

# KUNBUS

■ industrial communication



## User Manual Gateway component Serial

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# 1 General Information

## 1.1 Disclaimer

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## 1.2 Notes Regarding this User Manual

This user manual provides important technical information that can enable you as a user to integrate the Gateways into your applications and systems efficiently, safely and conveniently. It is intended for trained, qualified personnel, whose sound knowledge in the field of electronic circuits and expertise in Serial connections is assumed.

As an integral part of the module, the information provided here should be kept and made available to the user.

## 1.3 Validity

This document describes the application of the KUNBUS Gateway with the product number:

- PR100068, release 01
- PR100090, release 01

## 1.4 Limitation of Liability

Warranty and liability claims will lapse if:

- the product has been used incorrectly,
- damage is due to non-observance of the operating manual,
- damage is caused by inadequately qualified personnel,
- damage is caused by technical modification to the product (e.g. soldering).

## 1.5 Customer Service

If you have any questions or suggestions concerning this product, please do not hesitate to contact us:

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73770 Denkendorf  
+49 (0)711 3409 7077  
support@kunbus.de  
www.kunbus.de

## 2 Safe Use

### 2.1 User

The Gateway may only be assembled, installed and put into operation by trained, qualified personnel. Before assembly, it is absolutely essential that this documentation has been read carefully and understood. Expertise in the following fields is assumed:

- electronic circuits,
- basic knowledge of Serial connections,
- work in electrostatic protected areas,
- locally applicable rules and regulations for occupational safety.

### 2.2 Symbols

The symbols used have the following meaning:

#### **DANGER**

##### **Danger**

Always observe this information!

There is a safety hazard that can lead to serious injuries and death.

#### **CAUTION**

##### **Caution**

There is a safety hazard that can result in minor injuries and material damage.

#### **NOTICE**

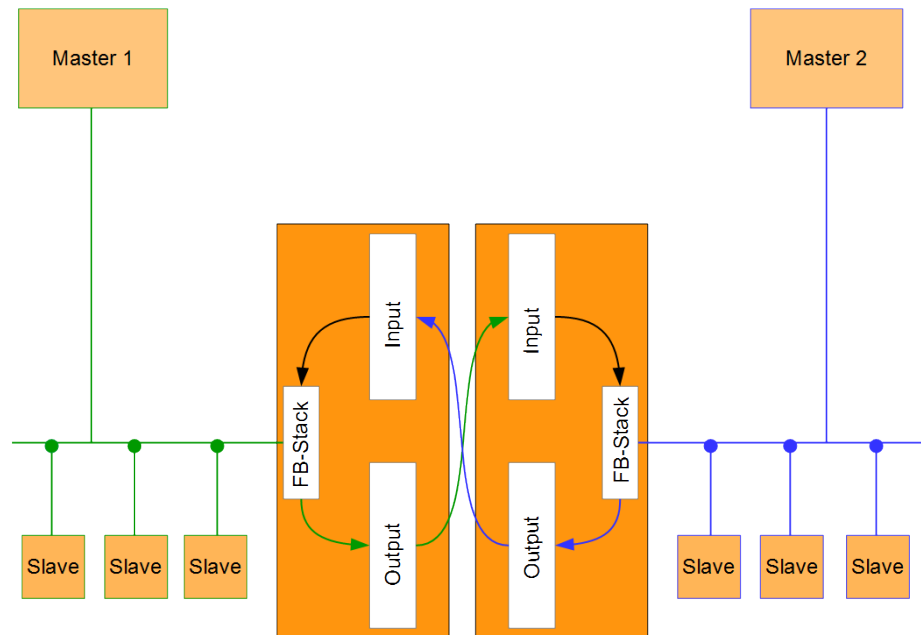
##### **Note**

There is a safety hazard that can result in material damage.

## 3 Overview

### 3.1 Functionality

The KUNBUS Gateway is a protocol converter. It allows communication between networks with different protocols.



*Illustration 1: Functionality*

A Gateway consists of 2 gateway components that master one specific protocol each. You can combine these gateway components as you wish. This design offers you a high degree of flexibility, since you can exchange the individual gateway components at any time. The following gateway components are currently available as slaves:

- CANopen
- CC-Link
- DeviceNet
- EtherCAT
- EtherNet/IP
- Modbus RTU
- Modbus TCP
- POWERLINK
- PROFIBUS
- PROFINET
- Sercos III

## 3.2 Scriptor

Product variant "Serial" includes a software component that allows you to set up customer-specific data exchange protocols. If, for example, the gateway component is to communicate in an application with a serial-controlled servomotor, this servomotor expects a preset protocol to be processed in order to receive the actuator values or to return sensor values. With the aid of the Scriptor you can load small executable program sequences into the gateway component that are then executed there cyclically. With the appropriate data exchange protocol the gateway component can receive such actuator values and transmit these to the servomotor via the fieldbus. The program sequences required are loaded once into the gateway component in the form of a script and then always executed there cyclically.

