



Level Controller

NRR 2-60

EN
English

Installation & Operating Manual
819693-02

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Content of this Manual

Product:

Level Controller NRR 2-60

First edition:

BAN 819693-00/08-2019cm

Applicable documents:

Installation & Operating Manual BAN 808941-xx for URB 60 Visual Display and Operating Unit

You can find the latest Installation & Operating Manuals on our website:

<http://www.gestra.com>

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Scope of delivery/Product package

- 1 x Level Controller NRR 2-60
- 1 x Installation & Operating Manual

How to use this Manual

This Installation & Operating Manual describes the correct use of the NRR 2-60 level controller. It applies to all persons who integrate this equipment into 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 given.
- 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

A Keys to illustrations



Additional
information



Read the relevant
Installation & Operating Manual

Hazard symbols in this Manual



Danger zone/Dangerous situation



Danger of death from electric shock

Types of warning

DANGER

Warning of a dangerous situation that will result 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 will result in damage to property or the environment.

Specialist terms/Abbreviations

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

CAN (Controller Area Network) bus

Data transmission standard and interface for connecting electronic equipment, sensors and control systems. Data can be sent and received.

TRV .. / NRG .. / LRG ... / SRL ...

GESTRA equipment and type designations, see page 8.

PhotoMOS output

PhotoMOS are a special kind of semiconductor relay, which use a light-emitting diode on the input side that is optically coupled to an output transistor. This type of electrically non-conductive connection makes sure the input and output circuits are electrically isolated from each other.

PI controller

Controller with proportional (P) and integral (I) control.

SELV

Safety Extra Low Voltage

Usage for the intended purpose

The NRR 2-60 level controller can be used together with the NRG 26-60 or NRG 26-61 level electrodes as a level control system and limit switch in steam boilers and hot water installations, and in condensate and feedwater tanks.

Combinations with a URW 60 universal converter*

The NRR 2-60 level controller can also be used for the above-mentioned purposes together with a URW 60 universal converter * and in combination with an external level electrode (with 4-20 mA current output).

* *The URW 60 universal converter converts the analogue 4-20 mA signals from the level electrodes into CAN bus signals.*

Configuration, operation and visual display

The equipment is configured and operated and information is viewed via the URB 60 visual display and operating unit.

Overview of possible unit combinations

Level controller	Level electrode	Universal converter (analogue to CAN bus)	Visual display and operating unit
NRR 2-60	NRG 26-60 NRG 26-61	-	URB 60
	Ext. 4-20 mA	URW 60	URB 60

Fig. 1

Key to Fig. 1:

NRR = level controller

NRG = level electrode

URW = universal converter

URB = visual display and operating unit



To ensure the proper use of equipment during all types of use, please also read the Installation & Operating Manuals for the system components used.

- You will find the latest Installation & Operating Manuals for the system components named in **Fig. 1** on our website: <http://www.gestra.com>

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.

Basic safety notes



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

- Always switch off the voltage to the equipment before performing work on the terminal strips.
- Check that the plant is not carrying live voltage before commencing work.



Faulty equipment jeopardises plant safety.

- If the NRR 2-60 level controller does not behave as described on page 25, it may be faulty.
- Perform failure analysis.
- 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	Electrician/installer
Operation	Boiler service technician	Staff trained by the plant operator
Maintenance work	Specialist staff	Electrician
Refits	Specialist staff	Plant construction

Fig. 2

Notes on product liability

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

Function

The NRR 2-60 level controller is a 3-point stepping controller. It evaluates the data telegrams from a level electrode (e.g. NRG 26-60 or NRG 26-61) or from a URW 60 universal converter in cycles.

In the level controller, the actual value is compared with the set point, and a corrective signal is formed to compensate the control deviation. In addition, switching operations can be triggered by the output contacts if defined switchpoints are reached.

The data are transferred to an ISO 11898 CAN bus via the CANopen protocol.

Function tests and failure diagnosis are performed using the URB 60 visual display and operating unit.

