JUMO Wtrans receiver

Universal receiver
for JUMO wireless measuring probes

Operating Manual

90293100T90Z001K000

V1.00/EN/00488966

Note for FCC:

This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions:

- this device may not cause harmful interference, and
- this device must accept any interference received, including interference that maycause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This Class A digital apparatus complies with Canadian ICES-003.

Changes or modifications made to this equipment not expressly approved by the manufacturer may void the FCC authorization to operate this equipment.

Remarque pour IC:

Cet appareil numérique de la classe [A] est conforme à la norme NMB-003 du Canada.

Avis de conformité insérés dans le manuel d'utilisation des appareils radio exempts de licence. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- l'appareil ne doit pas produire de brouillage, et
- l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Approvals/Homologations

USA	FCC ID	VT4-WTRANST01 VT4-WTRANST01-02
Canada	IC	7472A-WTRANST01 7472A-WTRANST0102

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Contents

1.1 Safety information

General

This manual contains information that must be observed in the interest of your own safety and to avoid material damage. This information is supported by symbols which are used in this manual as indicated.

Please read this manual before starting up the device. Store this manual in a place that is accessible to all users at all times.

If difficulties occur during startup, please do not intervene in any way that could jeopardize your warranty rights!

Warning symbols

DANGER!

This symbol indicates that **personal injury from electrocution** may occur if the appropriate precautionary measures are not taken.

CAUTION!

This symbol in connection with the signal word indicates that **material damage or data loss** will occur if the respective precautionary measures are not taken.

Note symbols

NOTE!

This symbol refers to **important information** about the product, its handling, or additional benefits.

REFERENCE!

This symbol refers to **additional information** in other sections, chapters, or other manuals.

1 Introduction

1.2 Description

The Wtrans receiver T01 in combination with suitable Wtrans transmitters are used for mobile or stationary measurements of physical measurands. A significant reduction of the installation work is achieved due to the use of trendsetting wireless technology found in the industrial radio frequency 868.4 MHz or 915 MHz. Cable connections are not required. The radio-based sensor technology also functions in a rough industrial environment. The supplied lambda/four-antenna with an impedance of 50 ohm can be directly screwed on or mounted externally. If the antenna wall holder with a 3 m antenna cable is used then the open air range is 300 m. In the receiver the received measured values are converted, displayed, and are available as linear current or voltage signals (0(4) to 20 mA, 0 to 10 V) and via the digital interface RS485. All receiver outputs are galvanically isolated.Linkage to higher-ranking systems (e.g. the plant visualization software JUMO SVS3000 or the Modbus master compatible JUMO LOGOSCREEN nt paperless recorder) is possible via the digital interface with Modbus protocol.

Operation and configuration can be performed via the keypad in conjunction with a 2-line LCD display or with a setup program for greater convenience. This way, parameters such as filter constants, offset, alarms, and drag indicators (minimum and maximum value memory) can be set separately for each channel. For this purpose, a connector is provided on the front for a PC interface with USB/TTL converter for connecting the receiver and the PC.

The receiver in the mounting rail case is intended for installation on a DIN rail 35 × 7.5 mm according to DIN EN 60715.

The screw terminals for the electrical connection are located at different levels. The conductor cross section should not be bigger than 2.5 mm^2.

1.3 Block diagram

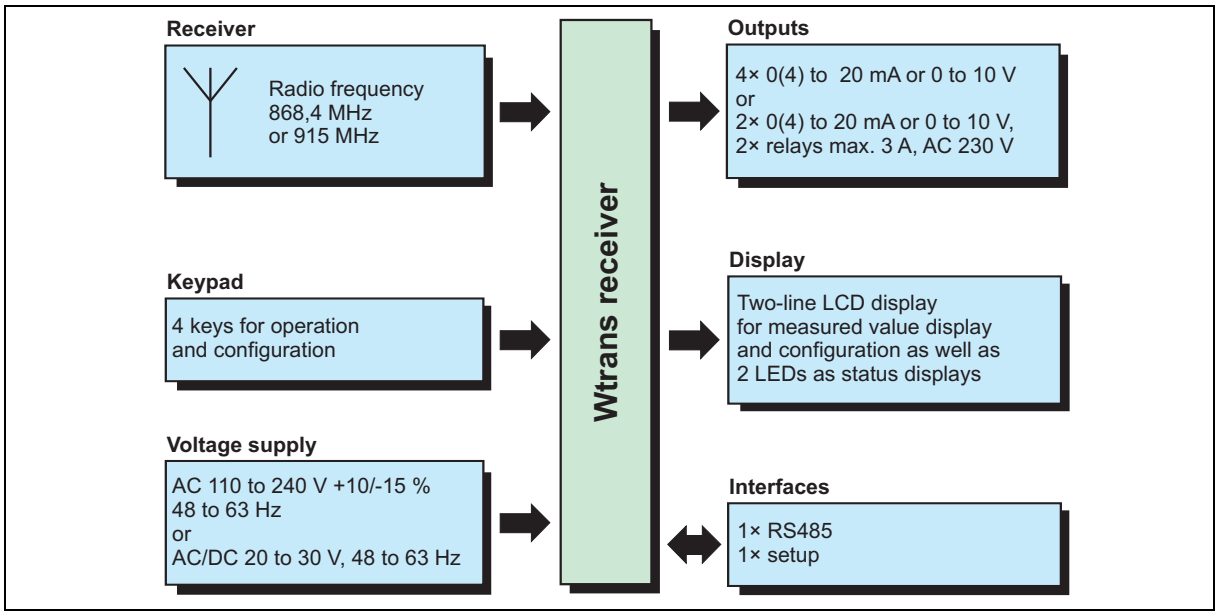


Fig. 1-1 Function review of the receiver

1.4 Declaration of conformity

NOTE!

Hereby JUMO GmbH & Co. KG declares that the radio equipment type Wtrans is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following Internet address: www.jumo.net

2.1 Nameplate

Position

The nameplate is glued to the unit.

Contents

The specifications contain important information. This includes:

Description	Designation on the nameplate	Example
Device type	Type	902931/10-8-10-23/000
Part no.	TN	00123456
Serial number	F-no.	0139741001115060005
Voltage supply		AC 110 to 240 V +10/-15 %, 48 to 63 Hz

Type

Please check the type supplied against your order document. To identify the type, use chapter 2.2 "Order details", page 10.

TN

The part no. uniquely identifies an article in the catalog. It is used in communication between the sales department and the customer.

F-no.

The fabrication number is used by the manufacturer to identify the device.

The date of manufacture (year/calendar week) and the version number is specified in the fabrication number.

Date of manufacture

The figures used for this are 12, 13, 14, 15.

Example: F-no. = 013974100111**1506**0005

The device was produced in the 6th calendar week of 2015.

Version number

Example: F-no. = 013974100**1**15060005

The receiver is equipped with the following functions, if the number 1 or higher stands at the eleventh position (counted from the left):

- Receipt of the input variables RTD temperature probe, thermocouple, potentiometer and voltage
- Customized linearization
- Scaling for the input variables potentiometer or voltage

If 0 stands at the eleventh position (counted from the left), it is a predecessor version which can only process the input variable RTD temperature probe "Pt1000“!