To use the Scriptor, you need a jumper with USB interface (PR1000101), which is not included in the scope of delivery.

KUNBUS provides you with a PC tool for creating and testing such scripts. You can read all the necessary details in the separate "KUNBUS-Scripter" manual.

### 3.3 Control Elements

Front view

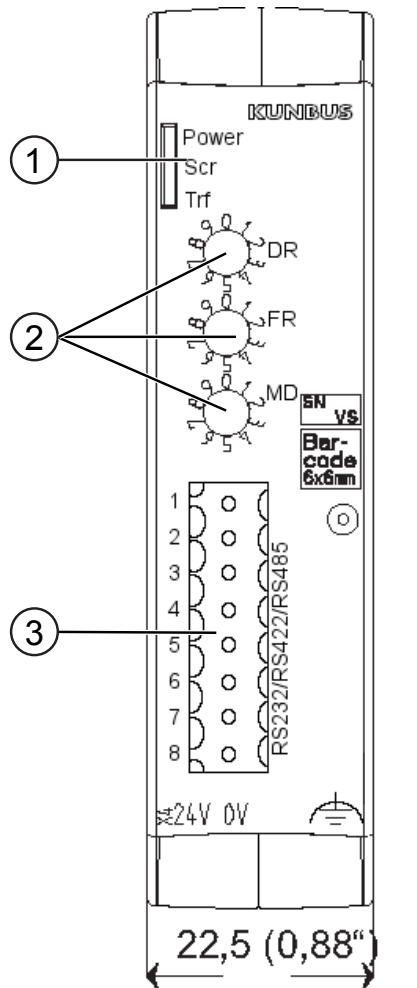


Illustration 2: Front view

1	Status LEDs
2	Rotary coding switch
3	Fieldbus connection



Top

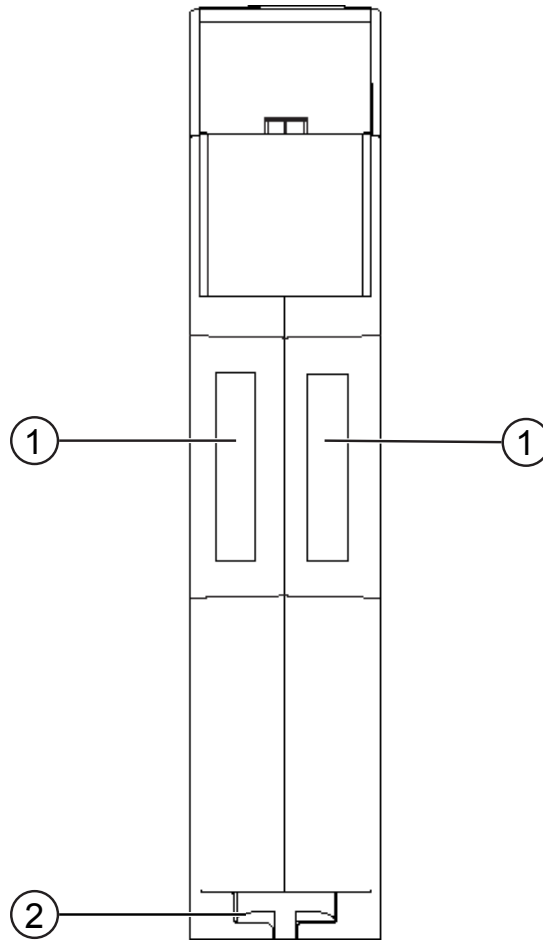


Illustration 3: Top

- |   |   |
|---|---|
| 1 | Interconnect ports<br>for interconnecting the gateway components.               |
| 2 | Locking clamps<br>for securely attaching the gateway component to the DIN rail. |

