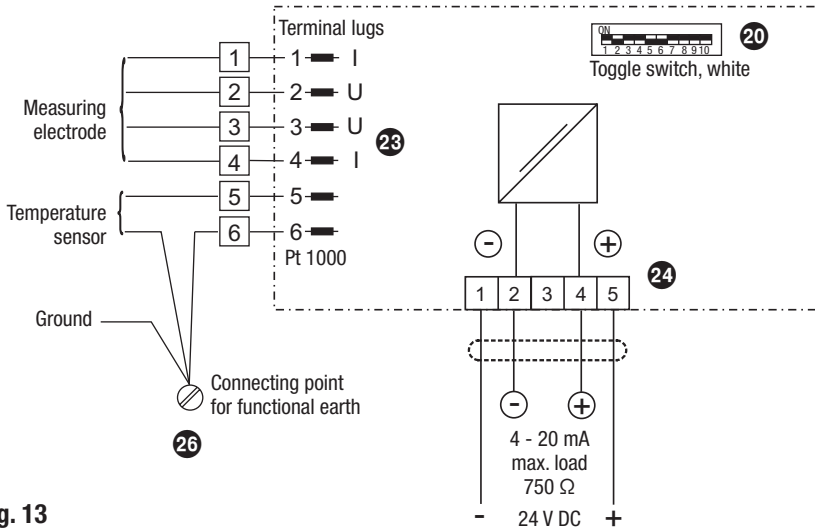


Fig. 13

Electrical connection continued

Safety power supply unit for LRGT 16-1, LRGT 16-2, LRGT 17-1

To supply the conductivity transmitter with 24 V DC, a safety power supply unit (PSU), e.g. Siemens SITOP PSU100C 24V/0.6A, must be used; this must provide a level of isolation against dangerous contact voltages that at least meets the requirements for double or reinforced insulation as per DIN EN 50178 or DIN EN 61010-1 or DIN EN 60730-1 or DIN EN 60950 (electrically protective separation). The PSU must be equipped with a protective device to DIN EN 61010-1.

Tools

- Screwdriver, size 1
- Screwdriver, size 2.5, fully insulated to VDE 0680-1

Factory settings

The conductivity transmitter is supplied with the following factory-set default values:

LRGT 16-1, LRGT 17-1

- Measuring range: 0.5 $\mu\text{S}/\text{cm}$ - 500 $\mu\text{S}/\text{cm}$ (at 25°C) as the **preferred measuring range**
- Temperature coefficient: 2.1 (% / °C)

LRGT 16-2

- Measuring range: 100 $\mu\text{S}/\text{cm}$ - 7000 $\mu\text{S}/\text{cm}$ (at 25°C)
- Temperature coefficient: 2.1 (% / °C)

Commissioning procedure

Switch on mains voltage and open the terminal box

Please check that the conductivity transmitter is wired in accordance with the wiring diagram **Fig. 12, 13** and switch on mains voltage.

For commissioning, open the terminal box by unscrewing the cover screws **16** and removing the cover **17**. The arrow on this cover points to the name plate.

Fig. 1, 9

Establishing the measuring range and actual value output

Set the parameters of the conductivity transmitter using the 10-pole code switch on the circuit board. You can also adjust the cell constant and initiate a function test by changing the code switch settings. The factory settings are shaded grey in the tables below.

1. Define the measuring range of the conductivity transmitter to suit the admissible conductivity range of the steam boiler.
2. Set the desired measuring range via the code switch. To change the code switch settings you can use a ball-point pen, for example.