2 Identifying the device version

2.2 Order details

			(1)	**Basic type**
		902931/10		Wtrans receiver T01.EC1 C rail case, protection type IP20, 4 analog outputs 0(4) to 20 mA or 0 to 10 V, RS485 interface with Modbus protocol
		902931/30		Wtrans receiver T01.EC3 C rail case, protection type IP20, 2 analog outputs 0(4) to 20 mA or 0 to 10 V and 2 relay outputs AC 230 V/5 A potential free, RS485 interface with Modbus protocol
			(2)	**Version**
x	x	8		Standard with default settings
x	x	9		Customer-specific configuration (specifications in plain text)
			(3)	**Radio frequency**
x	x	10		868.4 MHz (Europe)
x		20		915 MHz (America, Australia, Canada, and New Zealand) (not in connection with AC/DC 20 to 30 V) Ten frequencies can be configured in the 915 MHz frequency band.
			(4)	**Voltage supply**
x	x	23		AC 110 to 240 V +10/-15 %, 48 to 63 Hz
x	x	25		AC/DC 20 to 30 V, 48 to 63 Hz
			(5)	**Extra code**
x	x	000		None

	(1)		**(2)**		**(3)**		**(4)**		**(5)**
Order code		-		-		-		/	
Order example	902931/10	-	8	-	10	-	23	/	000

2.3 Scope of delivery

Our scope of delivery includes:

- 1 device in the ordered version
- 1 lambda/4 antenna, impedance 50 ohm, 868.4 MHz, $T_{max.}$ 125 °C or
- 1 lambda/4-antenna, impedance 50 ohm, 915 MHz, $T_{max.}$ 125 °C
- 1 operating manual

If you have any questions, please contact your supplier.

2 Identifying the device version

2.4 Accessories

The following articles are subject to charge and must be ordered separately:

Description	Part no.
Setup program on CD-ROM, multilingual[a]	00488887
Setup program incl. OnlineChart on CD-ROM, multilingual[a]	00549067
OnlineChart activation	00549188
additional lambda/4 antenna, impedance 50 ohm, 868.4 MHz, $T_{max.}$ 125 °C	00503151
additional lambda/4 antenna, impedance 50 ohm, 915 MHz, $T_{max.}$ 125 °C	00503152
Antenna holder for wall mounting with antipole for lambda/4 antenna	00482648
Lambda/4 antenna with waterproof, permanently connected cable, length 10 m, 868.4 MHz, $T_{max.}$ 125 °C	00523293
Lambda/4 antenna with waterproof, permanently connected cable, length 20 m, 868.4 MHz, $T_{max.}$ 125 °C	00523294
Antenna cable, length 3 m, impedance 50 ohm with pre-assembled screw-type connection, $T_{max.}$ 85 °C	00482646
Antenna cable, length 5 m, impedance 50 ohm with pre-assembled screw-type connection, $T_{max.}$ 85 °C	00490066
Antenna cable, length 10 m, impedance 50 ohm with pre-assembled screw-type connection, $T_{max.}$ 85 °C	00490068
Antenna cable, length 10 m, impedance 50 ohm with pre-assembled screw-type connection, $T_{max.}$ 125 °C	00511870
PC interface with USB/TTL converter, adapter (socket) and adapter (pins)	00456352
Interface converter I-7520A – RS232 to RS422/485	00376969
Plug-in power supply unit for interface converter (serial)	00365933
Interface card MOXA CP-132i – 2 × RS422/485	00397804
Modbus interface description (The Modbus interface description is available as a free download on the Internet at www.jumo.net.)	-
Plant visualization software JUMO SVS3000 (data sheet 700755)	-
Paperless recorder JUMO LOGOSCREEN nt (data sheet 706581)	-

[a] Configuration using a laptop/PC is only possible with an interface (PC interface with USB/TTL convertor or RS485) and one of the two setup programs.

3.1 Radio technology

The characteristic framework conditions for each transmission system include the available band width in the electro-magnetic spectrum and the maximum permissible transmission capacity. These parameters define the channel capacity.

The main selection criteria for the frequency range to be used include the requirement of a long range, interference resistance as well as the possibility to be able to apply a customized transmission protocol in public spectrum band. The focus when selecting the possible communication technologies is placed on miniaturizing the transmitting and receiving circuit as well as the power consumption, on enhancing the transmission safety and the transmission stability as well as on saving costs of the technology involved. Using a wireless connection essentially promises lower costs, higher flexibility and mobility as well as easier handling.

Taking into account the current applicable legislative texts and the available standards and industry standards, a wireless solution without a generally specified protocol has been selected for use of the Wtrans system on the 868.4 MHz radio frequency (Europe) or 915 MHz radio frequency (America, Canada, Australia, and New Zealand).

Certain areas have strict regulations that apply for this industrial radio frequency with regard to duty cycle, channel distribution, and transmission power. The various subdivisions within this frequency band are shown in Fig. 3-1.

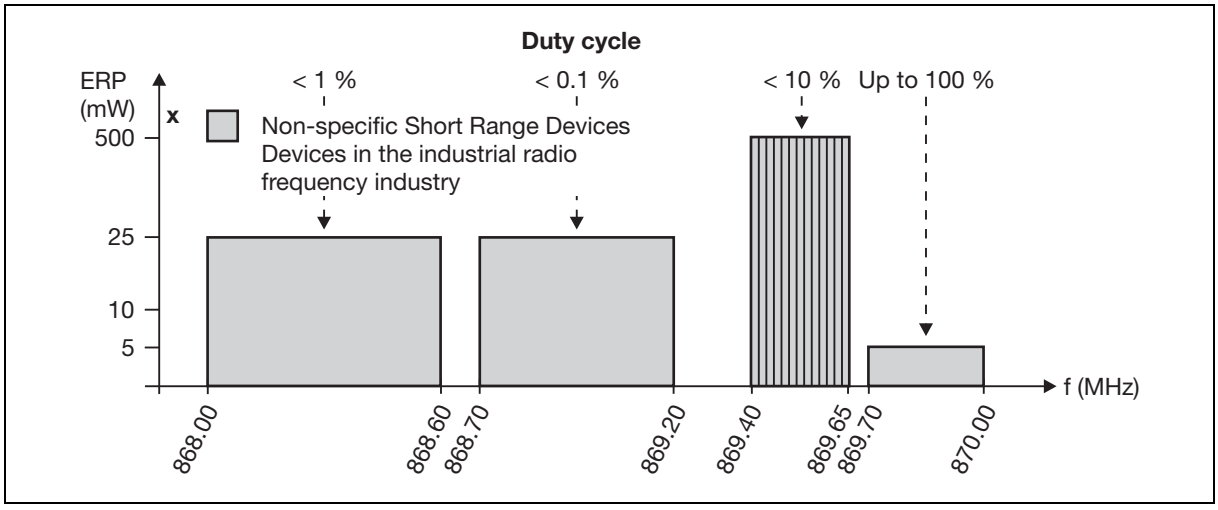


Fig. 3-1 Subdivision of the 868 MHz frequency band

The ERP power value (ERP: equivalent radiated power) value, which is plotted on the Y-axis, represents the permitted transmission capacity related to a Lambda/2 dipole gain. When utilizing the duty cycle during the transmission pulse at a small pulse width, the transmission impulse is only generated for a very short period.