## Bottom

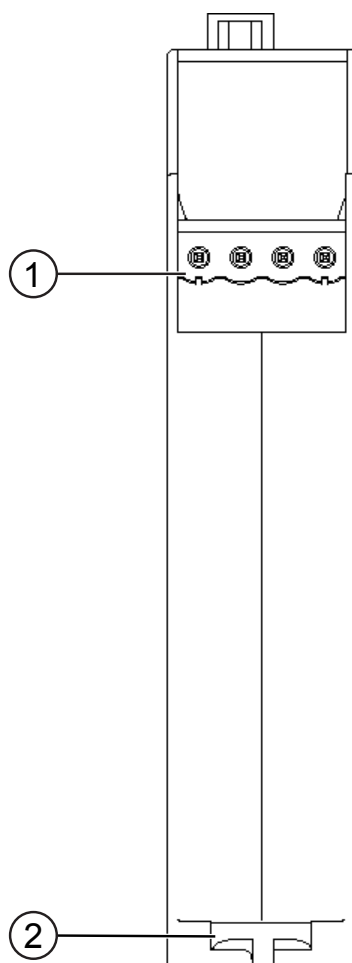


Illustration 4: Bottom

- |   |  |
|---|--|
| 1 | Mains connection with 24 V power supply                                      |
| 2 | Locking clamps for securely attaching the gateway component to the DIN rail. |

### 3.4 Status LEDs

The signals of the status LEDs for Serial connections have the following meaning:

Status LEDs for PR100090  
(Variant Modbus RTU Slave)

LED designation	Signal	Meaning
Power	off	Gateway not running.
	flashes, green	Initialization phase not yet completed.
	on, green	Operational.
	flashes, red	Correctable error (e.g. second gateway component missing).
	on, red	Serious error/defect in the gateway.
Scr	on, green	Configuration valid.
	flashes, red	The rotary switch was changed. Restart the gateway component to use the new settings.
Trf	off	No data communication.
	on, green	Data are received or sent.

## 4 Installation

### 4.1 Preparations for Trouble-free Operation

In the following section we have compiled some general information for you that is important for trouble-free operation. If you are already acquainted with this topic, you can skip to the next section. There, you will learn about which conditions are necessary for installing the gateway.

#### Cable routing

Route your cables separately in cable groups. This will protect your gateway from any unintended electromagnetic interferences.

The following groups should be routed separately from each other:

Group	Line
A	Data and power supply lines for: DC voltage below 60 V AC voltage below 25 V
B	Data and power supply lines for: DC voltage between 60 V and 400 V AC voltage between 25 and 400 V
C	Power supply lines above 400 V

- You can route cables of the same group together in cable ducts or bundles.
- Cables of group A and B:
  - Route the groups in separate bundles or
  - in cable ducts at a minimum distance of 10 cm from each other.
- Cables of group C
  - Route the groups in separate bundles or
  - in cable ducts at a minimum distance of 50 cm from the other groups.

## Shielding

Shield your cables. This will reduce any unintended electromagnetic interferences.

## Potential equalization

Potential differences occur when devices are connected to different earths. These potential differences cause malfunctions.

To prevent malfunctions, you have to route an equipotential equalization conductor.

When doing so, bear in mind the following points:

- Select an equipotential equalization conductor with low impedance.
- Select the following as a reference value for the cross-section of the potential equalization cable:
  - 16 mm<sup>2</sup> for potential equalization cables of up to 200 m in length
  - 25 mm<sup>2</sup> for potential equalization cables of more than 200 m in length
- Use potential equalization cables made of copper or galvanized steel.
- Connect potential equalization cables extensively with the earth rail.
- The smallest surfaces possible should be sandwiched between potential equalization cables and signal cables.

If the devices of the control system are connected by shielded signal cables that are earthed on both sides, the impedance must be 10% of the shielding impedance.

## 4.2 Requirements

The Gateway was designed for use in a control cabinet.

- ✓ The protection class of the control cabinet must be equivalent to at least IP54.
- ✓ For installation in the control cabinet you need a DIN rail 35 x 7.5 mm (EN50022).
  - Install the DIN rail horizontally in the control cabinet according to the manufacturers' specifications. When doing so, make sure that the Gateway is at a sufficient distance from other devices.

### NOTICE

**Your gateway could be damaged if temperatures are too high.**

- ➔ Make sure that the ambient temperature in the control cabinet is less than 60 °C.
- ➔ Keep the ventilation slots unobstructed. These must not be covered by cables etc.
- ➔ Maintain sufficient distance from other devices.

