GESTRA®

Conductivity Electrode

LRG 16-9

EN (USA)
English

Original Installation &
Operating Manual
850701-01

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Content of this Manual

Product:

- Conductivity Electrode LRG 16-9

First edition:

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Scope of supply, product package

- 1 x Conductivity electrode LRG 16-9
- 1 x Installation & Operating Manual

How to use this Manual

This Installation & Operating Manual describes the correct use of the LRG 16-9 conductivity electrode. It applies to persons who integrate this equipment in control systems, install, bring into service, operate, maintain and dispose of this equipment. Anyone carrying out the above-mentioned activities must have read this Installation & Operating Manual and understood its contents.

- Read this Manual in full and follow all instructions.
- Please also read the instructions for use of any accessories.
- The Installation & Operating Manual is part of the product package. Keep it in an easily accessible location.

Availability of this Installation & Operating Manual

- Make sure this Installation & Operating Manual is always available to the operator.
- If you pass on or sell the equipment to a third party, please also hand over the Installation & Operating Manual.

Illustrations and symbols used

1. Action to be taken
2.

- Lists
  - ◆ Bullet points in lists

Ⓐ Keys to illustrations



Additional information



Read the relevant Installation & Operating Manual

Hazard symbols in this Manual



Danger zone, dangerous situation

Types of warning

⚠ DANGER

Warning of a dangerous situation that results in death or serious injury.

⚠ WARNING

Warning of a dangerous situation that may possibly result in death or serious injury.

⚠ CAUTION

Warning of a situation that may result in minor or moderate injury.

⚠ ATTENTION

Warning of a situation that results in damage to property or the environment.

Specialist terms, abbreviations

Here, we explain some abbreviations, specialist terms, etc., which are used in this Manual.

NRGT .. / NRR.. / NRS.. / URS .. / URB .. / SRL .. / etc.

Equipment and type designations of GESTRA.

SELV

Safety Extra Low Voltage

Operating point (of the plant)

The operating point describes the operating parameters within which a plant or boiler is operated in its nominal range. In a steam boiler, for example, these parameters would be output, pressure, and temperature.

The design data may be a lot more stringent, however.

A boiler that is operated at 145 psi (10 bar) and 356°F (180°C) may be designed to withstand a pressure of 870 psi (60 bar) and a temperature of 527°F (275°C), for example, which is therefore not necessarily its operating point.

Usage for the intended purpose

The LRG 16-9 conductivity electrode may only be used in conjunction with LRS 1-.. conductivity switches or LRR 1-.. conductivity controllers for measuring conductivity in liquid conductive media.

The LRG 16-9 conductivity electrode can be used as a conductivity limiter or blowdown controller in steam boilers in combination with the following equipment:

Conductivity switch LRS 1-50
Conductivity controller LRR 1-50
Conductivity controller LRR 1-52

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

Applicable directives and standards

The equipment has been tested and approved for use in the scope governed by the following directives and standards:

Standards:

- UL 60730-1 and CAN/CSA E60730-1
  General Requirements for Automatic Electrical Controls

Improper use

There is a danger of death due to explosion if the equipment is used in potentially explosive atmospheres.

Do not use the equipment in potentially explosive atmospheres.

Do not bring any equipment into service that does not have its own specific rating plate.

The rating plate indicates the technical features of the equipment.

Basic safety information



Danger to life from scalding! Do not remove the conductivity electrode under pressure. Steam or hot water can spurt forcefully out of the equipment.

- Only remove the conductivity electrode at **0 psi (0 bar) boiler pressure**.



Risk of severe burns! Do not perform work on a conductivity electrode that is still hot. The conductivity electrode gets very hot during operation.

- Allow the conductivity electrode to cool down.
- Always wait for the conductivity electrode to cool before performing any installation and maintenance work.



There is a risk of electric shock during work on electrical systems.

- Always switch off the voltage to the plant before performing connection work.
- Check that the plant is not carrying live voltage before commencing work.



Danger to life! Hot steam or hot water can suddenly escape from a faulty LRG 16-9 conductivity electrode.

Shocks and impacts during transport or installation can result in damage to or leaks in the conductivity electrode, causing pressurized hot steam or hot water to escape through the pressure relief hole.

- To prevent damage during transport and installation, do not expose the electrode rod to major shocks or impacts.
- Before and after installation, check that the conductivity electrode is undamaged.
- When bringing the conductivity electrode into service, check that it is leak-tight.