Duty cycle in percentage designates the duration of a transmitter's transmissions based on a 1 hour. The entire transmission time can be distributed to several transmission intervals. Duty cycle thus specifies the ratio between the transmission time and the overall time and is specified in percent.

The duty cycle is also called the pulse-to-pause ratio or mark-to-space ratio.

If, for example, the transmission duration of a signal is 5 ms followed by a 995 ms transmission pause, the duty cycle is derived from the following calculation:

$$\frac{t_S}{tG} = \frac{5\ ms}{1000\ ms} = 0.005 = 0.5\ \%$$

3 Basic principles

3.2 General information about wireless transmission

Wireless signals are electromagnetic waves, the signal of which weakens during travel from the transmitter to the receiver (this is referred to as path attenuation). The field strength reduces inversely proportional in relation to the square of the distance between the transmitter and receiver.

In addition to this natural range restriction, a reduced range may also be caused by the following:

- Reinforced concrete walls, metallic objects and surfaces, heat insulation, or thermal protection windows with a vapor-deposited metal layer reflect and absorb electromagnetic waves, meaning a dead spot is formed behind them.
- The antenna is installed at an insufficient height; therefore, install as high as possible above the ground and ensure there is a line of sight between the transmitter and receiver.

The following values are reference values relating to permeability for radio signals:

Material	**Permeability**
Wood, plaster, glass (uncoated)	90 to 100 %
Brickwork, press boards	65 to 95 %
Reinforced concrete	10 to 90 %
Metal, aluminum lamination	0 to 10 %

The maximum range between the transmitter and receiver is 300 m in the open air when using the antenna holder for wall mounting on the receiver side. Optimum reception is achieved when there is a clear line of sight between the transmitter and receiver. When installing the receiver in a control cabinet or behind concrete walls or ceilings, always use the antenna holder for wall mounting and antenna cable on the receiver side.

NOTE!

The antenna wall holder offered by the device manufacturer is especially matched to the lambda/4 antenna and ensures optimum reception quality.
Antenna wall holders not produced by the device manufacturer may disrupt the reception and cannot ensure optimum reception.

NOTE!

The antenna cable offered by the device manufacturer has an attenuation of 0.8 dB/m. From a technical standpoint, we recommend using the shortest possible antenna to ensure good reception.

3.3 Reception characteristic of the lambda/4 antenna

Alignment of the lambda/4 antenna

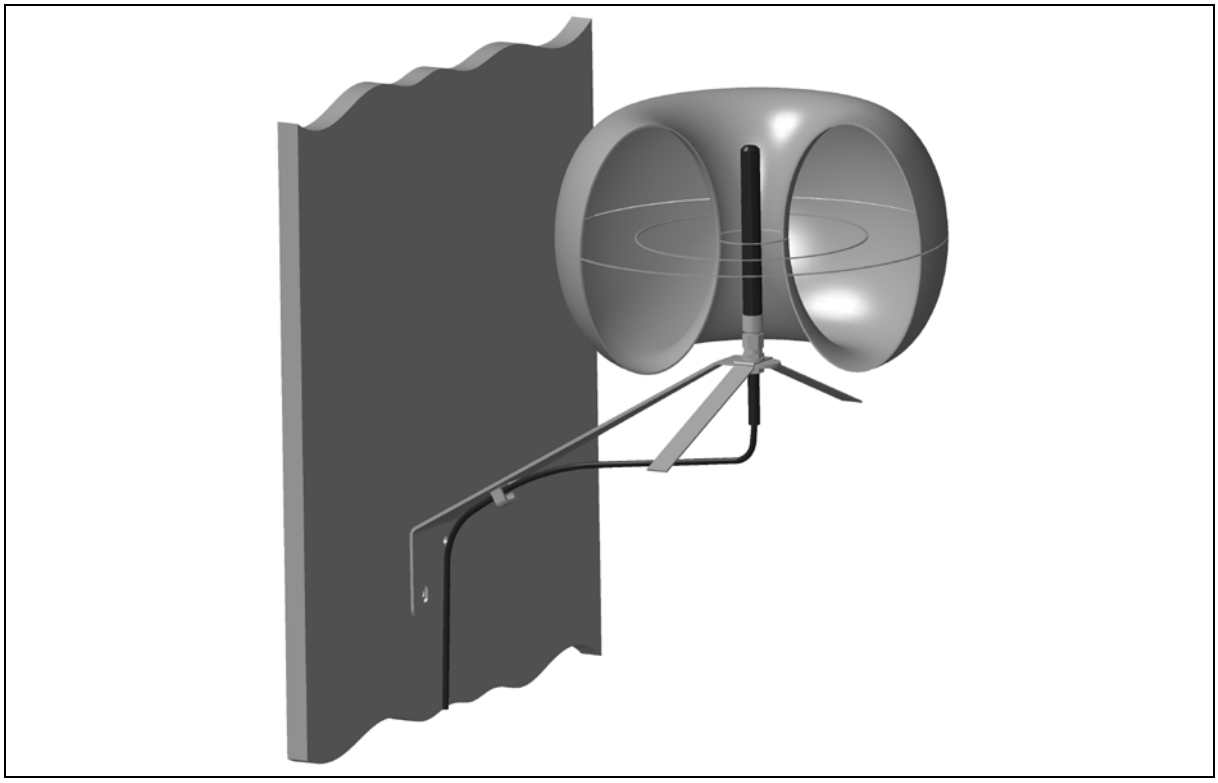


Fig. 3-2 Spatial directional response pattern of the lambda/4 antenna

From the spatial directional response pattern of the lambda/4 antenna you can derive that optimum reception can only be achieved when the antenna is vertically aligned.
From the vertical rod, the reception is nearly identical in all directions. The range and the top and bottom, however, is very limited.
The antenna holder for wall mounting can be mounted with the antenna in a vertical position orientated upward or downward, but horizontal antenna installation is not recommended.

NOTE!

To ensure that the reception antennas do not influence each other, adhere to a minimum distance of 500 mm for an optimum reception.

3 Basic principles

3.4 Interferences

Collisions in case of too many transmitters

When using a large number of transmitters, do not select a transmission interval which is too low, otherwise the transmission frequency will be unnecessarily occupied. A transmission interval that is too low leads to a very high data volume on the selected frequency, which can lead to collisions with other transmitters. The collisions can cause datagrams to be destroyed during wireless transmission.