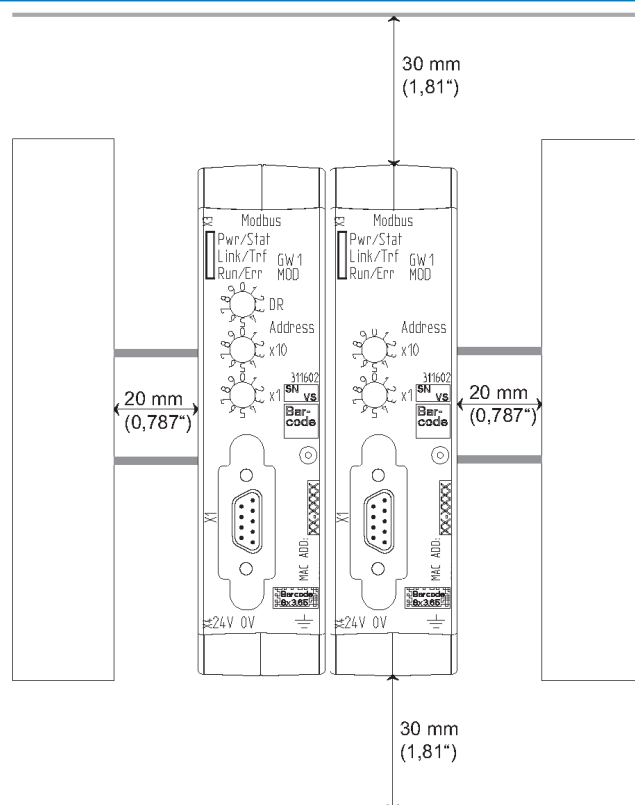


Illustration 5: Distances for installation

- Connect each gateway component individually to functional earth. When doing so, make sure that the power supplies of both gateway components have the same ground.
- ⇒ Your control cabinet now meets all requirements for installing the gateway.

## 4.3 Connecting Gateway Components

In order to attain a fully functional gateway, you have to interconnect both gateway components.

- Connect an interconnect port to each gateway component using the plug-in jumper provided.

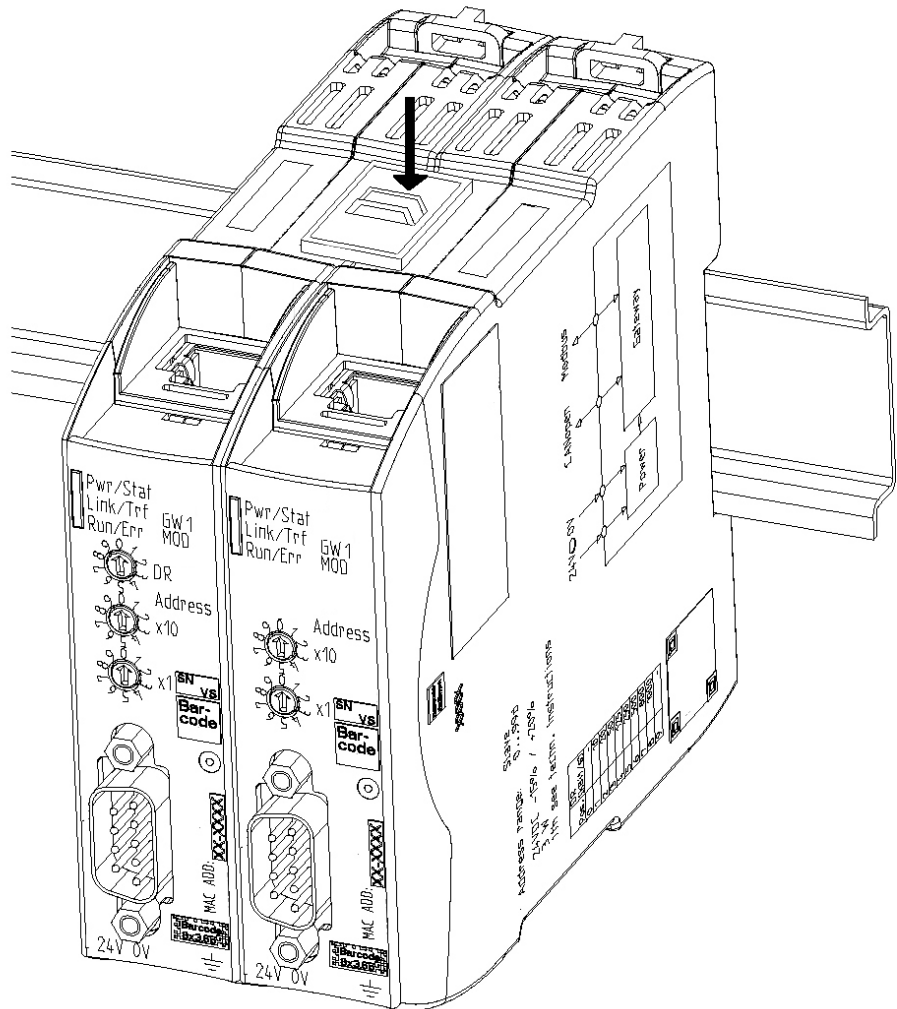


Illustration 6: Connecting gateway components

⇒ You can now install the gateway in the control cabinet.

