

LRR 1-50, LRR 1-51

Conductivity Controller LRR 1-50, LRR 1-51

Description

The LRR 1-50, LRR 1-51 conductivity controller is used in combination with the LRG 16-4, LRG 16-9 conductivity electrodes and the LRGT 1-... conductivity transmitter as a conductivity controller and limit switch, e.g., in steam boilers and hot water installations or in condensate and feedwater tanks. The conductivity controller indicates when a MAX conductivity has been reached, and opens or closes a continuous blowdown valve.

The LRR 1-50, LRR 1-51 conductivity controller can be combined in a circuit with the following conductivity electrodes or transmitters: LRR 1-50 conductivity controller with LRG 16-4 and LRG 16-9 conductivity electrodes, LRR 1-51 conductivity controller with LRGT 16-3, LRGT 16-4 and LRGT 17-3 conductivity transmitters.

Definition of terms

Continuous blowdown

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

Operating position of the continuous blowdown valve

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

Switching hysteresis

The controller is a 2-position controller, i.e. the continuous blowdown valve moves to the OPEN position when the set point is reached. The conductivity must then decrease, and when it reaches a value that is lower than the set point by the set hysteresis HySt, the valve moves into the OPERATING position.

Temperature compensation

The conductivity of water changes as the temperature falls or rises. To obtain meaningful readings, it is therefore necessary to base the measurements on the reference temperature of 77°F (25°C) and to correct the measured conductivity using the temperature coefficient tC.

Cell constant and correction factor

The geometric variable (cell constant) of the conductivity electrode is taken into account when calculating the conductivity. However, this constant may change during operation, e.g., due to dirt deposits on the measuring electrode. Correction is achieved by changing the correction factor CF or the CAL function.

Definition of terms continued

Flushing the continuous blowdown valve

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

Function

The LRR 1-50 conductivity controller, in conjunction with the LRG 1-... conductivity electrode, measures conductivity in conductive fluids. The conductivity electrode used is the LRG 16-4 or the LRG 16-9 with integrated resistance thermometer for monitoring the fluid temperature.

The LRR 1-51 conductivity controller processes the conductivity-dependent current signal from the LRGT 1-... conductivity transmitter. In the conductivity controller, this signal is standardized in line with the adjusted measuring range and indicated as an actual value on the 7-segment LED display.

Conductivity controller LRR 1-50: When the LRG 16-4 conductivity electrode is connected, a reference measurement is taken and a correction factor CF is adjusted to adapt the conductivity measurement to the specific conditions of the installation. When the LRG 16-9 conductivity electrode is connected, the temperature of the water is measured as well as its conductivity. The conductivity reading is then automatically compensated in the conductivity controller as a function of the adjusted temperature coefficient tC ($\%/^\circ\text{C}$). If the temperature changes, thanks to linear temperature compensation the reading is referenced to 77°F (25°C) over the entire measuring range, and indicated as an actual value on the 7-segment LED display.

The LRR 1-50, LRR 1-51 conductivity controller is a 2-position controller, i.e. the continuous blowdown valve moves to the OPEN position when the set point is reached. Once the conductivity has fallen by the set hysteresis, the valve returns to the OPERATING position. To prevent any loss of water from the boiler, the controller automatically closes 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 varied as desired within the measuring range. If the MAX limit is reached, the MAX output contact is switched and the MAX LED lights up. It switches back when the value has fallen below the preset hysteresis.

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

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

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

The parameters can be protected from unauthorized access with a password. The default password cannot be changed.

Conductivity Controller

LRR 1-50, LRR 1-51

Technical data

Conductivity controller LRR 1-50, LRR 1-51

Supply voltage

24 VDC, +/- 20%; PELV / CLASS2

Fuse

External MO.5A (medium time-lag)

Power consumption

4 W

Reset hysteresis

MAX limit: - 3% of set MAX limit, factory default.

Outputs

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

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

Inductive loads must have interference suppression (RC combination) as specified by the manufacturer.

1 analog output 4-20 mA, max. output load 500 ohms, actual value/manipulated variable output Y (switch-selectable)

Indicators and controls

1 rotary knob with integrated push-button for testing the MAX alarm and setting the parameters,

1 4-digit 7-segment LED display, green

1 red LED for MAX alarm,

2 yellow LEDs for continuous blowdown valve opening/closing

1 4-pole code switch for configuration.

Terminal box

Terminal box material: base of black polycarbonate, front of gray polycarbonate.

Terminal strips can be removed separately.

Terminal box attachment: Mounting clip on support rail TH 35, EN 60715.

Electrical safety

Pollution degree 2, overvoltage category II according to UL 60730-1

Protection

Terminal box: IP40 according to EN 60529

Terminal strip: IP20 according to EN 60529

As a UL open type, the equipment must be installed in a control cabinet.