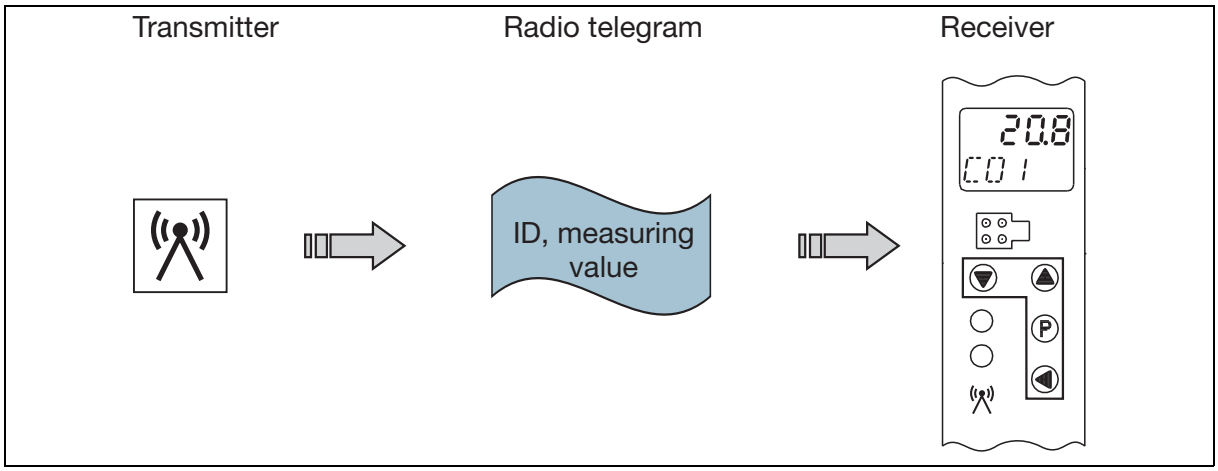


Fig. 3-3 The datagrams of a transmitter reach the receiver without collisions

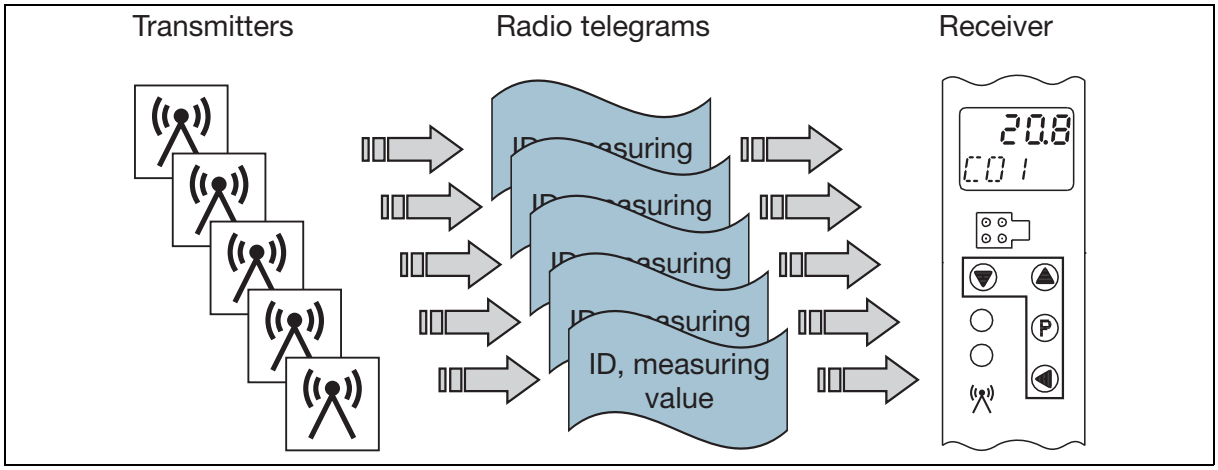


Fig. 3-4 The datagrams of several transmitters can collide

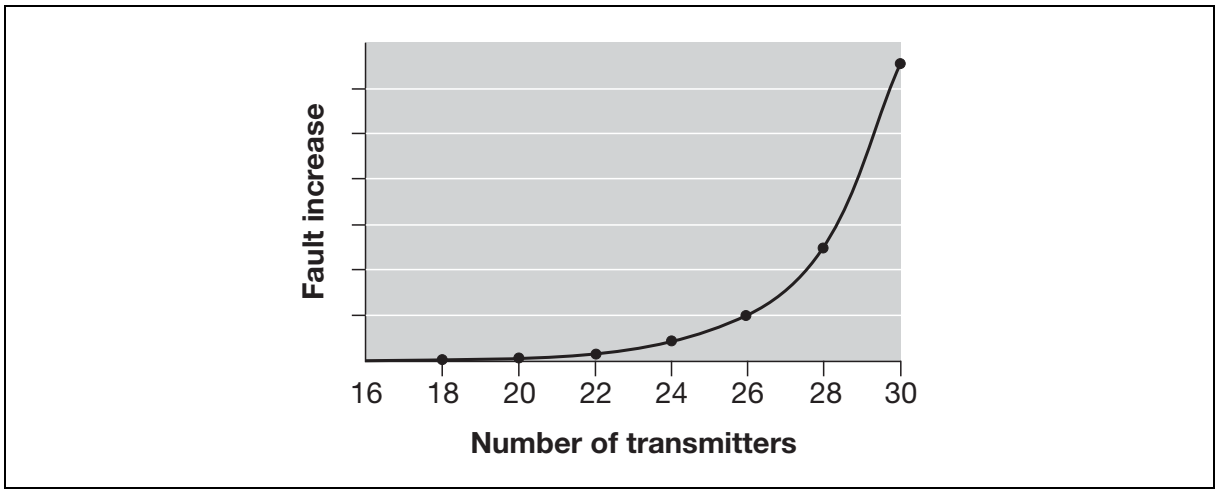


Fig. 3-5 Collisions depending on the number of transmitters with a transmission interval of 1 s

As Fig. 3-5 shows, the error curve increases sharply once there are 24 transmitters.

For this reason, we recommend using a maximum of 16 transmitters for the smallest transmission interval of 1 s.

For the factory setting of 10 s, a considerably larger number of transmitters is possible.

Estimating the maximum number of transmitters

If more than the recommended 16 transmitters are to be used with a transmission interval of 1 s, select a higher transmission interval to prevent an increased error quota.

Example:

16 transmitters with a transmission interval of 1 s = 32 transmitters with a transmission interval of 2 s

The calculation displayed in the next example applies when the number of transmitters is to be increased further.

Example:

16 transmitters with a transmission interval of 1 s = 48 transmitters with a transmission interval of 3 s (in theory)

However, from a transmission interval of ≥ 3 s, the telegram is transmitted twice. This means the number of transmitters that can be used is halved.

16 transmitters with a transmission interval of 1 s = 24 transmitters with a transmission interval of 3 s (effective)

The identical behavior occurs from a transmission interval of ≥ 60 s.

From this transmission interval, the telegram is transmitted three times.

External transmitters

External transmitters can transmit on the same frequency. If, for example, the transmitter and an external transmitter transmit their radio telegrams at the same time then the telegram is destroyed. No error is detected because the transmitters cannot check their own transmission while transmitting.

Electrical devices

In a harsh industrial environment, wireless telegrams can be destroyed by such things as frequency converters, electrical welding equipment, poorly shielded PCs, audio/video devices, electronic transformers, electronic ballasts, etc.