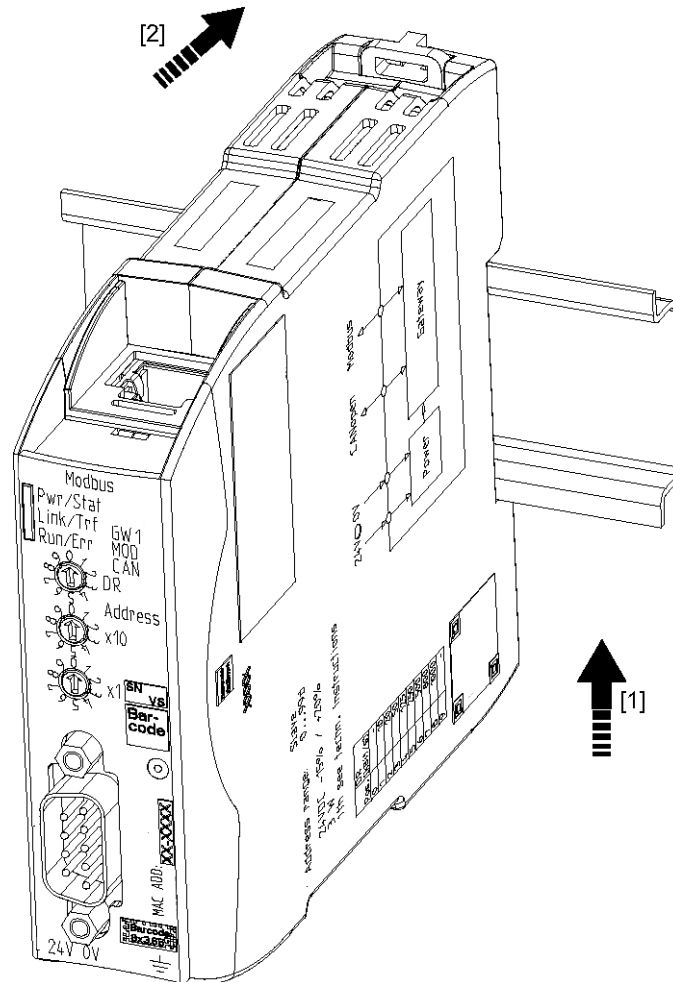
### NOTICE

**Only ever interconnect 2 gateway components.**

If you connect additional components, severe defects could result on all devices.

## 4.4 Installing a Gateway in the Control Cabinet

- Hold the raster element of the gateway on the DIN rail.
- Press down the locking elements towards the gateway.
- Make sure that the gateway is firmly attached to the DIN rail.





## 4.5 Connecting a Power Supply

To connect the gateway component to the power supply, you need a spring-loaded terminal (e.g. Metz-Connect SP995xxVBNC).

You have to connect each gateway component separately to a power supply. Never interconnect functional earth and GND, otherwise the galvanic isolation between gateway GND and fieldbus ground will be removed. Instead, connect the functional earth with low impedance to the potential equalization. You can then dispense with this connection if the shield of the fieldbus cable is connected to the potential equalization with lower impedance when entering the control cabinet.

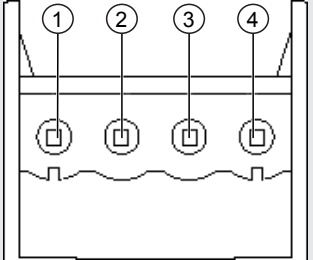
### NOTICE

**Connect each of the two gateway components to its own power supply**

→ Ensure in particular that no potential differences occur between the GND pins (2).

Pin assignment:

Pin	Assignment
1	24 V for module supply
2	GND
3	Do not connect!
4	Functional earth



### NOTICE

**Do not connect GND to PE**

This connection could cause unintended malfunctions.

