



Control Unit

# LRR 1-40



EN  
English

Original Installation Instructions  
**818527-03**

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## Important Notes

### Usage for the intended purpose

Use blowdown controller LRR 1-40 only in conjunction with conductivity electrode LRG 16-40, LRG 16-41, LRG 17-40 and an operating & display unit type URB or SPECTOR*control* for detecting and monitoring electrical conductivity in liquids (TDS control).

Note that the application of the control unit LRR 1-40 for conductivity limiting purposes or continuous boiler blowdown is only permissible if it is used in conjunction with the conductivity electrode LRG 16-40 / LRG 16-41 / LRG 17-40 and an operating & display unit type URB or SPECTOR*control*.

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

Any type of use differing from the usage described above must be considered as improper. The resulting risk will have to be borne by the user alone. The manufacturer hereby expressly rejects any claims for any damage resulting from improper usage.

### Safety note

The equipment must only be installed 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 strip of the control unit is live during operation. This presents the danger of electric shock!

Cut off power supply to the equipment before mounting or removing 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.

### ATEX (Atmosphère Explosible)

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

## Explanatory Notes

### Scope of supply

#### LRR 1-40

1 Control unit LRR 1-40 (plug-in unit in plastic case)

1 Terminating resistor 120  $\Omega$

1 Installation manual

### Description

#### 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 vapor into steam lines and superheaters. As a result the operational safety is impaired and the steam boiler and/or pipelines can be damaged. 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.

#### Intermittent boiler blowdown (bottom blowdown)

During the evaporation process fine sludge deposits settle on heating surfaces and in the lowest part of the steam boiler. The accumulated sludge sediments form a thermally insulating layer and can damage the boiler walls due to excessive heat.

The resulting suction effect occurs only at the moment when the valve is being opened, the opening time should therefore not exceed 2 seconds.

The timed pulse/interval control of the intermittent blowdown valve optimises sludge removal while minimising loss of boiler water.

The interval between the intermittent blowdown pulses can be set between 1 and 120 h (**intermittent blowdown interval**). The **duration of the intermittent blowdown** can be set between 1 and 60 s. For larger boilers it may be necessary to repeat the intermittent blowdown pulses. The **intermittent blowdown pulses** can be repeated up to 5 times within 5 - 30 seconds (**pulse interval**).

The **continuous** and **intermittent boiler blowdown** is controlled by the control unit LRR 1-40 in conjunction with the conductivity electrode LRG 16-40, LRG 16-41, LRG 17-40, the operating unit URB or SPECTOR*control* and the continuous blowdown valve BAE 46, BAE 47.

In conjunction with the conductivity electrode and the operating unit you can also use the control unit LRR 1-40 as conductivity limiter in steam boilers or for conductivity monitoring in condensate and feedwater systems.

The data exchange between the control unit LRR1-40, the conductivity electrode, the operating unit and further equipment is effected via CAN bus according to ISO 11898, using the CANopen protocol.



#### Note

- The control unit LRR 1-40 can control the continuous blowdown valve BAE 46, BAE 47 with the actuator ARIS EF 1-1 either directly via the output relays or the continuous blowdown valve BAE 46, BAE 47 with the actuator EF 1-40 via the CAN bus.

### Function

The control unit LRR 1-40 features the following functions:

- 2-position controller for the control of the continuous blowdown valve via output relays or via CAN bus,
- 3-position stepping controller for the control of the continuous blowdown valve via output relays or via CAN bus,
- Triggering of daily purging pulse (24 h) to actuate the continuous blowdown valve,
- De-activation of control function during stand-by operation of steam boiler,
- Alarm signal in the event of a malfunction in the conductivity electrode,
- MAX limit alarm for conductivity (TDS) limiting,
- MIN limit alarm or
- Automatic blowdown control with timed actuation of the intermittent blowdown valve,
- Analog actual value output (4-20 mA) for external conductivity indication (optional).

For these functions the control unit must evaluate at regular intervals the data telegrams sent off by the conductivity electrodes LRG 16-40, LRG 16-41, LRG 17-40 and the the actuator EF 1-40 (continuous blowdown valve BAE 46, BAE 47).

For the visual display of the process and the control of the continuous blowdown valve via CAN bus the control unit will send a separate data telegram with the following content:

- Type of conductivity electrode used with the CAN bus
- MIN / MAX limit,
- Continuous blowdown valve: setpoint of valve position,
- Times for automatic intermittent blowdown control.

Use operating & display unit URB or SPECTOR<sup>control</sup> to commission, operate and monitor the conductivity electrode LRG, the control unit LRR and the actuator EF.

The control unit can only test the switching of the MIN / MAX output relays.

### System components

#### LRG 16-40

Conductivity electrode LRG 16-40, PN 40, measurement with two electrodes

#### LRG 16-41

Conductivity electrode LRG 16-41, PN 40, measurement with four electrodes

#### LRG 17-40

Conductivity electrode LRG 17-40, PN 63, measurement with two electrodes

#### BAE 46, BAE 47

Continuous blowdown valve with actuator ARIS EF 1-1 or EF 1-40

### Design

#### LRR 1-40

Plug-in unit in plastic case for installation in control cabinets. The terminals are externally accessible.

For mounting on a standardised supporting rail TS 35 x 15 DIN EN 50022.

External dimensions: 73 x 100 x 118

## Technical Data

### LRR 1-40

#### **Type approval no.**

TÜV.WÜL.xx-007

#### **Input / output**

Interface for CAN bus according to ISO 11898 CANopen.

#### **Inputs**

One analog control input for signalling the valve position via a feedback potentiometer 1000  $\Omega$ , 320° angle of rotation, supply voltage 5 V DC.

One voltage input 18-36 V AC (50/60 Hz) or DC for external command:

control OFF, valve CLOSED, intermittent blowdown OFF. With DC protected against polarity reversal.

#### **Outputs**

Current supply for CAN bus 18-36 V DC, short-circuit protected.

Four volt-free relay contacts.

Max. contact rating with switching voltages of 24 V AC/DC, 115 V AC and 230 V AC: resistive / inductive 4 A.

Contact material AgNi 0,15.

Connected contactors must be provided with suppressors such as RC combinations as specified by the manufacturer.

One current output 4-20 mA as actual value, max. load 500  $\Omega$  (optional).

#### **Indicators and adjustors**

Four pushbuttons as operating elements.

Four LEDs (red/green) for indicating the operating modes.

One red LED "Bus Status"

One green LED "Power"

One 10-pole code switch: 7 poles for node ID, 3 poles for baud rate setting.

#### **Setpoint W**

Adjustable within the measuring range between the MIN/MAX limits.

#### **Control range (configuration as proportional controller)**

Beginning: 0.5 x setpoint W up to 1.5 x setpoint W

#### **Dead band (configuration as proportional controller)**

Based on setpoint W:

Setpoint W below 2000  $\mu\text{S}/\text{cm}$  (1000 ppm) DB = 3 %

Setpoint W above 2000  $\mu\text{S}/\text{cm}$  (1000 ppm) DB = 1 %

#### **Switching hysteresis of controller output (configuration as 2-position controller)**

Adjustable between 1 and 25 % of the adjusted setpoint.