Error fade-out

Lost datagrams (caused either by external interference sources or by collisions when using a large number of transmitters) can be ignored on the receiving side by the wireless timeout parameter and do not cause error messages. The value received last is retained over 2 to 20 transmission intervals and only then is the wireless timeout alarm activated (display "----").

NOTE!

In the event of collisions caused by an excessive number of transmitters, observe and, if necessary, correct the factors "number of transmitters", "transmission intervals", and, on the receiver, "wireless timeout".

3 Basic principles

3.5 Function overview

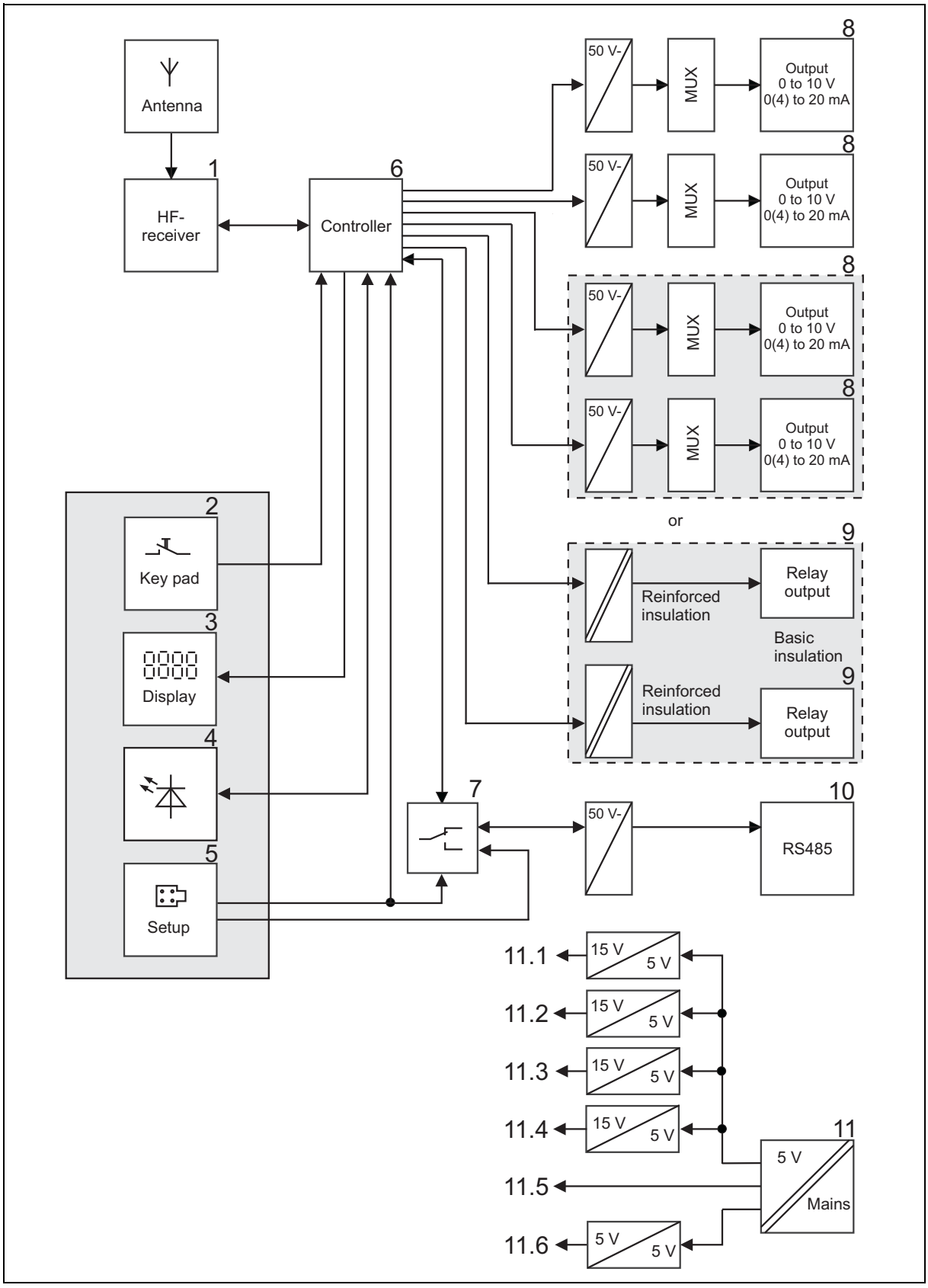


Fig. 3-6 Function overview of the receiver

(1) Wireless receiver
(2) Keypad
(3) LCD display
(4) Light diodes
(5) Setup interface
(6) Actual value calculation of the analog channels
(7) automatic changeover of the interfaces
(8) Analog outputs
(9) Relay outputs
(10)RS485 interface
(11)Voltage supply

Wireless receiver

The receiver is constantly active to receive the radio telegrams of the active transmitters. It checks the completeness of each radio telegram received.
If the radio telegram is valid, it is transferred to the processor for further processing, in the same manner as the demodulated measured data.

Keypad

The function keys permit the operation and configuration of the receiver without the setup program.

⇨ chapter 6 "Display and key functions", page 35

LCD display

In the normal display, the two rows of the LCD display show the current values. In the startup and parameter levels, they facilitate the operation and configuration dialog.

⇨ chapter 6 "Display and key functions", page 35

Light diodes

The top bicolor light diode is green when voltage is applied, i.e. the unit is operative. It flashes red in the event of an impending collective alarm. The bottom yellow light diode flashes with every valid radio telegram (data package) of the transmitter. The flash frequency increases with the number of transmitters.

⇨ chapter 6 "Display and key functions", page 35

Setup interface

The device is equipped with a setup interface to allow configuration via the setup program. For this purpose, the front features a connector for interface lines with USB/TTL converters for connection to a PC.
The setup interface is set with the following values by default:
Baud rate: 9600 bit/s, data format: 8 data bits, 1 stop bit, no parity,
minimum response time: 0 ms, device address: 1.

⇨ chapter 9.1.3 "RS485 interface", page 65

⇨ chapter 11 "Setup program", page 79

Actual value calculation of the analog channels

General information

The radio telegram detected by the receiver is transmitted to the controller for process value calculation. Here the individual measured values are processed.

Now the controller calculates the respective measured value from the transmitter counting values. Linearization and temperature calculation automatically follow the probe characteristic line. Each measured value can be checked for overrange and underrange by means of two limit values. The minimum and maximum measured values are saved in drag indicators.

Radio timeout function

The measured values of the transmitter are monitored via a radio timeout function. Should an individual radio telegram be missing, the value received last will be frozen. If no new radio telegram is received throughout the entire timeout duration, the measured value is set to "no input value“ with the top LED flashing red.

Automatic changeover of the interfaces

Both interfaces are operated via the same communication module (UART = Universal Asynchronous Receiver Transmitter). The device interrupts communication via the RS485, i.e. the setup connector has priority, when an interface cable is connected to the front setup plug.

Analog outputs

A maximum of four analog outputs (current or voltage) are available. The measured value is scaled to the set values for zero point and end value. Measured values outside of these limits are detected as measuring overrange or underrange. In this case, the value set here in the parameter level (value for measuring overrange and underrange) is applied.