## 4.6 Connecting a Gateway to the Fieldbus

To connect the gateway component to the fieldbus, you need a Phoenix connector.

The gateway component supports three different interfaces:

- RS-232
- RS-422
- RS-485

The pin assignment varies depending on the interface used:

Mode	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
RS232	5 V fused	Reserved	TX	GND-ISO	RX	Reserved	Reserved	Shield
RS485	5 V fused	Reserved	Reserved	GND-ISO	Data IN	Data OUT	Reserved	Shield
RS422	5 V fused	RX -	RX +	GND-ISO	TX -	TX +	Reserved	Shield

## 5 Configuration

### 5.1 Supported Size of the Process Data

The gateway component for Serial connections supports process data of a length up to 512 bytes.

#### NOTICE

**Bear in mind that the maximum length of the process data is always determined by the fieldbus with the shorter data length.**

## 5.2 Settings on the Rotary Switches

The gateway component has 3 BCD rotary switches.

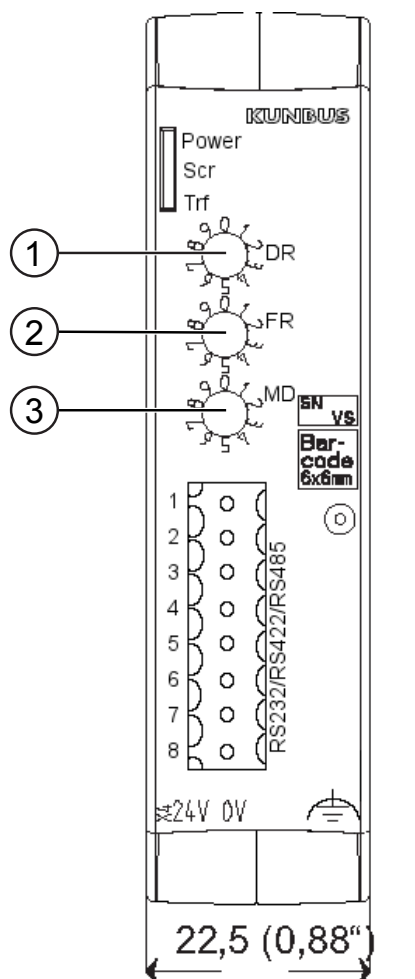


Illustration 7: Rotary switch

You can use these rotary switches for:

Switch	Function
DR	Setting bitrate
FR	Setting Frame Format
MD	Setting the type of interface

## Setting bitrate

Use switch "DR" (1) to set the bitrate. The settings have the following values:

Switch setting	PR 100068 (variant serial)	PR100090 (Variant Modbus RTU Slave)
0	Settings from the script are used. <b>Prerequisite:</b> You have called the instruction "configPort" in the Script.	The gateway component works with the default values: <ul style="list-style-type: none"> <li>- 9600 Bit/s</li> <li>- 8Bit</li> <li>- Even Parity</li> <li>- 1 StopBit</li> <li>- Node-ID 1</li> </ul>
1	2400 kBit/s	2400 kBit/s
2	4800 kBit/s	4800 kBit/s
3	9600 kBit/s	9600 kBit/s
4	19200 kBit/s	19200 kBit/s
5	38400 kBit/s	38400 kBit/s
6	54600 kBit/s	54600 kBit/s
7	115200 kBit/s	115200 kBit/s
8	115200 kBit/s	115200 kBit/s
9	9600 kBit/s (Default)	9600 kBit/s (Default)

### NOTICE

#### Error in the script processing

If you call up the instruction "configPort" for PR 100068 in the script and simultaneously set rotary switch 1 to one of the positions 1-9, this generates an error in the script processing.

## Setting Date Frame Format

Use switch "FR" (2) to set the data frame format

### NOTICE

If you have selected the configuration via the script for product variant PR 100068, you do not have to perform any further settings here.

- 0: Even Parity 8 Bit 1 Stop-Bit
- 1: Odd Parity 8 Bit 1 Stop-Bit
- 2: No Parity 8 Bit 1 Stop-Bit
- 3: Even Parity 8 Bit 2 Stop-Bit
- 4: Odd Parity 8 Bit 2 Stop-Bit
- 5: No Parity 8 Bit 2 Stop-Bit
- 6,7,8,9: corresponds to setting "0"

## Setting the type of interface

Use switch MD (3) to define the type of interface.

Here, you can select the appropriate interface mode. In addition, you can activate or deactivate a termination resistor and failsafe.