Weight

Approx. 0.44 lb (0.2 kg)

Ambient temperature

at power-on 32 ° ... 131 °F (0 ° ... 55 °C)

in operation 14 ° ... 131 °F (-10 ° ... 55 °C)

Transport temperature

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

Storage temperature

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

Relative humidity

Max. 95%, non-condensing

LRR 1-50 conductivity controller only

Connecting a conductivity electrode

1 input for LRG 1... conductivity electrode

(cell constant 1 cm⁻¹), 3-pole with shield, or

1 input for LRG 16-9 conductivity electrode

(cell constant 0.5 cm⁻¹), with integrated resistance thermometer Pt100, 3-pole on conductivity controller with shield.

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 77 °F (25 °C) or 1 to 5000 ppm at 77 °F (25 °C).

Correction factor CF

Adjustable from 0.05 to 5.000 in increments of 0.001

CAL function

Adjust the correction factor more easily by entering the measured conductivity

Dimensions

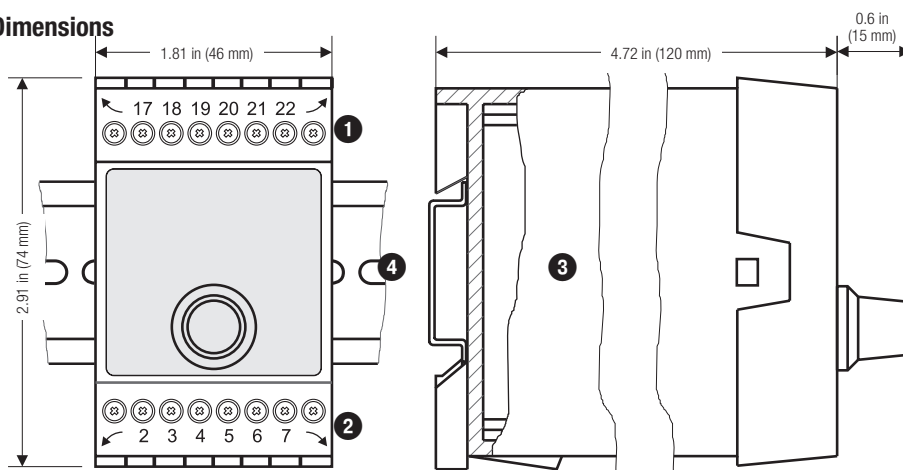


Fig. 1 LRR 1-50, LRR 1-51

Technical data continued

LRR 1-51 conductivity controller only

Connecting a conductivity transmitter

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

Lower end of measuring range SinL

0 - 0.25 - 25 - 50 ppm (0 - 0.5 - 50 - 100 µS/cm), adjustable.

Upper end of measuring range SinH

10 - 50 - 100 - 250 - 500 - 1000 - 1500 - 2500 - 3000 - 3500 - 5000 - 6000 ppm (20 - 100 - 200 - 500 - 1000 - 2000 - 3000 - 5000 - 6000 - 7000 - 10000 - 12000 µS/cm), adjustable.

How to order and specify

Conductivity controller LRR 1-50

GESTRA SPECTOR^{modul}

Conductivity controller with MAX alarm

Input: 1 input for conductivity electrode

1 input for Pt100 sensor

Output: 1 volt-free relay contact for MAX alarm

2 volt-free relay contacts for valve Open/Operating/Closed

1 actual value 4-20mA

7-segment display

Measuring range switch-selectable from 0.25 - 5000 ppm (0.5 - 10000 µS/cm)

Supply voltage: 24 V DC, 4 W

Conductivity controller LRR 1-51

GESTRA SPECTOR^{modul}

Conductivity controller with MAX alarm

Input: 1 input for LRGT conductivity transmitter (4-20 mA)

Output: 1 volt-free relay contact for MAX alarm

2 volt-free relay contacts for valve Open/Closed

1 actual value 4-20mA

7-segment display

Measuring range switch-selectable from 0.25 - 6000 ppm (0.5 - 12000 µS/cm), display goes up to 9999 µS/cm

Supply voltage: 24 V DC, 4 W

Important notes

The LRR 1-50, LRR 1-51 conductivity controller is clipped onto a support rail in the control cabinet.

The equipment is supplied with 24 V DC (PELV / CLASS2) and has an external 0.5A medium time-lag fuse.

This power supply unit must provide a level of isolation against dangerous contact voltages that at least meets the requirements for double or reinforced insulation in accordance with the following standard: UL 60730-1.

Protect the output contacts with an external slow blow 2.5A fuse to prevent them from welding together.

Switching off inductive loads produces surges that can severely impair the function of control systems. Connected inductive

loads must therefore have interference suppression (RC combination) as specified by the manufacturer.

Use a shielded, multi-core TC-ER control cable with minimum wire size AWG18, e.g., OELFLEX CONTROL TM CY 5G1, to connect the LRG 16-4 conductivity electrode.

To connect the LRG 16-9 conductivity electrode, a pre-wired control cable in various lengths is available as an accessory.