#### **Operating position of the continuous blowdown valve**

Adjustable as a function of the continuous blowdown valve.

#### **Proportional band $X_p$**

From 1 to 150 % relative to setpoint W (configuration as proportional controller), adjustable, 0 % (configuration as 2-position controller).

#### **MIN/MAX limits**

##### **Measuring range up to 200 $\mu\text{S}/\text{cm}$ (100 ppm):**

MIN limit adjustable between 0.5  $\mu\text{S}/\text{cm}$  (0.25 ppm) and MAX limit -2  $\mu\text{S}/\text{cm}$  (1 ppm),

MAX limit adjustable between 200  $\mu\text{S}/\text{cm}$  (100 ppm) and MIN limit +2  $\mu\text{S}/\text{cm}$  (1 ppm).

## LRR 1-40 - continued -

### Other measuring ranges:

MIN limit (only via URB) adjustable between 0.5  $\mu\text{S}/\text{cm}$  (0.25 ppm) and MAX limit  $-20 \mu\text{S}/\text{cm}$  (10 ppm),  
 MAX limit (only via URB) adjustable between end of measuring range and MIN limit  $+20 \mu\text{S}/\text{cm}$  (10 ppm).

### MIN/MAX limit,

### switching hystereses

MIN limit:  $+1 \%$  of the adjusted MIN limit,

MAX limit:  $-1 \%$  of the adjusted MAX limit.

### Conductivity measuring ranges for actual value output 4 - 20 mA

#### LRG 16-40, LRG 17-40

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

#### LRG 16-41

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

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



### Note

The electrical conductivity is measured in  $\mu\text{S}/\text{cm}$ . For ppm (parts per million) use the following conversion:  $1 \mu\text{S}/\text{cm} = 0.5 \text{ ppm}$ .



## Technical Data - continued -

### LRR 1-40 - continued -

#### **24 h purging pulse**

Forced opening of the continuous blowdown valve every 24 hours, adjustable.

#### **Automatic intermittent blowdown**

Intermittent blowdown interval (duration of break): 1 - 120 hours, adjustable in steps of one hour.

Duration of intermittent boiler blowdown: 1 - 60 seconds, adjustable in steps of one second.

Pulses of intermittent boiler blowdown: 1 - 5, adjustable in steps of one.

Pulse interval: 5 - 30 seconds, adjustable in steps of one second.

#### **Mains voltage**

230 V +10 / -15 %, 50 - 60 Hz

115 V +10 / -15 %, 50 - 60 Hz (optional)

24 V +10 / -15 %, 50 - 60 Hz (optional)

#### **Power consumption**

10 VA

#### **Protection**

Housing: IP40 to EN 60529

Terminal strip: IP20 to EN 60529.

#### **Max. admissible ambient temperature**

0 - 55 °C

#### **Body material**




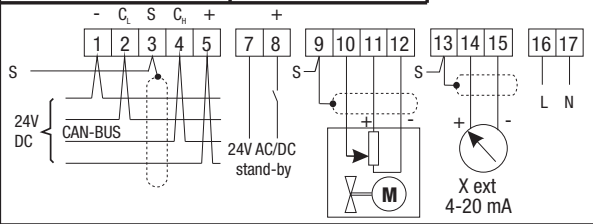


Front panel: polycarbonate, grey

Body: polycarbonate, black

#### **Weight**

approx. 0.8 kg

**Name plate / Marking**

 Betriebsanleitung beachten See installation instructions  Voir instructions de montage	Steuergerät control device appareil de commande		<b>LRR 1-40</b>		
	<b>Node ID:</b> _____				
IN / OUT: CAN-Bus 18-36 V DC		115V~ -15/+10%	10VA	IP 40 (IP20)	
Tamb = 55 °C ( 131 °F)					
			<b>TÜV . WÜL . xx-007</b>		
<b>GESTRA AG</b> Münchener Str. 77 D-28215 Bremen		Seriennummer			