Termination resistor

The termination resistor prevents reflexions from occurring at the end of the connection that could cause errors in the data communication.

The integrated termination resistor is 120  $\Omega$ .

### NOTICE

**Activate the termination resistor only if the module is the first or last subscriber of the connection.**

Errors in the data communication may occur if the termination resistor is activated while the module is connected at a central position in the network.

## Failsafe

A failsafe stabilizes the data transmission.

**Tip!:** Activate this function for longer, failure prone connections.

- 0: RS-232Mode (V.24 ) +- 10V to Ground Rx/Tx
- 1: RS485 mode
  - Failsafe deactivated
  - Termination resistor deactivated
- 2: RS485 mode
  - Failsafe deactivated
  - Termination resistor activated
- 3: RS485 mode
  - Failsafe activated
  - Termination resistor deactivated
- 4: RS485 mode
  - Failsafe activated
  - Termination resistor activated
- 5: RS422 mode
  - Failsafe deactivated
  - Termination resistor deactivated
- 6: RS422 mode
  - Failsafe deactivated
  - Termination resistor activated
- 7: RS422 mode
  - Failsafe activated
  - Termination resistor deactivated
- 8: RS422 mode
  - Failsafe activated
  - Termination resistor activated
- 9: as 0

**Also see about this**

 [\[▶ 25\]](#)

 [\[▶ 27\]](#)

## 5.3 Settings in the memory registers

To configure the gateway component, you have to access the register of the memory unit using the configuration software of your fieldbus master.

The storage unit is the central component for all functions of the gateway component. It is subdivided into individual Memory Register with a width of 16 bits each.

The functionality of the addressing was incorporated from Modbus. The register assignment depends on the application and is not specified by the Modbus specification. A Memory Register according to this specification has a register number between 1 (0x0001) and a maximum of 65536 (0x10000), of which the gateway component only uses a small part, however.

The 16-bit values are stored internally in the memory in Little Endian order. This must be taken into account when you access data via the fieldbus interface.

You have various access rights to the memory register:

- Read/Write: In these memory registers you can perform settings actively. We recommend that you perform the correct settings in all memory registers with this access type.  
Bear in mind that your settings will first be used by the gateway component after a restart.
- Read Only: These memory registers are informative. They display the parameters currently used by the gateway component.

Brief Overview of the Memory Registers

Memory Register	Function	Access
4096	Restarting software	Read/write
4097	Viewing current bitrate	Read only
4098	Current Frame Format	Read only
4099	Electrical response	Read only
4100	Setting the node ID	Read/write
4101	Default Settings	Read only
4102	Input size of the partner gateway component	Read only
4103	Output size of the partner gateway component	Read only
4104	Module type of the partner gateway component	Read only
4105	Fieldbus status of the partner gateway component	Read only

All memory registers are described in detail below.



## 4096 Restarting software

In this memory register you can restart the software of the gateway component.

<b>Memory Register</b>	4096
<b>Access type</b>	Holding
<b>Permanently stored</b>	No
<b>Access</b>	Read/write
<b>Meaning</b>	
19266 (4b42h)	Restarting software

## 4097 Current bitrate

In this memory register you will find information for the bitrate currently used.

<b>Memory Register</b>	4097
<b>Value Range</b>	1-8
<b>Permanently stored</b>	Yes
<b>Monitors with Range</b>	Yes
<b>Access</b>	Read only
<b>Meaning</b>	
0	Using settings from the script (only for PR 100068)
1	2400 kBit/s
2	4800 kBit/s
3	9600 kBit/s
4	19200 kBit/s
5	38400 kBit/s
6	54600 kBit/s
7	115200 kBit/s
8	115200 kBit/s

4098 Current Frame Format In this memory register you will find information of the last frame format set for the Modbus interface.

<b>Memory Register</b>	4098
<b>Value Range</b>	0-5
<b>Permanently stored</b>	Yes
<b>Monitors with Range</b>	Yes
<b>Access</b>	Read only
<b>Meaning</b>	
0	Even Parity 8 Bit 1 Stop-Bit
1	Odd Parity 8 Bit 1 Stop-Bit
2	No Parity 8 Bit 1 Stop-Bit
3	Even Parity 8 Bit 2 Stop-Bit
4	Odd Parity 8 Bit 2 Stop-Bit
5	No Parity 8 Bit 2 Stop-Bit

4100 Setting the node ID In this memory register you have the option, a Node-ID to set.

<b>Memory Register</b>	1025
<b>Value Range</b>	1-249
<b>Permanently stored</b>	Yes
<b>Monitors with Range</b>	Yes
<b>Access</b>	Read/write
<b>Meaning</b>	
1-249	The set node ID

4101 Default Settings In this memory register you can see whether or not the gateway component works with the default settings.