LRGT 16-1, LRGT 17-1

Code switch			Measuring range ($\mu\text{S}/\text{cm}$ at 25 °C)		Current output mA = $\mu\text{S}/\text{cm}$	
1	2	3			4 mA corresponds to	20 mA corresponds to
OFF	OFF	OFF	0.5	20	0.5	20
ON	OFF	OFF		100		100
OFF	ON	OFF		200		200
ON	ON	OFF		500		500
Factory settings				1000		1000
OFF	OFF	ON		2000		2000
ON	OFF	ON		6000		6000
OFF	ON	ON		12000		12000
ON	ON	ON				

LRGT 16-2

Code switch			Measuring range ($\mu\text{S}/\text{cm}$ at 25 °C)		Current output mA = $\mu\text{S}/\text{cm}$	
1	2	3			4 mA corresponds to	20 mA corresponds to
OFF	OFF	OFF	100	3000	100	3000
ON	OFF	OFF		5000		5000
OFF	ON	OFF		7000		7000
Factory settings				10000		10000
ON	ON	OFF				



Note

- When mains voltage is supplied (during commissioning), the first output will be 4 mA, then the output current increases until it reaches the actual value.

Checking the setting of temperature coefficient T_K

For linear compensation of the measured conductivity value at 25°C, the temperature coefficient T_K is factory set to 2.1 % per °C. Once service temperature has been reached, you can check this setting by carrying out a comparison measurement, e.g. as part of the commissioning procedure.

If there is a difference between the indicated conductivity and the measured comparison value, correct the transmitter readings by setting a lower or higher temperature coefficient. Continue modifying the T_K setting step by step until the indicated conductivity value matches the measured comparison value. Please wait 1 to 2 minutes after each step to allow the measured value to settle.

Code switch				Temperature coefficient T_K (% per °C)
4	5	6	7	
OFF	OFF	OFF	OFF	0 (no compensation)
ON	OFF	OFF	OFF	1.6
OFF	ON	OFF	OFF	1.7
ON	ON	OFF	OFF	1.8
OFF	OFF	ON	OFF	1.9
ON	OFF	ON	OFF	2.0
OFF	ON	ON	OFF	2.1
Factory settings				
ON	ON	ON	OFF	2.2
OFF	OFF	OFF	ON	2.3
ON	OFF	OFF	ON	2.4
OFF	ON	OFF	ON	2.5
ON	ON	OFF	ON	2.6
OFF	OFF	ON	ON	2.7
ON	OFF	ON	ON	2.8
OFF	ON	ON	ON	2.9
ON	ON	ON	ON	3.0

Operation

Correcting the measured value

- If there is a deviation between the indicated conductivity and the measured comparison value, check and change the temperature coefficient T_k setting. See page 20 for procedure and setting values.
- Only modify the cell constant if the temperature coefficient setting is **no longer** sufficient for correct compensation.



Note

- For the procedures of modifying the cell constant, performing a function test and observing the LEDs, open the terminal box by slackening the screws 16 and removing the housing cover 17. The arrow on this cover points to the name plate. **Fig. 1, 9**

Adjusting the cell constant

The factory-set cell constant is a geometric characteristic of the equipment used for calculating conductivity. However, this constant may change over time, e.g. due to dirt deposits.

- Depending on the deviation, set code switch 8 or 9 briefly to ON and then to OFF again.
- Repeat this step until the indicated value matches the measured comparison value.
- If the conductivity transmitter and conductivity controller are physically separated from one another, measure the current at the transmitter or have a second person perform the adjustment.
- If adjustment is no longer possible, remove the transmitter and clean the measuring surface and/or electrodes.



Note

Repeat the **cell constant adjustment** procedure until the indicated conductivity matches the measured comparison value. The cell constant can be reset to its default value. To do so, set code switches 8 and 9 simultaneously to ON then back to OFF after approx. 1 second.

Deviation in indicated conductivity	Code switch			LED indicator	
	8	9	Function	green	red
None	OFF	OFF	No change		
Indicated value below measured comparison value	ON	OFF	Cell constant increases		flashing rapidly
Indicated value above measured comparison value	OFF	ON	Cell constant decreases	flashing rapidly	
	ON	ON	Restores default factory setting	both flashing rapidly	

Operation continued

Function test

1. To check the functions of the conductivity transmitter, set code switch 10 to ON. This simulates a value that exceeds the measuring range limit and provides a current output of 20 mA.
2. After finishing the function test, set the code switch back to OFF.