⇨ chapter 5.2 "Connection diagram", page 32

⇨ chapter 8 "Configuration of the receiver", page 49

Relay outputs

Depending on the design, the device has a maximum of two relay outputs. The status switching relay output 1 or 2 is determined by different control signals. The desired control signal and the output signal (n/c or n/o contact) for each relay can be set in the parameter level.

⇨ chapter 5.2 "Connection diagram", page 32

⇨ chapter 8 "Configuration of the receiver", page 49

RS485 interface

The unit is equipped with an RS485 interface with Modbus protocol to permit connection to higher ranking systems. Baud rate, data format, minimum response time and device address can be set via the keyboard or the setup program.

⇨ chapter 5.2 "Connection diagram", page 32

⇨ chapter 8 "Configuration of the receiver", page 49

Voltage supply

The voltage supply of the receiver is generated with a switch-mode PSU from the mains voltage AC 110 to 240 V.

For the galvanic isolation of the output signals, further galvanically isolated voltages for the analog and relay outputs (11.1 to 11.4), the supply for the electronics (11.5), and the interface (11.6) are generated from the secondary voltage of the switch-mode PSU.

⇨ chapter 5.2 "Connection diagram", page 32

3.6 Data flow diagram

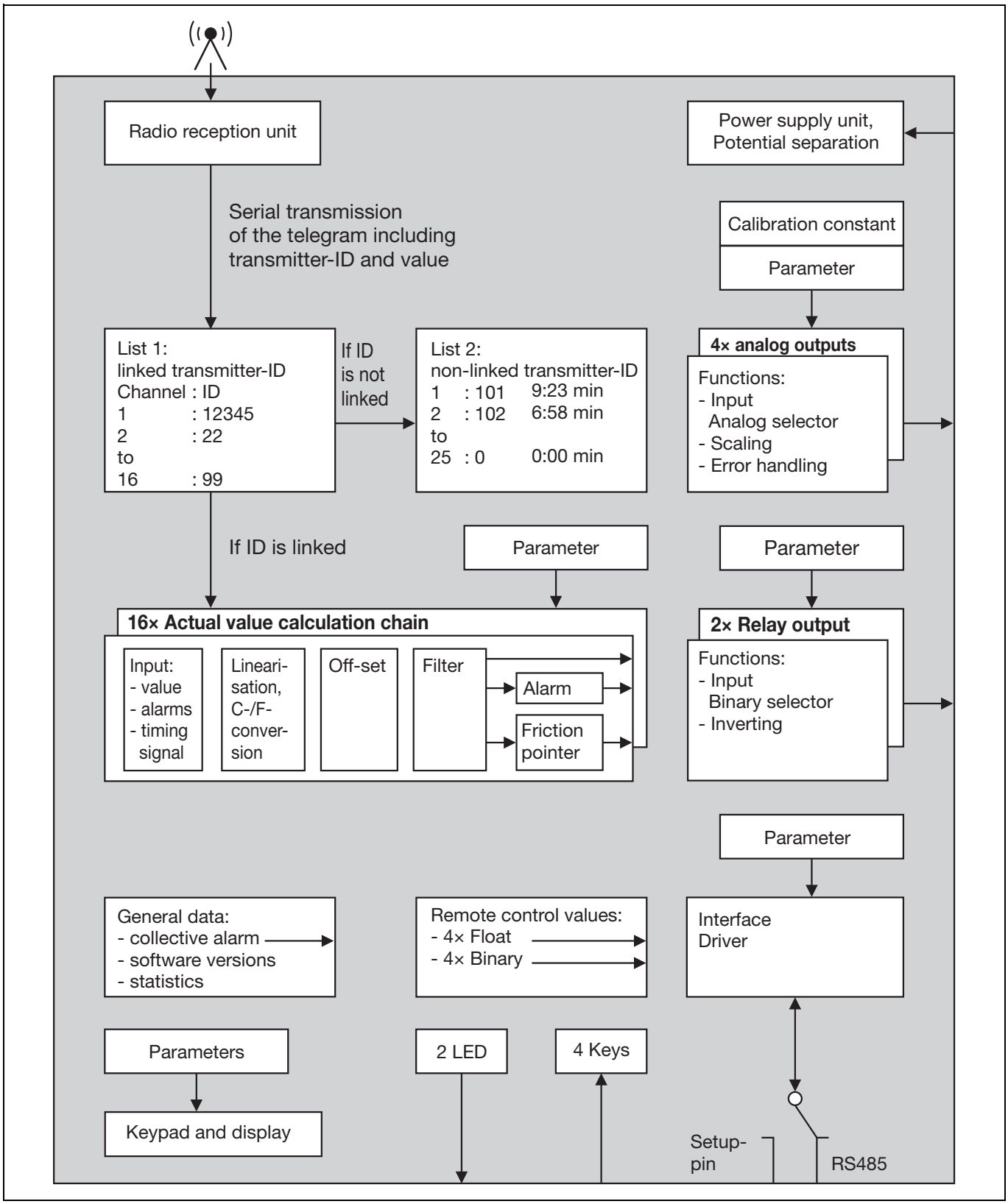


Fig. 3-7 Data flow diagram in the receiver

3 Basic principles

4.1 Mounting site and climatic conditions

4.1.1 Receiver

Mounting site and climatic conditions

The conditions at the installation site must meet the requirements specified in the technical data.

- The mounting site should be vibration-free as much as possible to prevent the screw-connections from working loose.
- The mounting site should be free from aggressive media, e.g. acids and lye, and, if possible, free from dust, flour, and other suspended matter to prevent the cooling slots from being blocked.
- At the installation site, ensure a minimum spacing of 100 mm above the device to allow access to the unlocking slot required for dismantling with a screw driver. Keep a minimum spacing of 150 mm, if the antenna is directly fitted on the receiver. Several receivers can be fitted next to each other without spacing. (Attention: When several antennas are fitted directly, they can influence each other).

The ambient temperature range at the mounting site may be -20 to +50 °C with a relative humidity of ≤ 85 % without condensation.

4.1.2 Antenna

The conditions at the installation site must meet the requirements specified in the technical data.