<b>Memory Register</b>	4101
<b>Value Range</b>	0-1
<b>Default Value</b>	0
<b>Permanently stored</b>	No
<b>Monitors with Range</b>	No
<b>Access</b>	Read only
<b>Meaning</b>	
0	No Default Value.
1	Gateway component works with default settings.

4099 Electrical response

In this memory register you can see the current settings for the electrical response on the serial interface.

You can change the settings using the rotary coding switch.

<b>Memory Register</b>	4099
<b>Value Range</b>	0-9
<b>Permanently stored</b>	No
<b>Monitors with Range</b>	Yes
<b>Access</b>	Read only
<b>Meaning</b>	
0	– RS-232Mode (V.24 ) +- 10V to Ground Rx/Tx
1	– RS485 mode – Failsafe deactivated – Termination resistor deactivated
2	– RS485 mode – Failsafe deactivated – Termination resistor activated
3	– RS485 mode – Failsafe activated – Termination resistor deactivated
4	– RS485 mode – Failsafe activated – Termination resistor activated
5	– RS422 mode – Failsafe deactivated – Termination resistor deactivated
6	– RS422 mode – Failsafe deactivated – Termination resistor activated
7	– RS422 mode – Failsafe activated – Termination resistor deactivated
8	– RS422 mode – Failsafe activated – Termination resistor activated
9	corresponds to setting "0"

4102 Input size of the partner gateway component

In this memory register you can see how large the input data area of the partner gateway component is.

<b>Memory Register</b>	4102
<b>Access type</b>	Holding
<b>Permanently stored</b>	No
<b>Access</b>	Read only

4103 Output size of the partner gateway component

In this memory register you can see how large the output data area of the partner gateway component is.

<b>Memory Register</b>	4103
<b>Access type</b>	Holding
<b>Permanently stored</b>	No
<b>Access</b>	Read only

## 6 Technical Data

### 6.1 Technical Data

<b>Dimensions</b>	
Width	22.5 mm
Height	96 mm
Depth	110.4 mm
Weight	90 g

<b>Electrical data</b>	
Power supply	24 V DC
Power consumption during operation (cyclical data exchange)	100 mA
Status display	LED

<b>Environmental conditions</b>	
Ambient temperature	0 – 60 °C
Storage temperature	- 25 – 60 °C
Humidity	93 % (at 40 °C)
Condensing	Not allowed
Protection class	
Control cabinet	IP54
Housing	IP20
Terminal area	IP20

<b>Assembly data</b>	
DIN rail	35 x 7.5 mm
Height	96 mm
Depth	110.4 mm

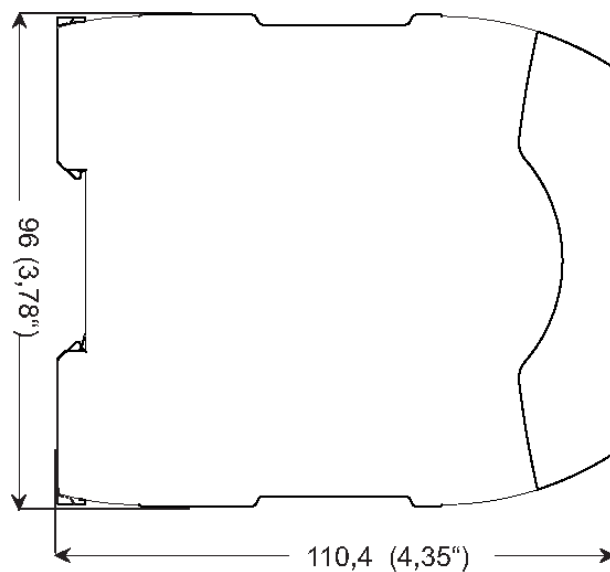


Illustration 8: Side dimensions

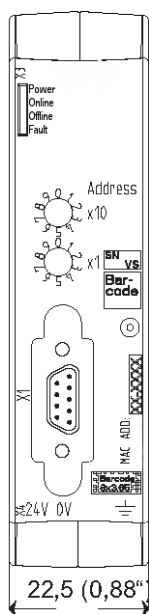


Illustration 9: Front dimensions