The data telegrams contain the following information:

- Level values from electrodes
- Fault indications on the occurrence of faults in electronic or mechanical parts

Behaviour in the event of MIN/MAX water level alarms

When MIN/MAX water level alarms arise, the appropriate output contact opens.

Possible combinations of functions and equipment

Combining the NRR 2-60 level controller with the level electrodes and the URB 60 visual display and operating unit gives you the following common functions:

Level controller	NRR 2-60
Function	
Evaluation of CAN bus data telegrams from connected NRG 26-60 or NRG 26-61 level electrodes.	●
Evaluation of CAN bus data telegrams from the connected URW 60 universal converter in combination with a 4-20 mA current output from a level electrode.	●
3-point stepping controller with proportional plus integral control (PI controller) and actuation of an electrically operated control valve.	●
MIN/MAX water level alarm.	●
Current inputs for steam and feedwater flowrate (3-component control)	●
The valve position can be displayed if a potentiometer is connected (in the control valve). The valve position is then shown on the URB 60 visual display and operating unit.	●
Actual value output 4-20 mA	●

Fig. 3

Technical data

Supply voltage

- 24 V DC +/-20%

Power consumption

- Max. 5 W

Current input

- Max. 0.3 A

Required external fuse

- M0.5A

Input/output

- Interface for CAN bus to ISO 11898, CANopen, insulated

Inputs NRR 2-60

- 1 x analogue input for potentiometer 0-1000 Ω , two-wire connection (indication of valve position)
- 1 x analogue input IN 2, 4-20 mA (feedwater flowrate) (optional)
- 1 x analogue input IN 3, 4-20 mA (steam flowrate) (optional)

Outputs of MIN/MAX contacts

- 2 x volt-free relay contacts (changeover relays), contact material AgNi0.15, AgSnO2
- Maximum switching current - 8 A at 250 V AC / 30 V DC - $\cos \phi = 1$
- Inductive loads must have interference suppression (RC combination) as per the manufacturer's specification

Off delay of MIN/MAX output relays

- 3 seconds (default)

On delay of MIN/MAX output relays

- 0 seconds (default)

Outputs of control valve OPEN/CLOSED

- 2 x volt-free relay contacts (changeover relays), contact material AgNi0.15, AgSnO2
- Maximum switching current - 8 A at 250 V AC / 30 V DC - $\cos \phi = 1$
- Inductive loads must have interference suppression (RC combination) as per the manufacturer's specification

Analogue output

- 1 x actual value output 4-20 mA, e.g. for an actual value display
- Max. load resistance 500 Ω

Technical data

Indicators and controls

- 1 x multicolour LED (orange, green, red)
 - ◆ orange = power up
 - ◆ green = running
 - ◆ red = malfunction
- 1 x 4-pole code switch for setting the controller group and baud rate

Protection class

- II double insulated

IP rating to EN 60529

- Terminal box: IP 40
- Terminal strip: IP 20

Electrical safety

- Pollution degree 2 for installation in control cabinet with protection rating IP 54, fully insulated

Admissible ambient conditions

- Service temperature: - 10 °C – 55 °C (0 °C – 55 °C at power-on)
 - Storage temperature: - 20 °C – 70 °C *
 - Transport temperature: - 20 °C – 80 °C (< 100 hours) *
 - Air humidity: max. 95%, non-condensing
- * Only switch on after a 24-hour defrosting period

Terminal box

- Terminal box material: Lower section of black polycarbonate (glass-fibre reinforced), front of grey polycarbonate
- 2 x 15-pole terminal strips, removable separately
- Max. cross-section per screw terminal:
 - ◆ 1 x 4.0 mm² solid, or
 - ◆ 1 x 2.5 mm² stranded with sleeve, or
 - ◆ 2 x 1.5 mm² stranded with sleeve
- Terminal box attachment: Mounting clip on support rail TH 35 (to EN 60715)

Weight

- Approx. 0.5 kg

Example name plate/Identification NRR 2-60

 Betriebsanleitung beachten!  See installation instruction!	2		3			
	4	5	6			
	15	16	7	17	8	
9						
10		18	 12345678-12345678			
		19				
12		20	UK	EAC	CE	14
		21	CA			