Attempts to repair the equipment will cause the plant to become unsafe.

- The LRG 16-9 conductivity electrode may only be repaired by the manufacturer, GESTRA.
- Only replace faulty equipment with identical equipment from GESTRA.

Required personnel qualifications

Activity	Personnel	
Integration in control system	Specialist staff	Plant designer
Installation/ electrical connection/ bringing into service	Specialist staff	The equipment may only be installed, wired and brought into service by qualified and competent staff.
Operation	Boiler service technician	Staff trained by the plant operator.
Maintenance work	Specialist staff	Fitting and maintenance work may only be performed by authorized staff who have undergone specific training.
Refits	Specialist staff	Persons trained by the plant operator to work with pressure and temperature.

Notes on product liability

The manufacturer cannot accept any liability for damages resulting from improper use of the equipment.

Function

The LRG 16-9 conductivity electrode is used as a conductivity limiter and blowdown controller in steam boilers in combination with the following equipment:

Conductivity switch LRS 1-50
Conductivity controller LRR 1-50
Conductivity controller LRR 1-52

In addition, this equipment can measure the conductivity in condensate and feedwater circuits and in cooling and cleaning water.

In combination with conductivity switches or controllers, the conductivity electrode measures conductivity in conductive fluids.

A Pt100 resistance thermometer is additionally integrated in the electrode for measuring the fluid temperature.

In the event of a short circuit or broken wire in the conductivity electrode, an error signal is generated in the conductivity switch or controller.

Safety information

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

Fitting and maintenance work may only be performed by authorized staff who have undergone specific training.

Technical data

Service pressure
464 psi at 460 °F (32 bar at 238 °C)

Mechanical connection
Thread ½" 14 NPT

Materials
Screw-in body: 1.4406 / F316L
Measuring electrode: 1.4571, X6CrNiMoTi17-12-2
Electrode rod insulation: PEEK

Cell constant
0.5 cm^{-1}

Electrical connection
M 12 sensor connector, 5-pole, A-coded

Protection
IP 55 according to DIN EN 60529
NEMA Type 1 according to NEMA 250

Ambient temperature
Max. 158 °F (70 °C)

Transport temperature
-4 °F … 176 °F (-20 °C … +80 °C) (<100 hours),
only switch on after a defrosting period of 24 hours.

Storage temperature
-4 °F … 158 °F (-20 °C … +70 °C), only switch on after a defrosting period of 24 hours.

Weight
Approx. 0.66 lb (0.3 kg)

Other information
Incorporated Type 1 action operating control, passive sensor
Pollution degree 3, impulse voltage 500V

Rating plate, identification

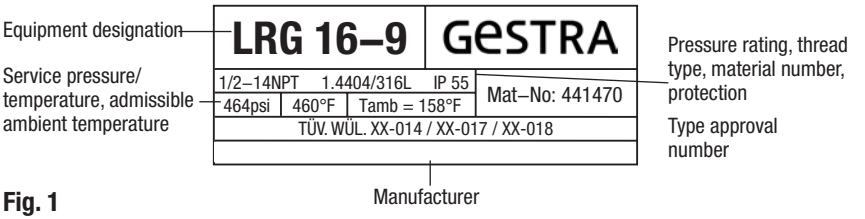


Fig. 1

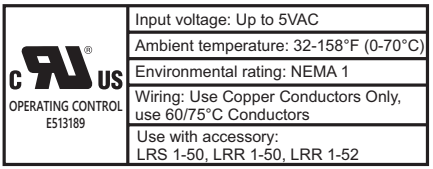


Fig. 2

Preparing for installation

If the equipment is to be installed outdoors, outside the protection of a building, environmental influences may adversely affect function.

- Pay attention to the permitted ambient conditions in the technical data, see page 1612.
- Do not operate the equipment if the temperature is below freezing.
  - ◆ At temperatures below freezing, use a suitable heat source (e.g., control cabinet heater, etc.).
- Connect all parts of the plant to a central grounding point to prevent equalizing currents.
- Use a cover to protect the equipment from direct sunlight, condensation and heavy rain.
- Use UV-resistant cable ducts for routing the connecting cable.
- Take further measures to protect the equipment from lightning, insects and animals, and salty air.