**Fig. 1**

Dimensions

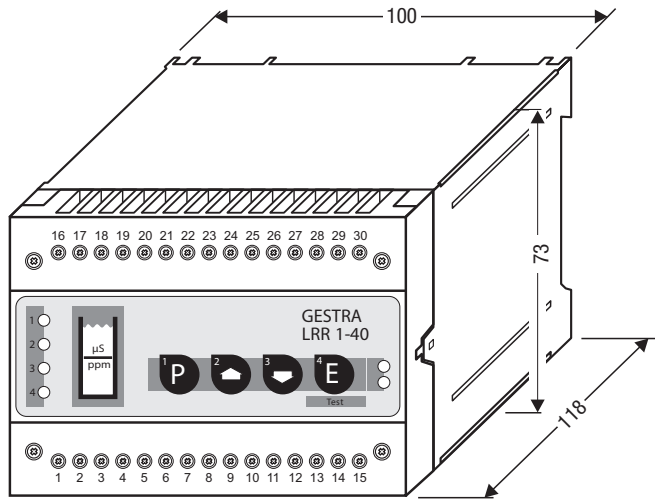


Fig. 2

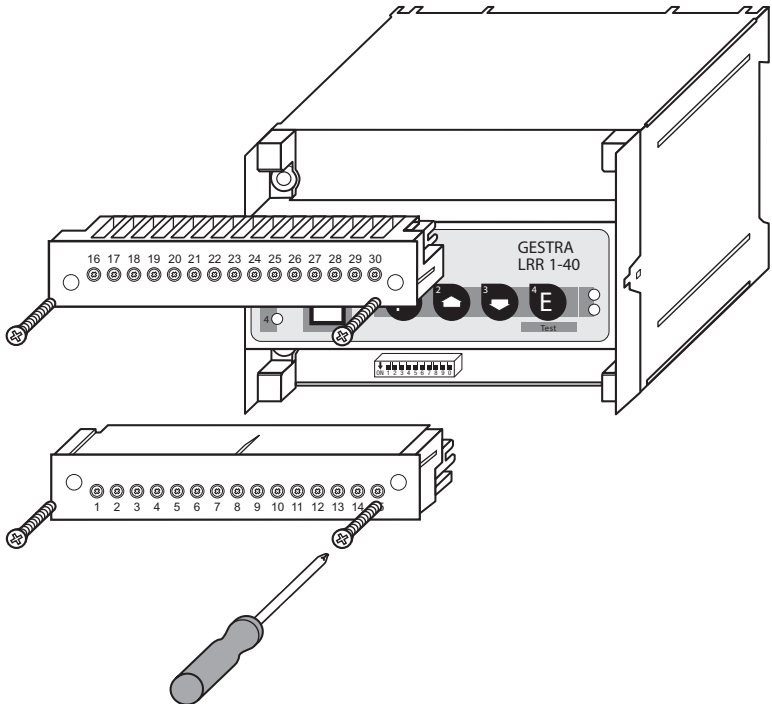


Fig. 3

# Functional Elements

## LRR 1-40

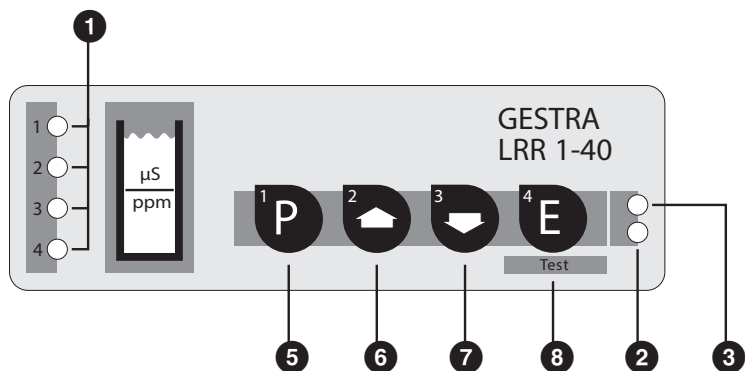


Fig. 4

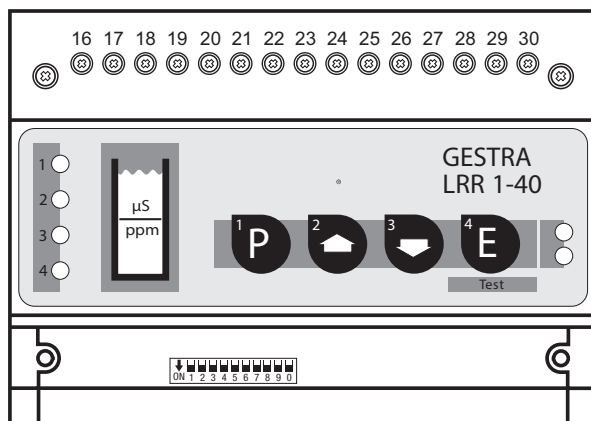


Fig. 5

### Key

<b>1</b> Status LED	<b>Alarm</b>	<b>Malfunction</b>
LED 1	MAX alarm	Malfunction message
LED 2	Continuous blowdown valve CLOSED	Malfunction message
LED 3	Continuous blowdown valve OPEN	Malfunction message
LED 4	MIN alarm / continuous blowdown	Malfunction message
<b>2</b> LED Bus status		
<b>3</b> LED Power		
<b>4</b>		
<b>5</b> Program button		
<b>6</b> Increase button		
<b>7</b> Decrease button		
<b>8</b> Enter / Test		
<b>9</b> Code switch, 10 poles		
<b>10</b> Terminal strip		
<b>11</b> Screws for terminal strip		
<b>12</b> Case		
<b>13</b> Supporting rail TS 35 x 15 DIN EN 50022		

## Installation

### LRR 1-40

#### Mounting on supporting rail

1. Clip control unit onto the supporting rail.  
Supporting rail TS 35 x 15, DIN EN 50022.
2. Align control unit. **Fig. 7**

#### Tools

- Screwdriver, size 5.5/100

Example of Installation

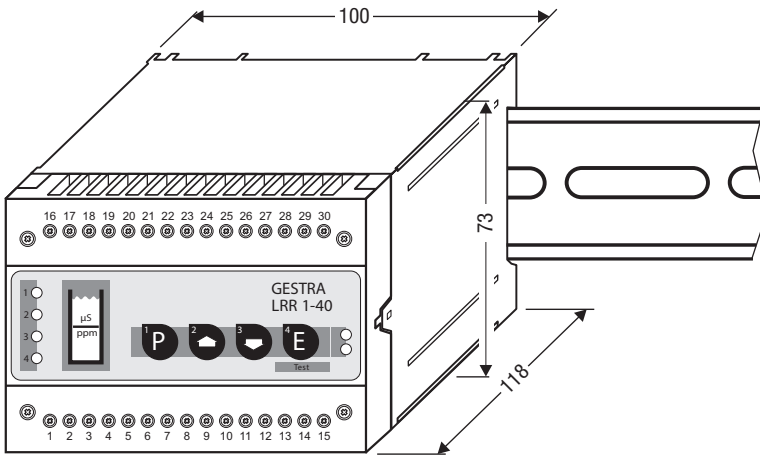


Fig. 6

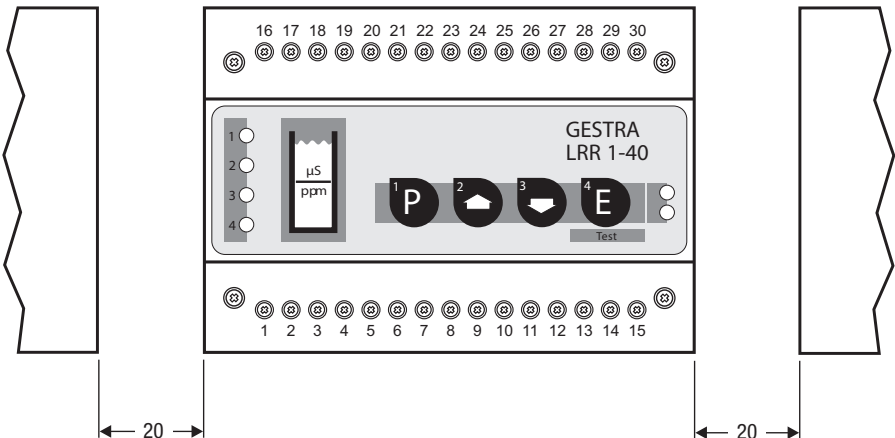


Fig. 7

## Key

- 10 Terminal strips
- 11 Screws for terminal strip
- 12 Case
- 13 Supporting rail TS 35 x 15 DIN EN 50022

## Electrical Connection

### Control cable

#### NRS, NRR, LRR, TRS, URB 1

To wire the equipment, multi-core twisted-pair control cable **must** be used for the bus line, e. g. UNITRONIC® BUS CAN 2 x 2 x ... mm<sup>2</sup> or RE-2YCYV-fl 2 x 2 x ... mm<sup>2</sup>.

Control cable assemblies (2 x 2 x 0.32 mm<sup>2</sup> cable with plug and connector) of various lengths are available as add-on equipment.

#### NRG, LRG, EF, URZ, TRV, URB 2

The equipment is fitted with sensor plug-in connectors (5 poles, A-coded). For connecting the bus devices control cable assemblies (with plug and connector) of various lengths are available as add-on equipment.

Note that the recommended control cables are not UV-resistant and must be protected by a UV-resistant plastic tube or cable duct if the equipment is installed outdoors (except for URB 2).

The baud rate (data transfer rate) dictates the cable length and size between the bus nodes. The total power consumption must also be taken into consideration when selecting the conductor size. The total power consumption is obtained from the number of bus nodes.

If the cable length between the steam boiler and the control cabinet exceeds 15 m, we recommend that you fit a branching box that is resistant to electromagnetic interference (stock code 1501214) and use a control cable with a larger conductor size for the distance to the control cabinet.

S 8	S 9	S 10	Baud rate	Cable length	Number of pairs and conductor size [mm <sup>2</sup> ]
OFF	ON	OFF	250 kBit/s	125 m	2 x 2 x 0.32
<b>Factory setting</b>					
ON	ON	OFF	125 kBit/s	250 m	2 x 2 x 0.5
OFF	OFF	ON	100 kBit/s	335 m	2 x 2 x 0.75
ON	OFF	ON	50 kBit/s	500 m	on request, depending on bus configuration
OFF	ON	ON	20 kBit/s	1000 m	
ON	ON	ON	10 kBit/s	1000 m	

Set baud rate via code switch 9. Make sure that all bus nodes feature the same settings.