13

Fig. 4

- ① Safety note
- ② Equipment function
- ③ Equipment designation
- ④ Power consumption
- ⑤ IP rating
- ⑥ Operating data
(maximum ambient temperature)
- ⑦ Power supply
- ⑧ Protection class
- ⑨ Wiring diagram
- ⑩ Component type approval
- ⑪ Material number-serial number
- ⑫ Manufacturer
- ⑬ Component type approval
- ⑭ Disposal information

Optional information

- ⑮ Measuring range in $\mu\text{S}/\text{cm}$
- ⑯ Measuring range in ppm
- ⑰ Cutout relay
- ⑱ Information on functional safety
- ⑲ Marking for limiters (STL)
or monitors (STM)
- ⑳ Field for set limit value
- ㉑ Mode of operation in accordance with
EN 60730-1

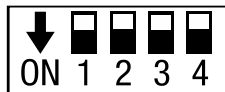


The date of production is printed on the side of the equipment.

Factory settings

The level controller is delivered ex-works with the following settings:

- Baud rate: 50 kbit/s (max. cable length 1000 m)
- Controller group: 1
- Code switch setting: Sliding switch, white (1 to 4 = OFF)



Configuring the controller group and baud rate, see page 23, Fig. 9.

- MAX switchpoint: 80%
- MIN switchpoint: 20%
- Set point: 50% of measuring range
- Direction of corrective action: Feed control
- Proportional band (Pb): $\pm 20\%$ of set point
- Reset time (Ti): 0 seconds
- Neutral zone: $\pm 0\%$ of set point (factory-set to off)
- Valve runtime: 40 seconds
- MIN/MAX alarm off delay: 3 seconds
- MIN/MAX alarm on delay: 0 seconds
- Quality factor: 1.00 (3-component control)

Functional elements and dimensions

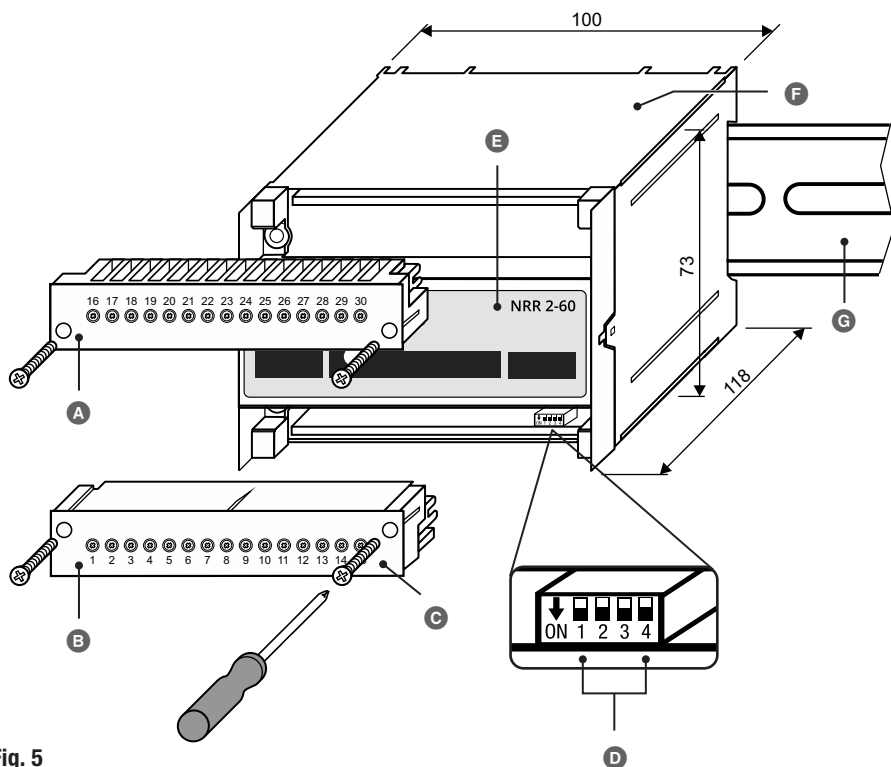


Fig. 5

- A** Upper terminal strip
- B** Lower terminal strip
- C** Screws (M3)
- D** 4-pole code switch, for setting the controller group and baud rate
- E** Front membrane with status LED, see page 24
- F** Terminal box
- G** Support rail TH 35



The code switch can be accessed by disconnecting and removing the lower terminal strip.