Code switch 10	Function test
OFF	Normal operation
ON	Simulation: measuring range limit exceeded

LED indicator

The two LEDs in the middle of the electronic circuit board indicate the status of the conductivity transmitter.

Normal operation	Green LED	Red LED	Current output [mA]
Conductivity 0 to + 10 % of measuring range		lit up	proportional to measured value
Conductivity 10 to + 90 % of measuring range	lit up	lit up	proportional to measured value
Conductivity 90 to + 100 % of measuring range	lit up		proportional to measured value

Fault indications and troubleshooting

Indications, diagnosis and remedies



Attention

Please check the following before fault diagnosis:

Supply voltage:

Is the conductivity transmitter supplied with the mains voltage specified on the name plate?

Wiring:

Does the wiring conform to the wiring diagram?

Fault indications	
The equipment is not working accurately	
Error	Remedy
Dirt on transmitter measuring electrode(s).	Clean measuring electrode(s) (see Maintenance)
Spacer disc PEEK 8 has shifted out of place. LRGT 16-2 only	Push spacer disc down to the sensor tip. (Fig. 5 , page 12)
Indicated conductivity reading is higher than measured comparison value.	Reduce temperature coefficient T_k during commissioning. Reduce cell constant during operation.
Indicated conductivity reading is lower than measured comparison value.	Increase temperature coefficient T_k during commissioning. Increase cell constant during operation.
Measuring result cannot be adjusted by changing the cell constant.	Remove conductivity transmitter and clean measuring surface/measuring electrodes.



Note

If the indicated conductivity cannot be explained or you cannot rule out a previous modification to the cell constant, reset this constant to the default factory setting. See **Adjusting the cell constant**.

After the reset, please carry out commissioning once more.

The equipment fails to work	
Error	Remedy
Power failure	Switch on supply voltage. Check all electrical connections.
Faulty electronic circuit board	Check and/or replace electronic circuit board (page 25).
The earth connection to the vessel is interrupted.	Clean seating surfaces and screw in conductivity transmitter together with sealing ring 33 x 39, form D, DIN 7603, 1.4301, bright annealed. Do not insulate the electrode thread with hemp or PTFE tape



Note

- To observe the LEDs for fault indication, open the terminal box by unscrewing the cover screws ⑯ and removing the housing cover ⑰. The arrow on this cover points to the name plate. **Fig. 1, 9**

Fault indications			
The LEDs indicate a malfunction			
Indication	Current output [mA]	Error	Remedy
Red LED flashing	0	Electrode wires interrupted or measuring surface/measuring electrodes exposed.	Check connections of electrode wires (electronic circuit board, terminal lugs 1-4). If necessary, replace equipment. Check water level and/or installation.
	0	Short circuit in electrode wires	Check connections of electrode wires (electronic circuit board, terminal lugs 1-4). If necessary, replace equipment.
	4	Value below set value 0%, e.g. measuring surface/measuring electrodes exposed.	Check water level and/or installation
Green LED flashing	20	Value above set value 100%, e.g. measuring range too small.	Set a larger measuring range.
Red and green LEDs are flashing alternately	0	Temperature in terminal box exceeds 85°C	Check ambient temperature, make sure it does not exceed 70 °C.
Red and green LEDs are flashing alternately	0.5	Open or short circuit in wires to resistance thermometer. Faulty thermometer. Outside range 0 - 280°C.	Check connections of thermometer wires (electronic circuit board, terminal lugs 5-6). If necessary, replace equipment.
Red and green LEDs are flashing alternately and rapidly	20	Code switch 10 set to ON	Set code switch 10 to OFF

Checking the electronic circuit board

1. Unscrew the cover screws **16** and remove the housing cover **17**. The arrow on this cover points to the name plate. **Fig. 1, 9**
2. Disconnect electrode wires from terminal lugs 1-4 on the circuit board.
3. Connect terminal lugs 1+2 to 3+4.
4. Connect 1 kohm resistance to terminal lugs 2+3.
5. Approx. 1000 $\mu\text{S}/\text{cm}$ must be indicated.
6. If this value is reached, remove the resistance and restore the original state. If it is not, replace the electronic circuit board.