### Note

- The max. baud rates and cable lengths indicated above are based on empirical values obtained by GESTRA. In certain cases it may be necessary to reduce the baud rate in order to ensure operational safety.
- The type and design of the data cable has a strong influence on the electromagnetic compatibility (EMC) of the equipment. Take special care when connecting the equipment.
- If you do not use the control cable assemblies connect the connectors and jacks for the control cables as indicated in the assignment diagram for sensor plug-in unions.

### CAN bus voltage supply

To ensure the troublefree operation of the CAN bus system make sure that the voltage supply for all bus devices is sufficient.

Please use the following table to check the voltage supply of your bus system.

Control units with voltage supply	Qty.	X	Power output per item	=	Sum
		X	6 W	=	W
Please enter data.			Sum 1	=	W
Sensor, transmitter, control units, operating & display unit URB 1	Qty.	X	Power consumption per item	=	Sum
		X	3 W	=	W
Operating & Display Unit URB 2		X	5 W	=	W
Please enter data.			Sum 2	=	W

If sum 2 exceeds sum 1 supply the CAN bus with 24 V DC coming from a separate and stabilized safety power supply unit (e. g. SITOP Smart 24 V 2.5 A).

The power supply unit must be electrically isolated from dangerous contact voltages and must meet at least the requirements on double or reinforced isolation acc. to DIN EN 50178 or DIN 61010-1 or DIN EN 60730-1 or DIN EN 60950 (safe isolation).

The power supply unit must be provided with an overcurrent protective device in accordance with EN 61010-1.



### Attention

If a safety power supply unit (e. g. SITOP smart, 24 V, 2.5 A) is used for the voltage supply of the CAN bus do not tap the supply voltage from the terminals 1 and 5 of the GESTRA control devices.

Wiring diagram LRR 1-40

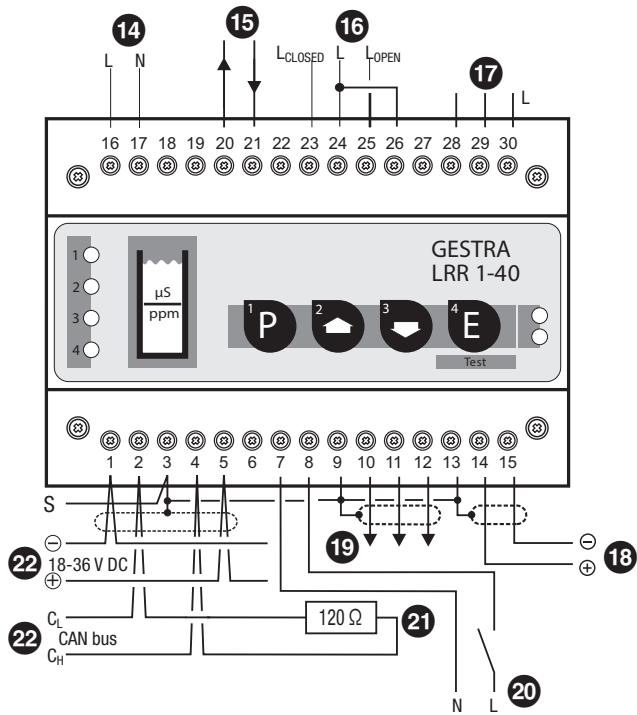


Fig. 6

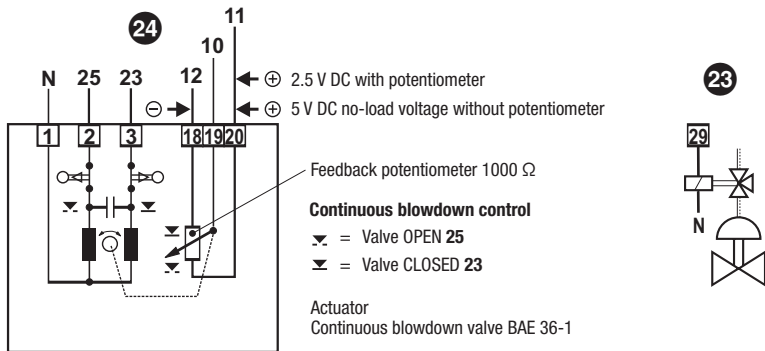


Fig. 7

## Wiring diagram for the sensor plug-in connectings

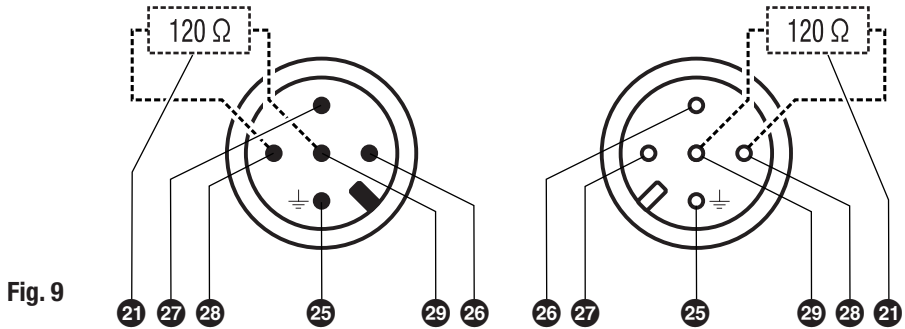


Fig. 9

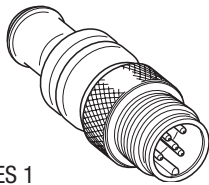


Fig. 10 RES 1

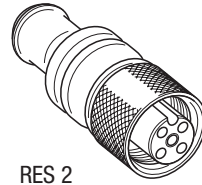


Fig. 11 RES 2

### Key

- 14 Mains supply
- 15 MAX limit, safety circuit
- 16 Continuous blowdown valve CLOSED / OPEN
- 17 MIN limit / intermittent blowdown
- 18 Actual value output 4-20 mA (optional)
- 19 Feedback potentiometer
- 20 Contact in burner control, if stand-by function is desired. Terminal 7/8 ⊕ voltage input 24 V AC/DC for external command; contact closed, control OFF, valve CLOSED, intermittent blowdown OFF [stand-by] (May come from the bus supply). For DC: Observe polarity!
- 21 Terminating resistor 120 Ω, RES 1 or RES 2
- 22 CAN bus line, twisted pair control cable
- 23 Intermittent blowdown valve
- 24 Continuous blowdown valve
- 25 Pin 1: Screen
- 26 Pin 2: Voltage supply 24 V DC+ (red)
- 27 Pin 3: Voltage supply 24 V DC- (black)
- 28 Pin 4: CAN data line C<sub>H</sub> (white)
- 29 Pin 5: CAN data line C<sub>L</sub> (blue)