You will need the following tools:

- Size 27 open-ended wrench

Dimensions of the LRG 16-9

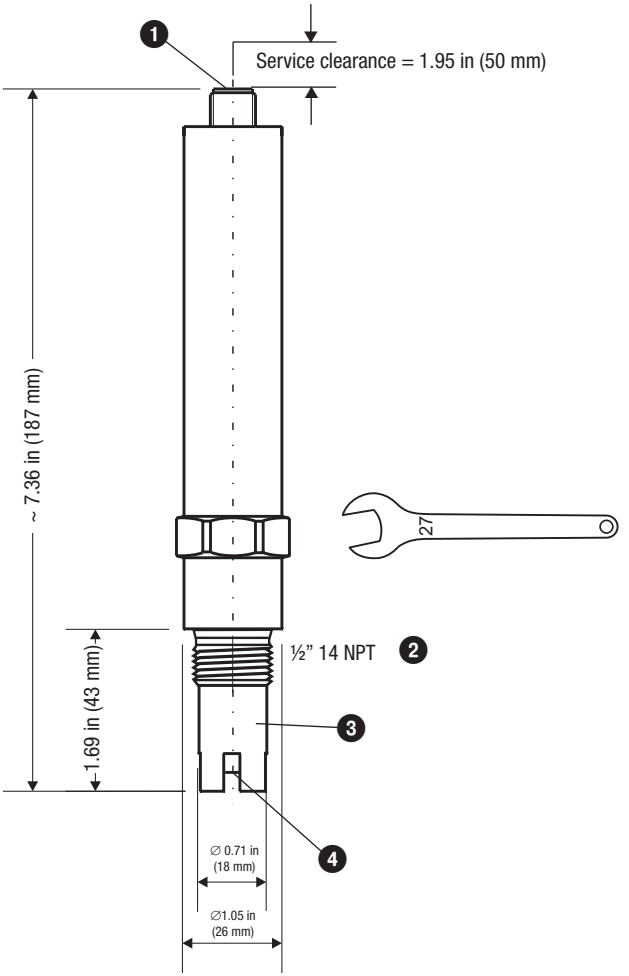


Fig. 3 LRG 16-9

Key

1. M 12 sensor connector, 5-pole, A-coded
2. Electrode thread ½" 14 NPT
3. Measuring tube
4. Measuring surface

⚠ DANGER

Danger to life! Escaped hot steam can cause scalding.

Hot steam or hot water can escape suddenly if the conductivity electrode is unscrewed while under pressure.

- Reduce the boiler pressure to 0 psi (0 bar) and check the pressure before unscrewing the conductivity electrode.
- Only remove the conductivity electrode at 0 psi (0 bar) boiler pressure.

⚠ WARNING

The hot conductivity electrode can cause severe burns.

The conductivity electrode gets very hot during operation.

- Always let the conductivity electrode cool down before performing installation and maintenance work.
- Only remove a conductivity electrode that has cooled down.

⚠ ATTENTION

Incorrect installation can lead to malfunctions in the plant or the conductivity electrode.

- Install the conductivity electrode horizontally or inclined. The measuring surface must be permanently submerged.
- Leave a distance of **approx. 0.6 in (15 mm)** between the lower end of the measuring tube and the pipe wall.
- Do not cut the measuring electrode or measuring tube.

Note

- The conductivity electrode is intended for installation in pipes.
- The conductivity electrode is installed in a screwed socket, a measuring chamber or a mounting flange.
- Please leave a service clearance of 1.95 in (50 mm) for installing and removing the conductivity electrode, see **Fig. 3.**

Installation

Installing the LRG 16-9

- Make sure that the internal and external threads are in perfect condition.
- Do not apply more than three windings of PTFE insulating tape around the electrode thread.

⚠ WARNING

Do not use too much tape. Do not use fitting lubricants or pastes.

- Fit the electrode and tighten first with your hand and then with a size 27 open-ended wrench. Do not use a pipe wrench.
- Recommendations for tightening torques cannot be given due to the conical/parallel type of connection.
- Avoid tightening excessively; part of the electrode thread should always remain visible.

The electrode body does not “sit” on the flange, i.e. the underside of the hexagon is not in contact with the flange (also see **Fig. 4**). If it is in contact, the internal thread is outside tolerance. In this case, the flange must be replaced.

After the electrode has been installed with PTFE sealing tape, you must ensure there is adequate electrical contact between the electrode and the boiler wall.

To do this, after installation measure the resistance between the electrode body and the boiler with a multimeter.

The reading must be < 10 ohms.

If the reading is > 10 ohms, connect the electrode to the boiler wall using a band grounding clamp. (The band grounding clamp is available as an optional accessory)

Next, measure the resistance again.