⇨ chapter 3.1 "Radio technology", page 13

⇨ chapter 3.2 "General information about wireless transmission", page 14

⇨ chapter 4.4 "Installing the antenna", page 27

4 Installation

4.2 Dimensions

4.2.1 Receiver

Basic type 902931/10 and 902931/30

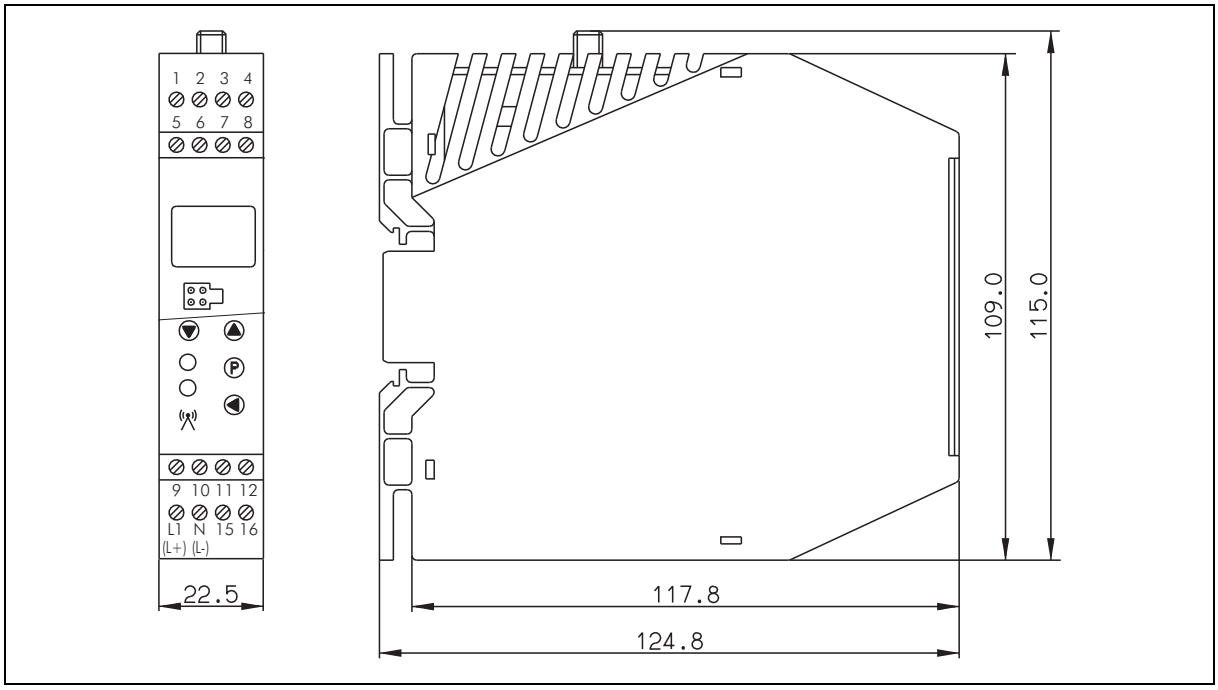


Fig. 4-1 Receiver dimensions

4.2.2 Lambda/4 antenna

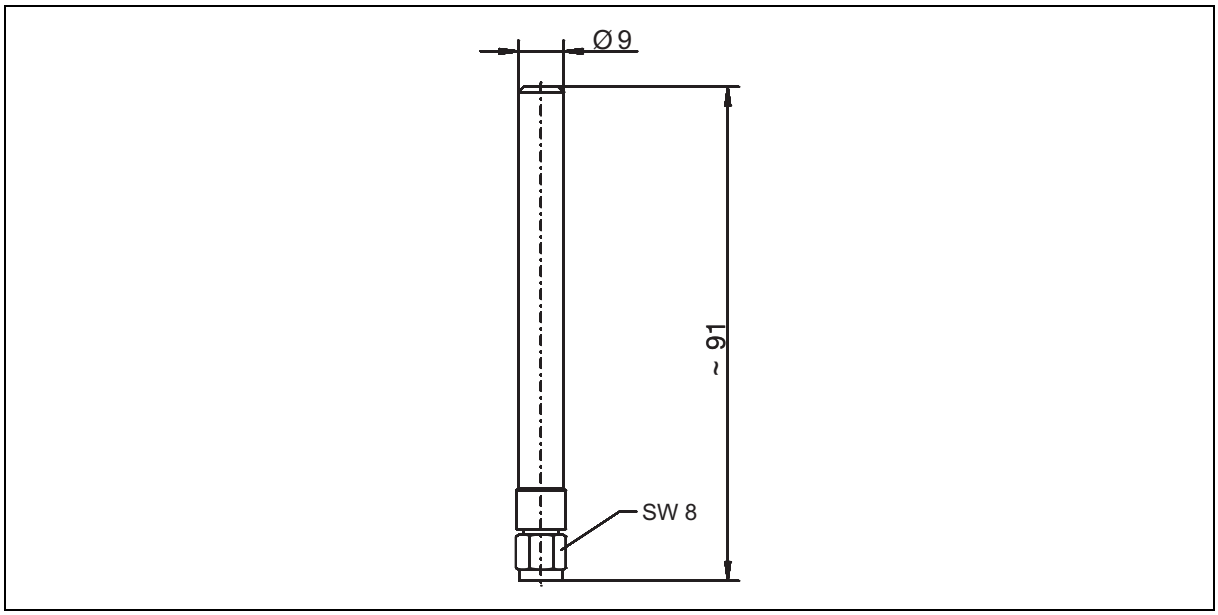


Fig. 4-2 Lambda/4 antenna dimensions

4.2.3 Antenna wall holder for lambda/4 antenna

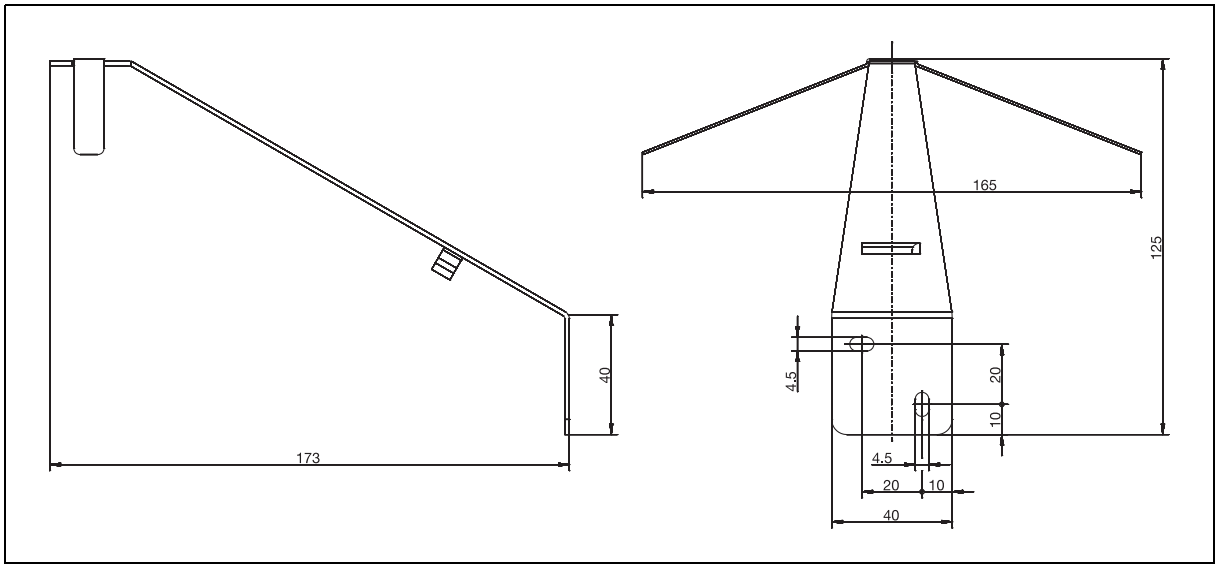


Fig. 4-3 Dimensions of antenna wall holder for lambda/4 antenna

4 Installation

4.3 Installing the receiver

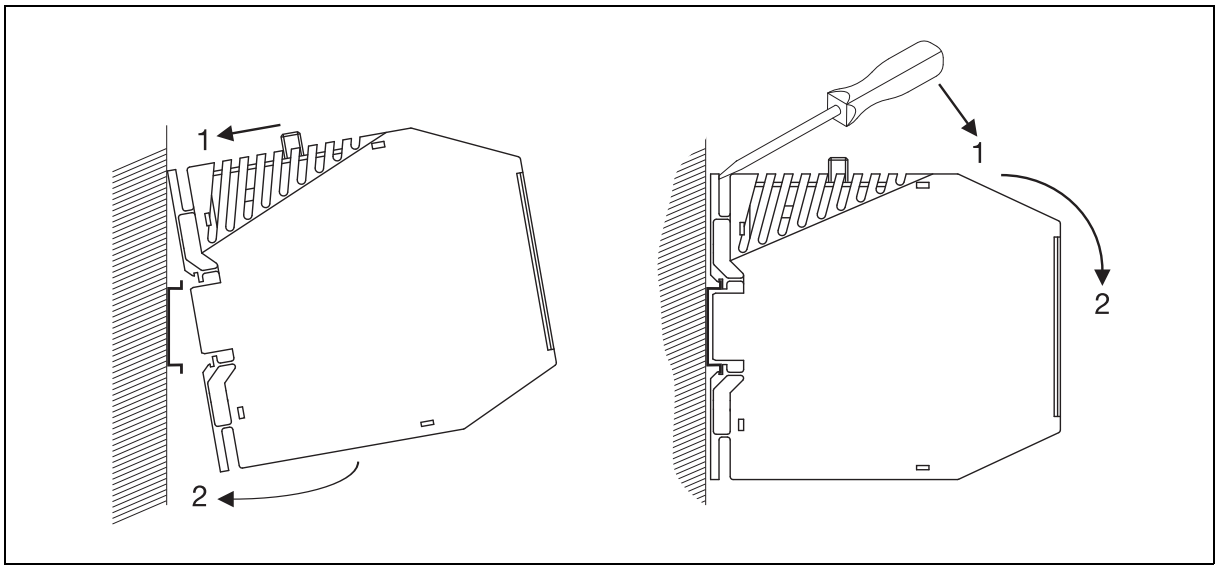


Fig. 4-4 Installation (left) and disassembly (right) of the receiver

Fastening the receiver on the DIN rail

The receiver is intended for installation on a 35 mm DIN rail according to DIN EN 60715. Installation/ disassembly is performed as follows:

Installation

Step	Action
1	Hook the housing into the DIN rail from above.
2	Swing the housing downwards until it engages.

Dismounting

Step	Action
1	Insert a suitable screw driver in the unlocking slot and press towards the device.