## CAN bus wiring diagram

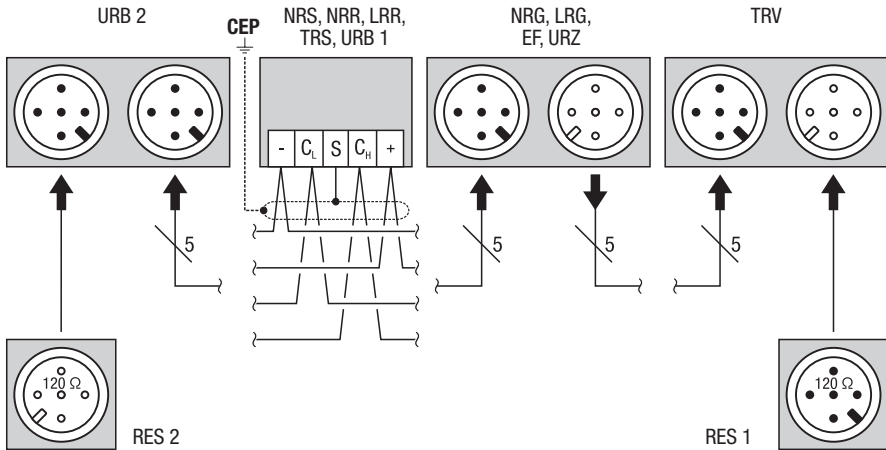


Fig. 12



### Attention

- Wire equipment in series. Star-type wiring is not permitted!
- Make sure that the bus line is separated from mains and signal lines.
- Link screens of control cables such that electrical continuity is ensured and connect them **once** to the central earthing point (CEP). If equipotential bonding currents are to be expected, for instance in outdoor installations, make sure that the screen is separated from the central earthing point (CEP).
- To protect the switching contacts fuse circuit with T 2.5 A or according to TRD regulations (1.0 A for 72 h operation).
- If two or more system components are connected in a CAN bus system, provide the first and the last device with a terminating resistor of 120 Ω, **Fig. 10, Fig. 11**
- Note that in a CAN bus network only **one** water-level limiting system may be used.
- Do **not** interrupt the CAN bus network during operation with one or more system components!

**In the event of an interruption a malfunction alarm is raised.**

If the control unit has to be replaced, detach terminal strips **10**. **Fig. 3**

Before taking the CAN bus line from the terminal strip, make sure that all connected system components are out of service.



### Note

- Link screen only to terminal 3, ensure electrical continuity and connect it once to the central earthing point (CEP).
- The rated voltage is indicated on the name plate.
- When switching off inductive loads, voltage spikes are produced that may impair the operation of control and measuring systems. Connected contactors must be provided with suppressors such as RC combinations as specified by the manufacturer.
- Even in correctly wired systems high frequency interference caused by the installation can lead to system outages and malfunction alarms. For more information please refer to the fault-finding list in the section **Malfunctions - Troubleshooting**.

### Tools

- Screwdriver for slotted screws, size 2.5, completely insulated according to VDE 0680

## Basic Settings

### Bus cable

All devices (level, conductivity, temperature) are interconnected via CAN bus. The CANopen protocol is used for the data exchange between the equipment groups. All devices have an electronic address – the node ID. The four-core bus cable serves as power supply and data highway for high-speed data exchange.

The CAN address (node ID) can be set between **1 - 99**.

The control unit LRR 1-40 has already been configured at our works for operation with other GESTRA components and can be used straight away without having to set the node ID.

**If several identical systems are to communicate in one CAN bus network, set a different node ID for each system (e. g. limiter, controller, etc).**

**If the length of the CAN bus cable exceeds 125 m change the settings of the code switch ⑨.**

For more information on switch positions see **Basic Settings - Switch positions**.

## Basic Settings - continued -

### Node ID

#### Water level limiter

NRS 1-40	NRG 16-40 (1)	NRG 16-40 (2)	Reserved	Reserved	
X	X + 1	X + 2	X + 3	X + 4	
1	2	3			Factory setting

#### Safety system for steam boilers with superheater

NRS 1-40.1	NRG 16-40 (1)	NRG 16-40 (2)	TRV 5-40	Limiter 4	
X	X + 1	X + 2	X + 3	X + 4	
1	2	3	4		Factory setting

#### Safety system (e. g. hot-water generating units)

NRS 1-40.1	NRG 16-40 (1)	NRG 16-40 (2)	Limiter 3	Limiter 4	
X	X + 1	X + 2	X + 3	X + 4	
1	2				Factory setting

#### Safety system (e. g. hot-water generating units)

NRS 1-40.2	TRV 5-40 (1)	TRV 5-40 (2)	Limiter 3	Limiter 4	
X	X + 1	X + 2	X + 3	X + 4	
6	7	8	9	10	Factory setting
	TRS 5-40 (1)	TRS 5-40 (2)			
	X + 1 + 90	X + 2 + 90			
	97	98			

#### High level alarm

NRS 1-41	NRG 16-41	Reserved	Reserved	Reserved	
X	X + 1	X + 2	X + 3	X + 4	
6	7	8	9	10	Factory setting

#### Further components

SRL 40		
X = (sensor: level limiter // hi alarm) + 2		Factory setting
ORT 6		
98		Factory setting

#### On-off level control

Reserved	NRS 1-42	NRG 16-42	
X - 1	X	X + 1	
19	20	21	Factory setting

#### Modulating level control

URZ 40	NRS 2-40	NRR 2-40	NRG 26-40	Reserved	
X - 2	X - 1	X	X + 1	X + 2	
38	39	40	41	42	Factory setting

#### Automatic continous blowdown control

EF 1-40	Reserved	LRR 1-40	LRG 1-4...	Reserved	
X - 2	X - 1	X	X + 1	X + 2	
48	49	50	51	52	Factory setting

#### Control unit

URB 1, URB 2		
60		Factory setting

### Factory setting

The control unit LRR 1-40 features the following factory set default values:

#### Control parameters

- Setpoint W: 5000  $\mu\text{S}/\text{cm}$
- Switching hysteresis of controller output (configuration as 2-position controller): 10 %
- Operating position of continuous blowdown valve: 8 %
- Proportional range  $X_p$  : 0 %
- MAX switchpoint (Hi): 7000  $\mu\text{S}/\text{cm}$
- MIN switchpoint (Lo): 1000  $\mu\text{S}/\text{cm}$
- Automatic intermittent blowdown: Off
- 24-h purging pulse: Off

#### System settings

- Baud rate: **250 kBit/s for 125 m bus line**
- Node ID: 50

Enter the assigned node ID on the name plate.

### Establishing / changing node ID

If several identical systems are to communicate in a CAN bus network, allocate a different node ID for each system (e. g. limier, controller, etc). In most cases it is sufficient to commission the equipment with the default factory settings.

To set the code switch ⑨ remove the lower terminal strip ⑩.



#### Attention

- We recommend that you commission the CAN bus devices with the default factory setting.
- Do **not** use a node ID for more than one piece of equipment in the CAN bus system!