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

If you are not using the pre-wired control cable, lay a shielded 5-core TC-ER control cable with minimum wire size AWG18, e.g., OELFLEX CONTROL TM CY 5G1, as the 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 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).

Route connecting cables between items of equipment separately from power lines.

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

If the installation requires an interlock, this must be implemented in the downstream (safety) circuit.

Conductivity Controller LRR 1-50, LRR 1-51

Key

- 1 Upper terminal strip
- 2 Lower terminal strip
- 3 Terminal box
- 4 Support rail TH 35, EN 60715
- 5 Connection of supply voltage 24 V DC with 0.5A medium time-lag fuse provided by customer
- 6 Actual value/manipulated variable output 4-20 mA
- 7 Conductivity electrode LRG 1.-..
- 8 Central grounding point (CGP) 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
- 13 Conductivity transmitter LRGT 1.-..., 4-20 mA, with grounding point

Note:

After the supply voltage of the controller is switched off, L2 must remain on until the actuator has closed the continuous blowdown valve.

Electrical connection of the LRR 1-50

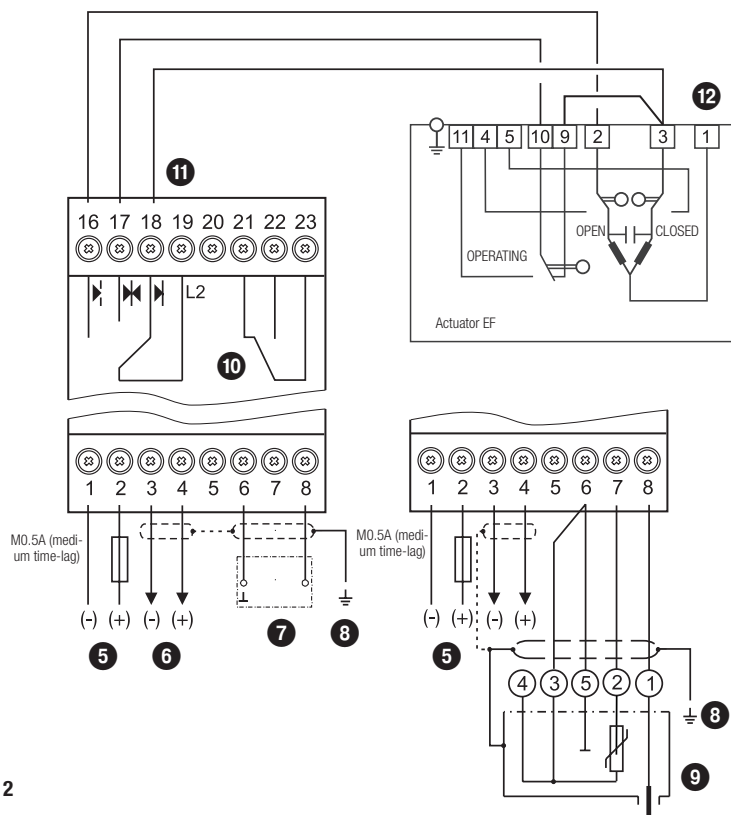


Fig. 2

Electrical connection of the LRR 1-51

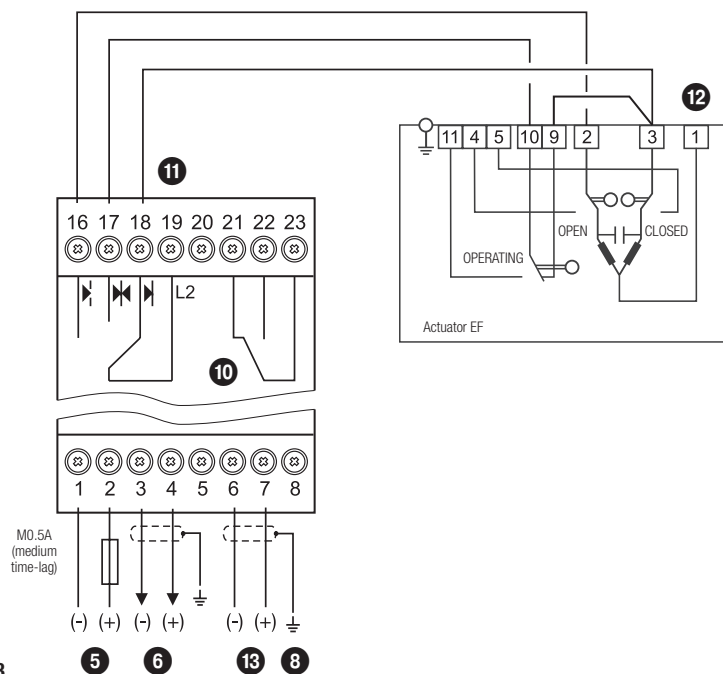


Fig. 3

Directives and standards

Please see our Declaration of Conformity and associated certificates or approvals for details on the conformity of our equipment and the applicable standards.

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.

Please note our general terms of business.

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