The value must be < 10 ohms and entered as followed:

Measured resistance: _____ ohms

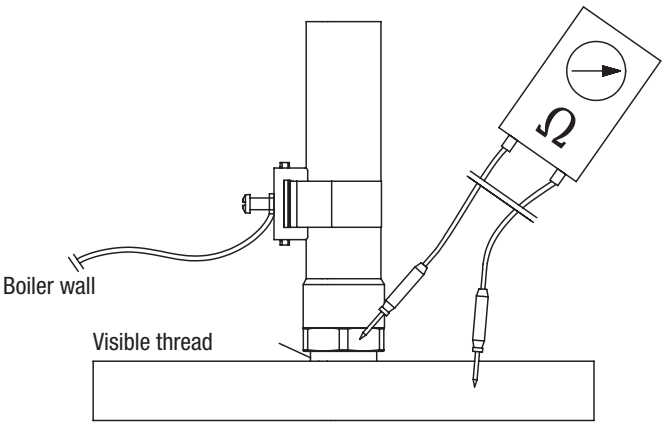


Fig. 4

Installation examples with dimensions

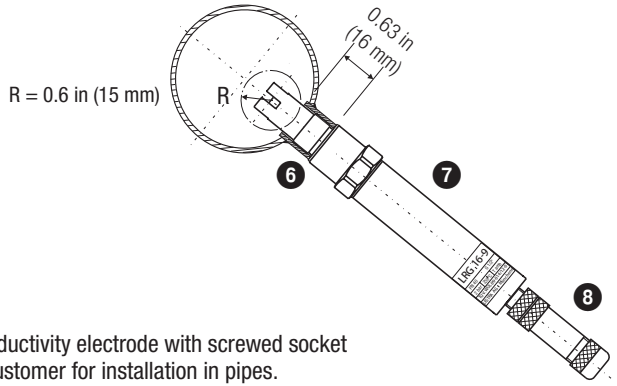


Fig. 5
LRG 16-9 conductivity electrode with screwed socket provided by customer for installation in pipes.

Note

- To keep gas bubbles and flash steam away from the conductivity electrode, it is installed in a bypass that is lower than the main pipe.
- Install a throttling point, e.g., non-return valve (GESTRA type RK 86) in the main pipe.
- Tap fluid from the main pipe at the side from below (45°), to prevent air and dirt from getting into the bypass.

Key

6 Screwed socket ½" 14 NPT, length 0.63 in (16 mm), prepared on-site

7 Conductivity electrode LRG 16-9

8 Socket (not included in delivery)

Electrical connection

Connecting a conductivity electrode

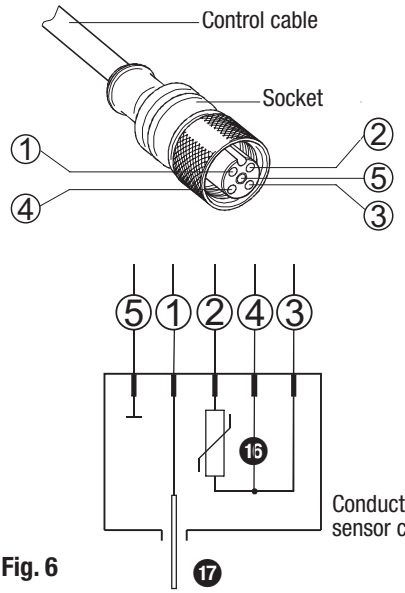
The LRG 16-9 conductivity electrode is equipped with an M12 A-coded, 5-pole sensor connector, see **Fig. 6** for assignment. A pre-wired control cable (with connector and socket) is available in various lengths as an accessory for connecting the electrode.

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

If you are not using the pre-wired control cable, lay a shielded TC-ER control cable with a minimum wire size of AWG18, e.g., OELFLEX CONTROL TM CY 5G1, as a connecting cable. In addition, connect a socket, e.g., Binder series 713 99-0436-58-05, to the control cable at the electrode end.

The cable length between the conductivity electrode and the conductivity switch or controller is max. 98 ft (30 m), or max. 32 ft (10 m) with a conductivity of 0.5 - 5 ppm (1-10 µS/cm).