## Code switch settings



		Node ID	50
S1	OFF	1	
S2	<b>ON</b>	2	
S3	OFF	4	
S4	OFF	8	
S5	<b>ON</b>	16	
S6	<b>ON</b>	32	
S7	OFF	64	

Fig. 15 (Factory setting)



		Node ID	76
S1	OFF	1	
S2	OFF	2	
S3	<b>ON</b>	4	
S4	<b>ON</b>	8	
S5	OFF	16	
S6	OFF	32	
S7	<b>ON</b>	64	

Fig. 16 (Example 1)

S8	S9	S10	Baud rate	Cable length
OFF	<b>ON</b>	OFF	250 kBit/s	125 m
<b>ON</b>	<b>ON</b>	OFF	125 kBit/s	250 m
OFF	ON	<b>ON</b>	100 kBit/s	335 m
<b>ON</b>	ON	<b>ON</b>	50 kBit/s	500 m
OFF	<b>ON</b>	<b>ON</b>	20 kBit/s	1000 m
<b>ON</b>	<b>ON</b>	<b>ON</b>	10 kBit/s	1000 m

Fig. 17 (Factory setting 250 kBit/s)



## Commissioning



### Note

Use operating & display unit URB or SPECTOR*control* to commission, operate and monitor the conductivity electrode LRG, the control unit LRR and the actuator EF. Please observe the operating instructions of the operating unit URB / SPECTOR*control*. The control unit LRR 1-40 automatically detects the type of the connected conductivity electrode.

### Start

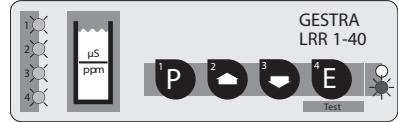
Apply mains voltage.

The status LEDs 1 - 4 are flashing rapidly.

The LED "Power" is illuminated.

LEDs 1 - 4 go out after a short period of time.

Then the equipment switches either to normal operating mode or alarm mode.



### Note

To analyse and remedy malfunctions occurring during the commissioning procedure refer to section **Malfunctions** and **System malfunctions**.

### Performance of the continuous blowdown valve

The continuous blowdown valve is motored into the CLOSED position and then into the OPERATING position or the control position.

#### Only applicable if the 24 hour purging was activated:

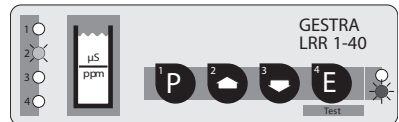
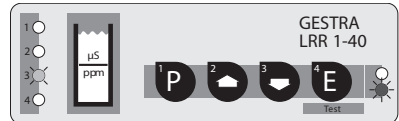
The continuous blowdown valve is actuated and opens for 2 minutes. LED 3 is flashing.

After two minutes the operation is reversed. LED 3 is no longer illuminated.

The continuous blowdown valve is again actuated for 2 minutes, and closes.

LED 2 is flashing.

Then the continuous blowdown valve is motored into the OPERATING position or into the required control position.



### Note

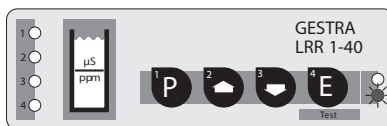
If a CAN open actuator is controlled the LEDs 2 and 3 are not flashing/illuminated.

Since the MIN limit is not yet activated during commissioning, LED 4 or 1 is flashing rapidly for about 60 seconds (see MIN limit).

## Operation

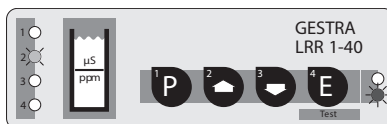
### Normal operation

LED "Power" is illuminated.  
LEDs 1-4 not illuminated



### Continuous boiler blowdown

LED 2 is flashing while the continuous blowdown valve is closing.  
LED 3 is flashing while the valve is opening.



#### Note

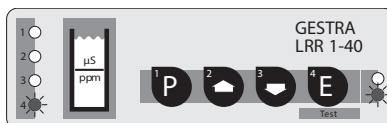
LEDs 2 and 3 go out once the valve position dictated by continuous blowdown control is reached.  
If a CAN open actuator is controlled the LEDs 2 and 3 are not flashing/illuminated.

### Intermittent boiler blowdown

#### Only applicable if Automatic Intermittent Blowdown Control was activated:

When the mains voltages is switched on the adjusted interval between the blowdown pulses (blow-down interval) is started.

If a blowdown pulse is triggered,  
LED 4 is illuminated during the pulse time and  
relay contact 4 closes.  
The intermittent blowdown valve opens.



#### Note

LED 4 is not lit during the adjusted interval between intermittent boiler blowdowns.  
Relay contact 4 is open, the intermittent blowdown valve is closed.

The interval between the intermittent blowdown pulses can be set between 1 and 120 h (**intermittent blowdown interval**). The **duration of the intermittent blowdown** can be set between 1 and 60 s. For larger boilers it may be necessary to repeat the intermittent blowdown pulses. The **intermittent blowdown pulses** can be repeated up to 5 times within 5 - 30 seconds (**pulse interval**). Parameters can only be set via the operating unit URB / SPECTOR*control*.

## Operation - continued -

### Stand-by operation

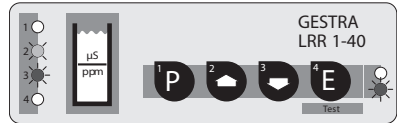
To avoid loss of water, the continuous blowdown control and the automatic boiler blowdown (if activated) can be de-activated during stand-by operation or when the firing is switched off. An external control command (see wiring diagram) triggers off the signal.

The continuous blowdown valve is motored into the CLOSED position.

LED 2 is flashing and LED 3 is illuminated during the stand-by operation.

The MIN/MAX limit and the monitoring function remain active during stand-by operation.

After the equipment switches back to normal operation the continuous blowdown valve is motored into the OPERATING position or the control position. In addition an intermittent blowdown pulse is triggered off (provided that automatic intermittent boiler blowdown has been activated and the pulse duration has been set).



### 24 hr purging pulse

#### Only applicable if the 24 hour purging was activated:

To prevent blocking of the continuous blowdown valve a purging pulse is triggered when the mains voltage is switched on.

The continuous blowdown valve is actuated and opens for 2 minutes. LED 3 is flashing.

After two minutes the operation is reversed. LED 3 is no longer illuminated.

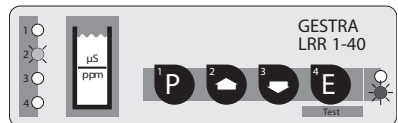
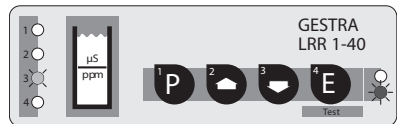
The continuous blowdown valve is operated for 2 minutes and closed, LED 2 is flashing.

Then the valve is motored into the OPERATING position or into the required control position.

This process is repeated every 24 hours.

During stand-by operation the time interval continues without triggering off the purging pulse.

Note that during the purging process the MIN limit is not active.



#### Note

If a CAN open actuator is controlled the LEDs 2 and 3 are not flashing/illuminated.

### MAX limit / MIN limit

#### Only applicable if:

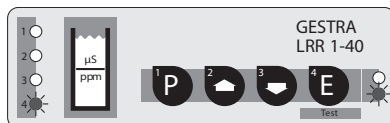
- Relay contact 1 (feedback LED 1) works as switching output for MAX limit
- Relay contact 4 (feedback LED 4) works as switching output for MIN limit

LED 1 lights up once the set MAX limit is reached.  
Relay contact 1 opens (safety circuit).