Equipment settings, see page 23.

Installing the NRR 2-60 level controller

The NRR 2-60 level controller snaps onto a TH 35 support rail in a control cabinet.

DANGER



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

- Switch off the voltage to the plant before you install the equipment.
- Check that the plant is not carrying live voltage before commencing work.

1. Before you install the equipment, switch off the voltage to the plant or secure the surrounding equipment in the control cabinet, if live, so it cannot be touched.
2. Carefully press the unit onto the support rail until the holder clips into place.

Electrical connection safety notes

DANGER



Incorrectly connecting the level controller or any associated components is a danger to plant safety.

- Connect the level controller and all associated components as shown in the wiring diagrams Fig. 6/Fig. 7 in this Manual.
- Do not use unused terminals as jumpers or support terminals.

Wiring diagram for NRR 2-60 level controller

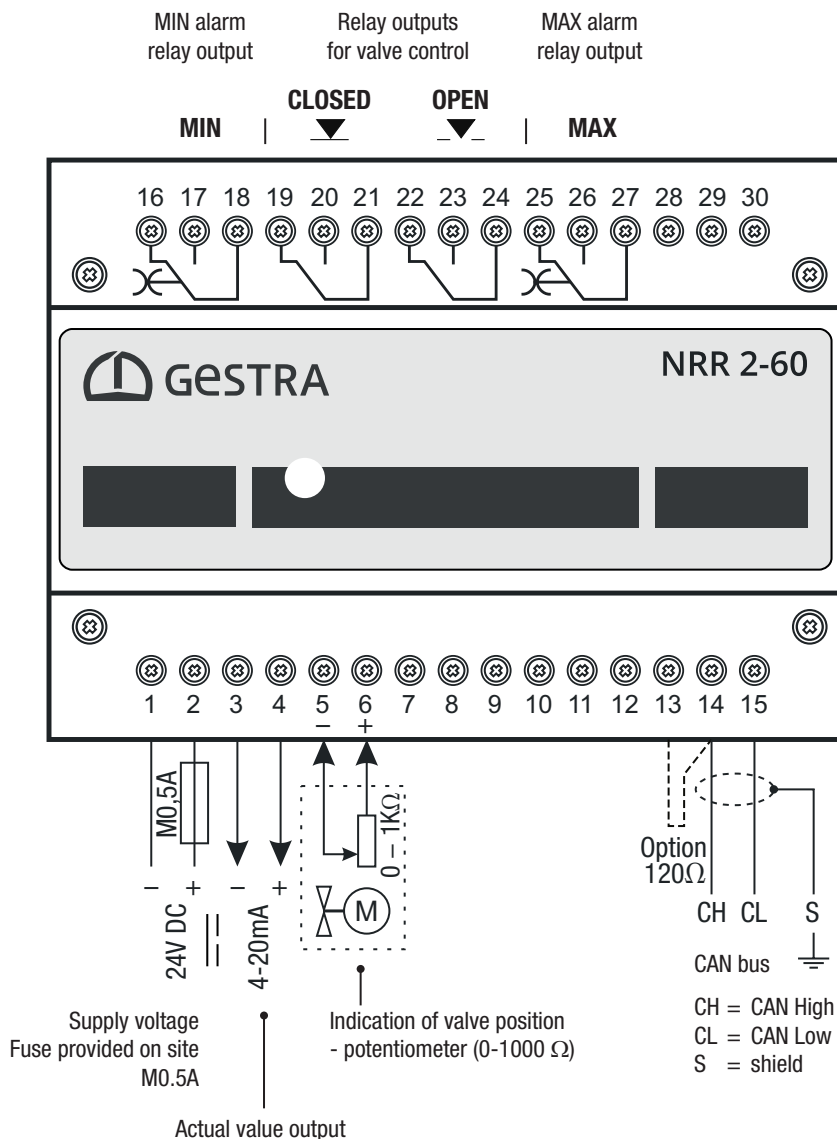


Fig. 6

Wiring diagram for NRR 2-60 level controller as a 3C controller

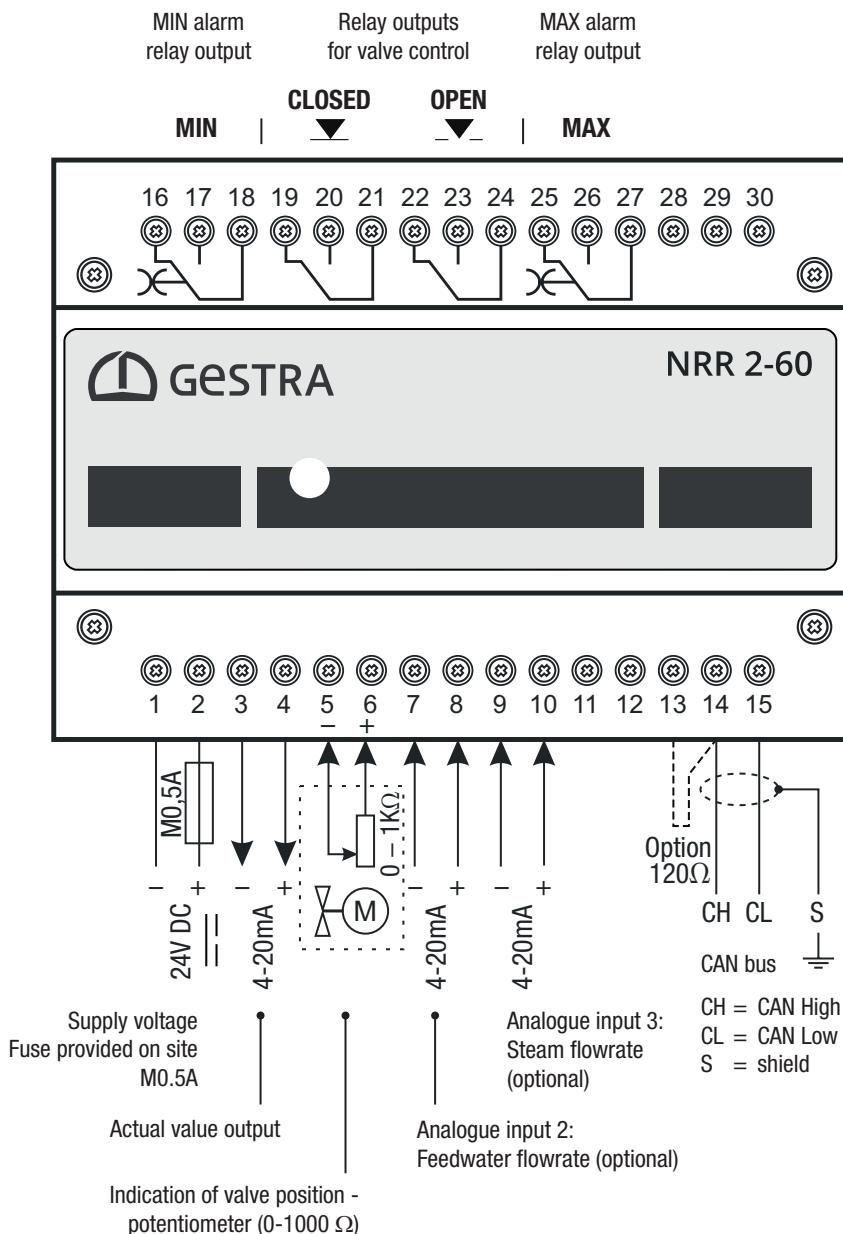


Fig. 7

Electrical connection

Bus line, cable length and cross-section

- A shielded, multi-core, twisted-pair control cable, e.g. UNITRONIC® BUS CAN 2 x 2 x .. mm² or RE-2YCYV-fl 2 x 2 x .. mm² must be used as the bus line.
- Pre-wired control cables (with connector and coupling) are available as accessories in various lengths.
- The baud rate is determined by the line length (transfer rate) between the bus terminal devices, and the conductor size is determined by the overall current input of the measuring sensors.
- As far as possible, route the bus line separately from power lines and protected from environmental influences.