Conductivity electrode LRG 16-9, pin-socket assignment



Connector/ socket	Assignment	Wire colors
1	Measuring electrode	brown (BN)
2	Resistance thermometer Pt100	white (WH)
3		blue (BU)
4		black (BK)
5	Ground	gray (GY)

Fig. 6

Attention

- If you are not using the pre-wired control cable, you must connect a socket to the connecting cable, as shown in the wiring diagram **Fig. 6**. Please pay attention to the installation instructions of the socket manufacturer.
- Route the connecting cable between items of equipment separately from power lines.
- Connect shields as directed by the Installation & Operating Manuals for the LRS 1-50, LRR 1-50 and LRR 1-52 conductivity switch/controller.

Fault indications and troubleshooting

Indications, diagnosis and corrective action



Attention

Please check the following before fault diagnosis:

Supply voltage:
Is the conductivity switch/controller supplied with the voltage specified on the rating plate?

Wiring:
Does the wiring conform to the wiring diagram?

Fault indications	
Conductivity switch/controller is imprecise	
Error	**Corrective action**
Indicated conductivity reading is higher than measured comparison value.	Increase temperature coefficient tC when bringing into service. Reduce correction factor CF during operation.
Indicated conductivity reading is lower than measured comparison value.	Reduce temperature coefficient tC when bringing into service. Increase correction factor CF during operation.
Reading cannot be adapted by changing the correction factor.	Remove conductivity electrode and clean measuring surface/measuring electrode.

Conductivity switch/controller not working	
Error	**Corrective action**
Power failure	Switch on supply voltage. Check all electrical connections.
Ground connection to tank is interrupted.	Measure the resistance between the electrode and boiler wall. If necessary, use a band grounding clamp, see page 16.
Faulty conductivity electrode, reading too low. Electrode wires interrupted or measuring surface exposed.	Check electrode wire connections. Replace equipment if necessary. Check water level and/or installation.
Faulty conductivity electrode, reading too high. Short circuit in electrode wires.	Check electrode wire connections. Replace equipment if necessary.
Faulty temperature sensor, temperature reading too low.	Check LRG 16-9 conductivity electrode and replace if necessary. Check electrical connection (short circuit, open circuit?).
Faulty temperature sensor, temperature reading too high.	



Attention

- Please pay attention to the LRS 1-50, LRR 1-50 and LRR 1-52 Installation & Operating Manuals for bringing into service and further trouble-shooting.

Taking out of service

⚠ DANGER



Danger to life! Escaped hot steam can cause scalding.

Hot steam or hot water can escape suddenly if the conductivity electrode is unscrewed while under pressure.

- Reduce the boiler pressure to 0 psi (0 bar) and check the pressure before unscrewing the conductivity electrode.
- Only remove the conductivity electrode at **0 psi (0 bar) boiler pressure**.

⚠ WARNING



The hot conductivity electrode can cause severe burns.

The conductivity electrode gets very hot during operation.

- Perform installation and maintenance work only when the conductivity electrode has been allowed to cool.
- Only remove conductivity electrodes that have cooled down.

Proceed as follows:

1. Detach the sensor socket from the conductivity electrode.
2. Make sure the equipment is not hot or under pressure before dismantling it.

Cleaning the measuring electrode

1. Detach the sensor socket from the conductivity electrode.
2. Make sure the equipment is not hot or under pressure before dismantling it.

Cleaning the measuring electrode (measuring surface):

■ Wipe off loose deposits with a fat-free cloth.

■ Scrub off stubborn deposits using sandpaper (medium grain).

Re-install the conductivity electrode. Pay attention to the information in the 'Installation' and 'Electrical connection' sections.

Safety information

Fitting and maintenance work may only be performed by authorized staff who have undergone specific training.

Disposal

Dispose of the conductivity electrode in accordance with statutory waste disposal provisions.

Returning decontaminated equipment



If products have come into contact with media that are hazardous to health, they must be drained and decontaminated before being returned to GESTRA.

The term 'media' can refer to solid, liquid or gaseous substances or mixtures, as well as radiation.

GESTRA can accept returned products only if accompanied by a completed and signed return note and also a completed and signed declaration of decontamination.



The return confirmation and declaration of decontamination must be attached to the outside of the return package, as processing will otherwise be impossible and the products will be returned to the sender at their expense.

Please proceed as follows:

1. Let GESTRA know about the return beforehand by e-mail or phone.
2. Wait until you have received the return confirmation from GESTRA.
3. Fill out the return confirmation (including declaration of decontamination) and send it with the products to GESTRA.

UL components

The LRG 16-9 conductivity electrode is registered under XACN.E513189.

For your notes

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

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