LED 1 goes out once the value falls below its limit.  
Relay contact 1 closed.

LED 4 lights up once the set MIN limit is reached.  
Relay contact 4 opens.

LED 4 goes out once the value exceeds its limit.  
Relay contact 4 closed.



### MAX limit / MIN limit = Automatic intermittent boiler blowdown

#### Only applicable if:

- Relay contact 1 (feedback LED 1) works as switching output for MAX limit
- Relay contact 4 (feedback LED 4) works as switching output for automatic intermittent boiler blowdown

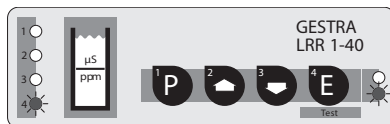
LED 1 lights up once the set MAX limit is reached.  
Relay contact 1 opens (safety circuit).

LED 1 is not illuminated if the actual value is below the MAX limit.  
Relay contact 1 closed.

LED 4 is illuminated during intermittent blowdown and relay contact 4 is closed.  
The intermittent blowdown valve opens.

LED 4 is not illuminated during the time between intermittent blowdown.

Relay contact 4 is open, the intermittent blowdown valve is closed.



#### Note

The MIN limit is activated approx. 60 seconds after the mains voltage has been applied. During this time LED 1 or - depending on the setting - LED 4 is flashing rapidly.

## Operation - continued -

### Performance test

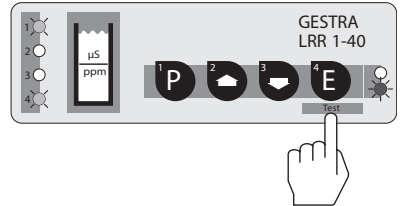
As part of the performance test a value is simulated that exceeds the measuring range limit of 12000  $\mu\text{S}/\text{cm}$  of the conductivity electrode. The equipment must response as if the MAX limit were exceeded.

Press button **E** briefly.

LED 1 and 4 are flashing rapidly.

LED 4 is illuminated during intermittent boiler blowdown.

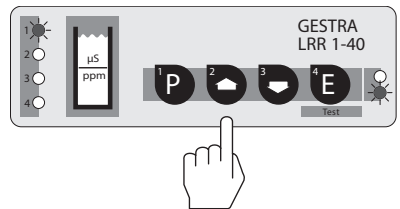
The test mode remains active for 10 seconds.



Press button **P** and wait until LED 1 is illuminated.

Relay contact 1 opens.

As long as the button is pressed down a conductivity value greater than 12000  $\mu\text{S}/\text{cm}$  is simulated.



### When using the equipment as conductivity limiter please note:



#### Note

The control unit LRR 1-40 does not lock automatically when the adjusted MAX limit is exceeded

If a lock function is required by the installation it must be provided in the follow-up circuitry (safety circuit). The circuitry must meet the requirements of the EN 50156-1.

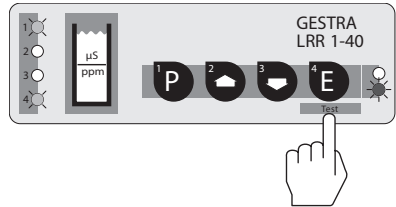
## Performance test for relays 1 and 4

Press button **E** briefly.

LED 1 and 4 are flashing rapidly.

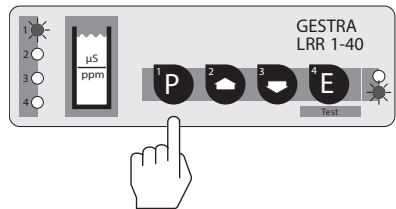
LED 4 is illuminated during intermittent boiler blowdown.

The test mode remains active for 10 seconds.



Press button **P**.

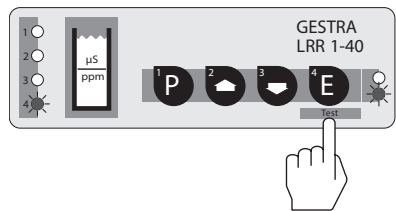
As long as the button is pressed down LED 1 is lit and relay contact 1 opens (MAX limit).



Press button **E**. As long as the button is pressed down LED 4 is illuminated and relay contact 4 opens (MIN limit).

If automatic intermittent boiler blowdown is active:

Press button **E**. As long as the button is pressed down LED 4 is lit and relay contact 4 closes (intermittent blowdown valve opens).



## Malfunctions

### Fault finding list for troubleshooting

#### Equipment does not work - no function

**Fault:** LED "Power" is not illuminated.

**Remedy:** Apply mains voltage and wire equipment in accordance with wiring diagram.

#### Equipment does not work correctly

**Fault:** Due to dirt deposits on the measuring surface(s) the indicated actual value may be wrong (determined with reference measurement).

**Remedy:** Remove conductivity electrode and clean measuring surface(s).

**Fault:** Dirt deposits on the measuring surface(s) can cause MAX or MIN alarms although the actual value is between these limits (reference measurement).

**Remedy:** Remove conductivity electrode and clean measuring surface(s).

#### If configured as proportional controller: The equipment works as two-position (on-off) controller

**Fault:** The feedback potentiometer in the continuous blowdown valve is either defective or not connected.

**Remedy:** Wire the equipment in accordance with the wiring diagram and check the potentiometer.

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

## System Malfunctions



### Danger

The terminal strips of the equipment are live during operation.  
This presents the risk of severe cases of electric shock!  
Cut off power supply to the equipment before mounting or removing the terminal strips!

### Causes

Malfunctions occur if CAN bus components have been mounted, wired or configured incorrectly or if electronic component parts are defective, or in the event of excessive heat in the equipment or electrical interference in the supply system.

Malfunction alarms are set off by:

- Fault in the conductivity electrode (internal connecting cable defective, temperature sensor defective),
- Measuring surface(s) of electrode exposed,
- Admissible temperature in electrode terminal box exceeded,
- Faulty communication in CAN bus system
- Failure of 24 V power supply unit.

If one of the first four malfunctions occurs, the relay contact for MAX limit (terminal 20 and 21) is opened and the continuous blowdown valve closes.

For a more detailed malfunction analysis the operating and display device URB or SPECTOR*control* must be used.

Please observe the respective installation manuals.

### Test

When carrying out the individual tests please check:

#### **Wiring:**

Is the wiring in accordance with the wiring diagrams?

Is the polarity correct throughout the whole bus line?

Is the bus line of each of the end nodes provided with a 120  $\Omega$  terminating resistor?

Is a feedback potentiometer connected?

#### **Conductivity electrode:**

Is the measuring surface of the electrode permanently submerged?

#### **Node ID:**

Are the node IDs set correctly?

Do not use a node ID twice!

#### **Baud rate:**

Is the cable length appropriate for the baud rate?