Connecting the 24 V DC power supply

- The NRR 2-60 level controller is supplied with 24 V DC.
- A safety power supply unit that delivers a Safety Extra Low Voltage (SELV) must be used to supply the equipment with 24 V DC.
- Use an M0.5A fuse as an external fuse.

Connecting the MIN/MAX/CLOSED/OPEN output contacts

- Connect the outputs as shown in wiring diagrams Fig. 6/ Fig. 7.
- Only use the terminals specified in the wiring diagrams.
- Use a T2.5A fuse to protect the switching contacts.

Notes on connecting inductive loads

All connected inductive loads, such as contactors and actuators, must have interference suppression using RC combinations as per the manufacturer's specifications.

Connecting the actual value output (4-20 mA)

- Please note the load resistance of max. 500 Ω .
- Use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm², e.g. LIYCY 2 x 0.5 mm².
- Maximum cable length = 100 m.
- Route connecting cables separately from power lines.

Connecting the analogue inputs or the potentiometer (0-1000 Ω)

- Use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm², e.g. LIYCY 2 x 0.5 mm².
- Maximum cable length = 100 m.
- Route connecting cables separately from power lines.

Wiring diagram of CAN bus system

Example

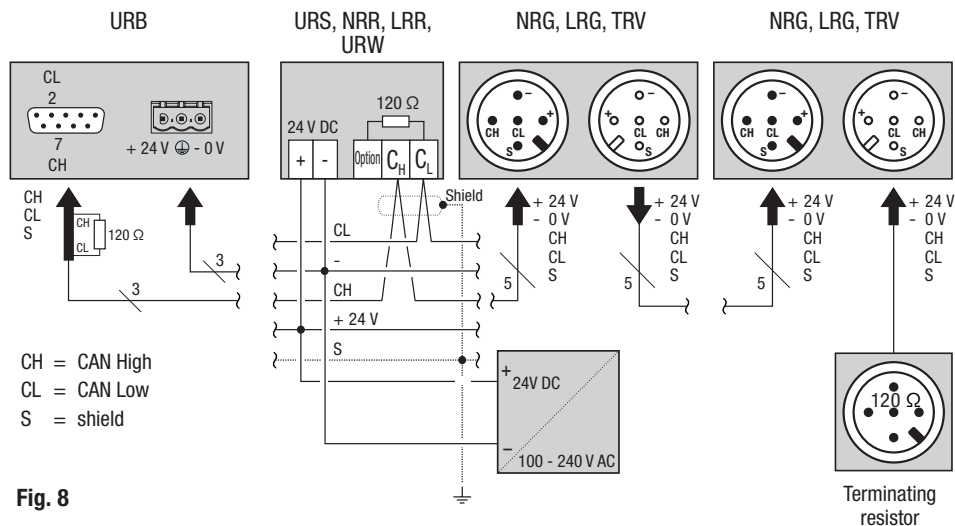


Fig. 8

Important notes on connecting the CAN bus system

- A dedicated 24 V DC SELV power supply unit that is isolated from connected loads must be used to supply the SPECTORconnect system.
- Make sure wiring is in line, not in a star!
- Use a central earth to prevent differences in potential in system parts.
 - ◆ Connect the bus line shields to one another all the way along, and connect to the central earthing point (CEP).
- If two or more system components are connected in a CAN bus network, a 120 Ω terminating resistor must be connected to the **first** and **last** devices between terminals C_L/C_H.
- The NRR 2-60 level controller is equipped with an internal terminating resistor. To activate the internal terminating resistor in the NRR 2-60 level controller, insert a jumper between the terminals ("Option 120Ω" and "CH").
- The CAN bus network must not be interrupted during operation!
If it is, an alarm is triggered.