Replacing the electronic circuit board

1. Unscrew the cover screws **16** and remove the housing cover **17**. The arrow on this cover points to the name plate. **Fig. 1, 9**
2. Disconnect electrode wires from terminal lugs on circuit board.
3. Detach the terminal strip **24**.
4. Undo the functional earth **26** connection.
5. Unscrew the fixing screws **25** for the electronic circuit board and remove the board.
The circuit board is available as a spare part.

Order no.	LRGT 16-1 LRGT 17-1	LRGT 16-2
321320	LRV 1-40 24 V DC	
321370		LRV 1-42 24 V DC

6. Install the new electronic circuit board in reverse order to the above.



Note

Please indicate the version and material numbers stated on the name plate when ordering spare parts.

After replacing the electronic circuit board, please carry out commissioning once more.

Check the conductivity readings of controllers LRR 1-51, LRR 1-53 and of KS 90-1 by carrying out comparison measurements.

If you encounter any deviations, please correct the cell constant of the conductivity transmitter.

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

Maintenance

Safety note

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



Danger

Steam or hot water can escape when the conductivity transmitter is loosened. This presents a risk of severe scalding all over the body! Therefore, only dismantle the conductivity transmitter when the boiler pressure is 0 bar. The conductivity transmitter becomes hot during operation. Risk of severe burns to hands and arms. Make sure that equipment is cold before carrying out installation and maintenance work.

Cleaning the measuring electrode

The conductivity transmitter may only be installed and removed by qualified specialist staff. Please pay attention to the note in the "Installation" section on pages 11 and 12.

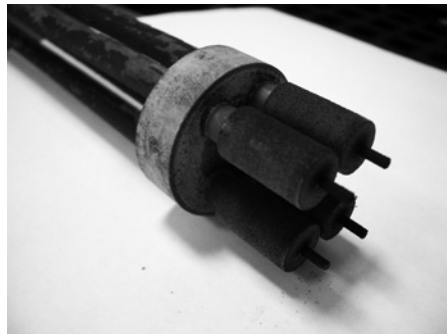
Before cleaning the measuring electrode(s), take the conductivity transmitter out of operation and remove it.

Clean the measuring electrode (**LRGT 16-1**, **LRGT 17-1**) or electrodes (**LRGT 16-2**):

- Use a fat-free cloth to wipe off loose deposits.
- Use abrasive linen (medium grain, e.g. 400 µm) to remove encrusted deposits.

For **LRGT 16-1**, **LRGT 17-1** you can also slacken the locking grub screw ④, unscrew the measuring tube ② by hand, and then clean the electrode rod and measuring surface. **Fig. 2**

Example of dirty measuring electrodes





Danger

Take care not to bend the electrode rod(s), and prevent hard physical shocks to the rod(s).



Note

After cleaning the electrode rod(s), the conductivity transmitter should indicate the correct conductivity once more, without any changes to settings. It is only necessary to adjust the cell constant in isolated cases.

Removing and disposing of the conductivity transmitter

Removing and disposing of conductivity transmitters LRGT 16-1, LRGT 16-2, LRGT 17-1

1. Switch off the supply voltage.
 2. Unscrew the cover screws **16** and remove the housing cover **17**.
 3. Disconnect the connecting wires from terminal strip **24** and pull wires out of the cable gland.
 4. Make sure the equipment is not hot or under pressure before dismantling it.
- Dispose of the conductivity transmitter in accordance with statutory waste disposal provisions.



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