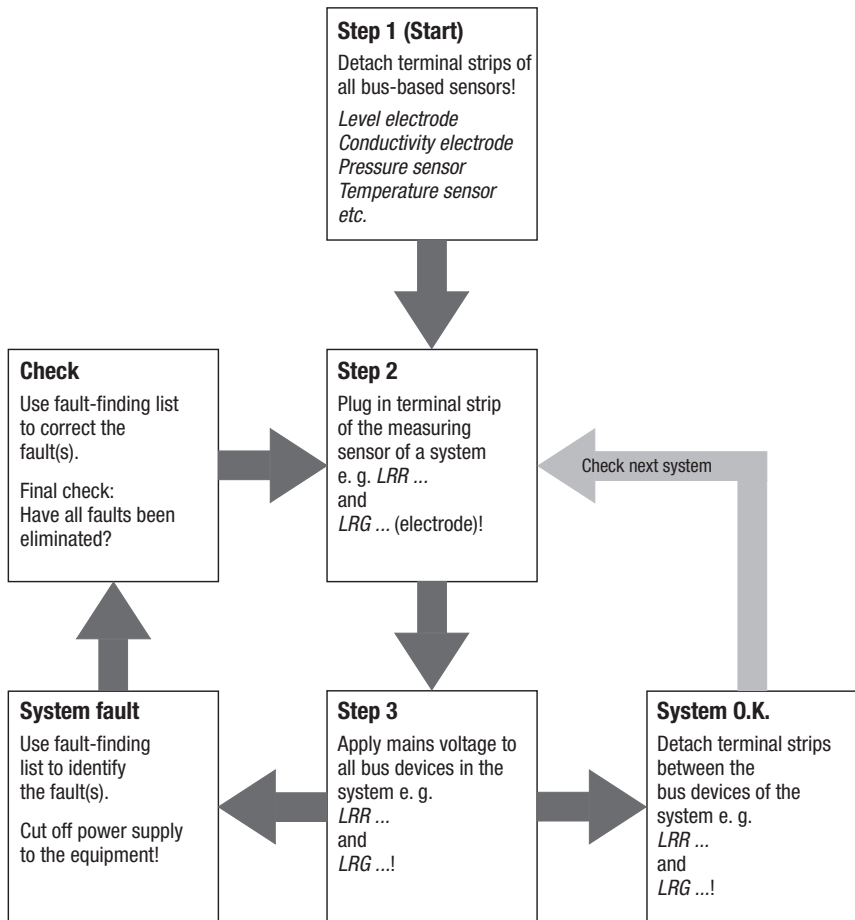
Is the baud rate setting identical for all devices?



## Systematic malfunction analysis

The sources of malfunctions occurring in CAN bus systems operating with several bus-based stations must be analysed systematically since faulty components or incorrect settings can give rise to negative interactions with intact bus devices in the CAN bus system. These unwanted interactions can cause error messages in fully functional bus devices, which will make fault detection even more difficult.

**We recommend the following systematic fault finding procedure:**

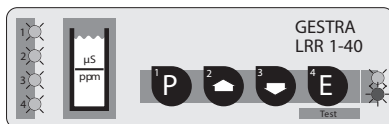


## System malfunctions - continued -

### Error message 1

**LEDs 1 to 3 (4 for MIN limit) are flashing rapidly**

A communication error has been detected.



**Fault:** The initialising phase has not been finished during start-up.  
No communication with conductivity electrode!

**Remedy:** Check wiring, node ID, baud rate setting and bus cable.  
Cut off power supply and re-start system after 5 sec.

### Error message 2

**LEDs 1 to 3 (4 for MIN limit) are flashing slowly.**

**Fault:** Measuring surface(s) of conductivity electrode is exposed.

**Remedy:** Check installation and make sure that the measuring surface is submerged

**Fault:** Internal wires of the conductivity electrode are defective or the temperature sensor failed.

**Remedy:** Replace conductivity electrode.

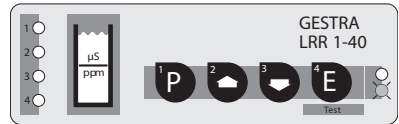
**Fault:** The temperature in the terminal box of the conductivity electrode exceeds the specified limit.

**Remedy:** Check installation of electrode and, if necessary, protect the equipment against excessively high temperatures. As soon as the temperature falls below the max. admissible limit, the equipment switches back to operating mode.

## System malfunctions - continued -

### Error message 3

#### LED bus status is flashing slowly



**Fault:** The data transfer between the control unit and the electrode is interrupted!  
**Remedy:** The wiring of the bus lines must be in accordance with the wiring diagram (observe polarity). As specified in the wiring diagram provide the end-of-line bus devices with 120  $\Omega$  terminating resistors.  
Cut off power supply and restart system after 5 sec.

**Fault:** Incorrect baud rate setting for one or more bus devices.  
**Remedy:** Check the baud rate settings of all bus-based devices.  
The baud rates **must** be identical!  
Cut off power supply and restart system after 5 sec.

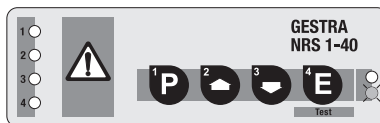
**Fault:** The total length of the bus line does not correspond to the baud rate setting!  
**Remedy:** Check the baud rate settings of all bus-based devices.  
Cut off power supply and restart system after 5 sec.

**Fault:** In spite of correct wiring and commissioning of the equipment an error message is indicated.  
**Remedy:** The error message is caused by the high-frequency interference coming from the system. For interference suppression we supply ferrite rings, stock code # 147253. The 230 V supply lines should be looped five to ten times through the ferrite ring. If several controllers are used in one system, they can be fed from the interference suppressed supply lines. For the interference suppression of the bus line we supply hinged-shell ferrite rings, stock code # 147254. The hinged-shell ferrite rings are clamped onto the bus lines near the terminal strip of the control unit. Restart system after installation. There is a source of interference in the surrounding area. Take corrective action, e. g. suppress interference of valve actuators with 22 nF / 220  $\Omega$ . Restart system after installation.

## System malfunctions - continued -

### Error message 4

#### LED Power is flashing slowly



**Fault:** The power supply unit in the control device is overloaded!  
**Remedy:** Test the supply voltage for all CAN bus systems. The two end-of-line devices must be supplied with a voltage of > 24 V DC. If this is not the case check the supply voltage of the CAN bus; see section “Electrical Connection”.  
Cut off power supply and restart system.

**Fault:** Power supply unit in control unit defective!  
**Remedy:** Replace control unit.

## Decommissioning



### Danger

The terminal strips of the equipment are live during operation.  
This presents the risk of severe cases of electric shock!  
Cut off power supply to the equipment before mounting or removing the terminal strips!

### Replacing control unit

1. First detach terminal strips 10. For this purpose turn the right and left fixing screw 11 in direction of the arrow until the terminal strip can be detached.
2. Undo the fixing slide, snap out the controller and take it off the supporting rail 13.
3. When ordering spare parts please state the serial number indicated on the name plate.
4. Write down the parameters set in the operating panel URB / SPECTORcontrol and enter them in the new control unit LRR 1-40 after installation.

### Disposal

Dismantle the equipment and separate the waste materials, using the material specification as a reference.

Electronic component parts such as the circuit board must be disposed of separately!  
For the disposal of the equipment observe the pertinent legal regulations concerning waste disposal.

## **Annex**

### **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.en/documents](http://www.gestra.en/documents) or can be requested from us.

**For your notes**

**For your notes**



Agencies all over the world: [www.gestra.de](http://www.gestra.de)

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