Changing the equipment settings

DANGER



Danger of death from electric shock if live connections on terminal strips are touched.

- Always switch off the voltage to the equipment before performing work on the terminal strips.
- Check that the plant is not carrying live voltage before commencing work.

You can change the baud rate and controller group of the NRR 2-60 level controller at any time using code switch **Ⓢ** (see **Fig. 5**).



Make changes before installing the level controller, when access is easier.

You will need the following tools:

- Size 2.5 slotted screwdriver, fully insulated
- Size 1 Phillips screwdriver, fully insulated

Proceed as follows:

1. Switch off the supply voltage to the equipment or plant.
2. Unscrew and pull off the lower terminal strip, see **Fig. 5**.
3. Set code switch **Ⓢ** (see **Fig. 5**) as desired, see page 23, **Fig. 9**.
4. When your changes are complete, put the terminal strip back on and screw in place.

Changing the equipment settings

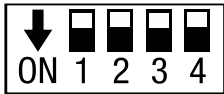
For operation, you must define the controller group and baud rate for the level controller on code switch

Fig. 5. The desired controller functions are achieved by connecting the different level electrodes and configuring the URB 60 visual display and operating unit as appropriate.



Set the same baud rate for all bus nodes.

Code switch **Fig. 5** - sliding switch, white



Configuring the controller group and baud rate

NRR 2-60 level controller

Code switch Fig. 5					
S1	S2	S3	S4	Configuration	ID
OFF	OFF			Controller group 1 (default)	40
OFF	ON			Controller group 2	45
ON	OFF			Controller group 3	60
ON	ON			Controller group 4	65
		OFF		Baud rate 50 kbit/s (default)	
		ON		Baud rate 250 kbit/s	
			OFF	Reserve (default)	
			ON	Reserve	

Fig. 9



Configure the level controller as described in the Installation & Operating Manual of the URB 60 visual display and operating unit.

- You can find the latest Installation & Operating Manuals for the system components named in **Fig. 1** on our website: <http://www.gestra.com>

Setting the measuring range

DANGER



An incorrectly calibrated level electrode is a danger to plant safety.

Before bringing the level controller into service, set the active measuring range of the connected level electrode by defining the start and end of the measuring range.

For your level measurement, set the start (0% calibration value) and end (100% calibration value) of the measuring range of the connected level electrode. This will give you the necessary active measuring range as a percentage of the boiler level.

You can determine these values for the connected level electrode by performing calibration.



To do this, read the relevant information in the Installation & Operating Manual of the NRG 26-60 or NRG 26-61 level electrode.

Bringing into service – starting, operation and alarm

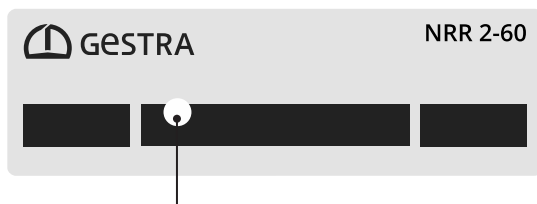


Fig. 10

Multicolour LED (orange/green/red),
orange = power up/green = running/red = malfunction

Feed control or discharge control is active.

Startup

During startup, all the relays of the NRR 2-60 3-point stepping controller are de-energised and the LED lights up orange.

Normal operation

During normal operation, when the supply voltage is on and the measured level is within the MIN and MAX switchpoints, the MIN and MAX relays of the controller are energised. The LED lights up green.

Alarm

If the level is below the set MIN limit or above the set MAX limit, the appropriate relay (MIN/MAX) of the controller is de-energised and indicates that the MIN/MAX level has been reached. The LED lights up green.

The output relays (CLOSED/OPEN) of the NRR 2-60 3-point stepping controller that actuate the valve are energised or de-energised, depending on how they are configured on the URB 60 and on what is currently required.

Behaviour in the event of a malfunction

In the event of a malfunction, the LED lights up red and the MIN/MAX relays become de-energised. The OPEN/CLOSED relays behave as described in the tables on page 27.



Faulty equipment jeopardises plant safety.

- If the NRR 2-60 level controller does not behave as described on this page, it may be faulty.
- Perform failure analysis.
- Only replace faulty equipment with identical equipment from GESTRA.

System malfunctions

Causes

System malfunctions occur if CAN bus components have been incorrectly installed or configured, if the equipment has overheated, if there is interference in the supply network or if electronic components are faulty.

Check the installation and configuration before systematic troubleshooting

Installation:

- Check that the installation location complies with the admissible ambient conditions in terms of temperature, vibration, interference sources, etc.

Wiring:

- Does the wiring conform to the wiring diagrams?
- Is the bus line polarity correct throughout?
- Is a 120 Ω terminating resistor connected to the terminal devices of the CAN bus line?

Controller group and baud rate configuration on the level controller:

- Are the controller group and baud rate correctly set on code switch .

Configuration of electrodes:

- Are the electrodes correctly set and has the measuring range been calibrated?

Baud rate:

- Is the cable length correct for the set baud rate?
- Is the baud rate identical for all devices?

DANGER



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

- Always switch off the voltage to the equipment before working on the terminal strips (installation, electrical connection, disassembly).
- Disconnect all poles of the supply cable from the mains and secure so they cannot be switched back on.
- Check that the plant is not carrying live voltage before commencing work.
- Interrupting the CAN bus during operation triggers an alarm.

System malfunctions

Indication of system malfunctions

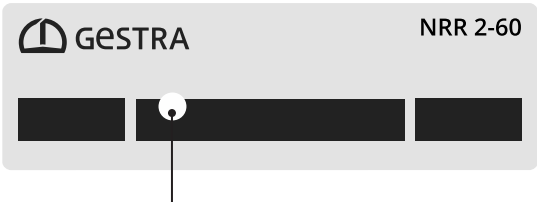


Fig. 11

Multicolour LED (orange/green/red),
orange = power up/green = running/red = malfunction

Indication of malfunctions in the NRR 2-60 level controller (feed control active)					
Type of fault/malfunction	Relay				LED
	MIN	MAX	CLOSED	OPEN	
Breakdown in CAN bus communication Electrode failure	De-energised	De-energised	De-energised	Energised	Red
Interruption to power supply	De-energised	De-energised	De-energised	De-energised	Off

Indication of malfunctions in the NRR 2-60 level controller (discharge control active)					
Type of fault/malfunction	Relay				LED
	MIN	MAX	CLOSED	OPEN	
Breakdown in CAN bus communication Electrode failure	De-energised	De-energised	Energised	De-energised	Red
Interruption to power supply	De-energised	De-energised	De-energised	De-energised	Off

What to do in the event of system malfunctions



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

Taking out of service

1. Switch off the supply voltage and the voltage to the equipment.
2. Check that the equipment is not live.
3. Unscrew and pull off the upper and lower terminal strips, see **Fig. 5 A; B**
4. Release the slider holder on the base of the equipment, and detach the NRR 2-60 level controller from the support rail.

Disposal

Dispose of the level controller in accordance with statutory waste disposal regulations.

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.

Such media include solid, liquid or gaseous substances, mixtures of these, or 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 returned goods and be accessible from the outside. Otherwise, the goods cannot be dealt with and will be returned, carriage unpaid.

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 (and declaration of decontamination) and send it with the products to GESTRA.

Declaration of Conformity Standards and Directives

You can find details on the conformity of the equipment and the applicable standards and directives in the Declaration of Conformity and associated certificates.

You can download the Declaration of Conformity from www.gestra.com and request relevant certificates by writing to the following address:

GESTRA GmbH

Münchener Straße 77

28215 Bremen

Germany

Tel. +49 421 3503 0

Fax +49 421 3503 393

e-mail info@de.gestra.com

Website www.gestra.com

Modifications to the equipment not approved by us will invalidate the Declarations of Conformity and certificates.



You can find our authorised agents around the world at:

www.gestra.com

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