2	Swing the device out of the DIN rail from below and remove.

NOTE!

At the installation site, ensure a minimum spacing of 100 mm above the device to allow access to the unlocking slot required for dismantling with a screw driver. Keep a minimum spacing of 150 mm, if the antenna is directly fitted on the receiver. Several receivers can be fitted next to each other.

4.4 Installing the antenna

The maximum operating distance between transmitter and receiver is 300 m in the open air.
The antenna used and its correct positioning is a determining factor for both operating distance and reliability of the wireless connection. In practice, the most varied influences affect the wireless transmit distance. For this reason, careful thought should be given to the conditions prevailing at the installation site when selecting the type of antenna installation.

⇨ chapter 3.1 "Radio technology", page 13

4.4.1 Antenna installation directly on the receiver

The lambda/4 antenna supplied as standard can be directly screw-fitted clockwise on the receiver.

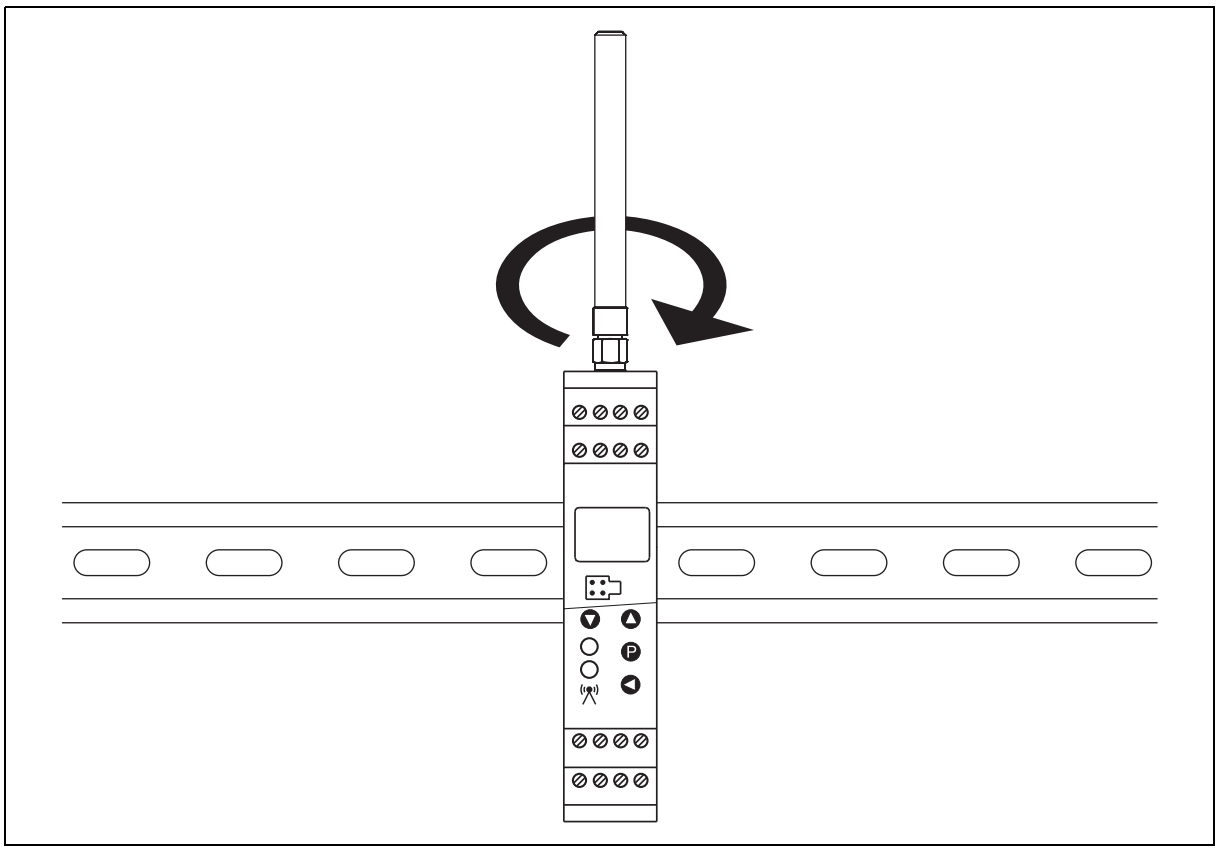


Fig. 4-5 Antenna installation directly on the receiver

4.4.2 Antenna installation on the antenna wall holder

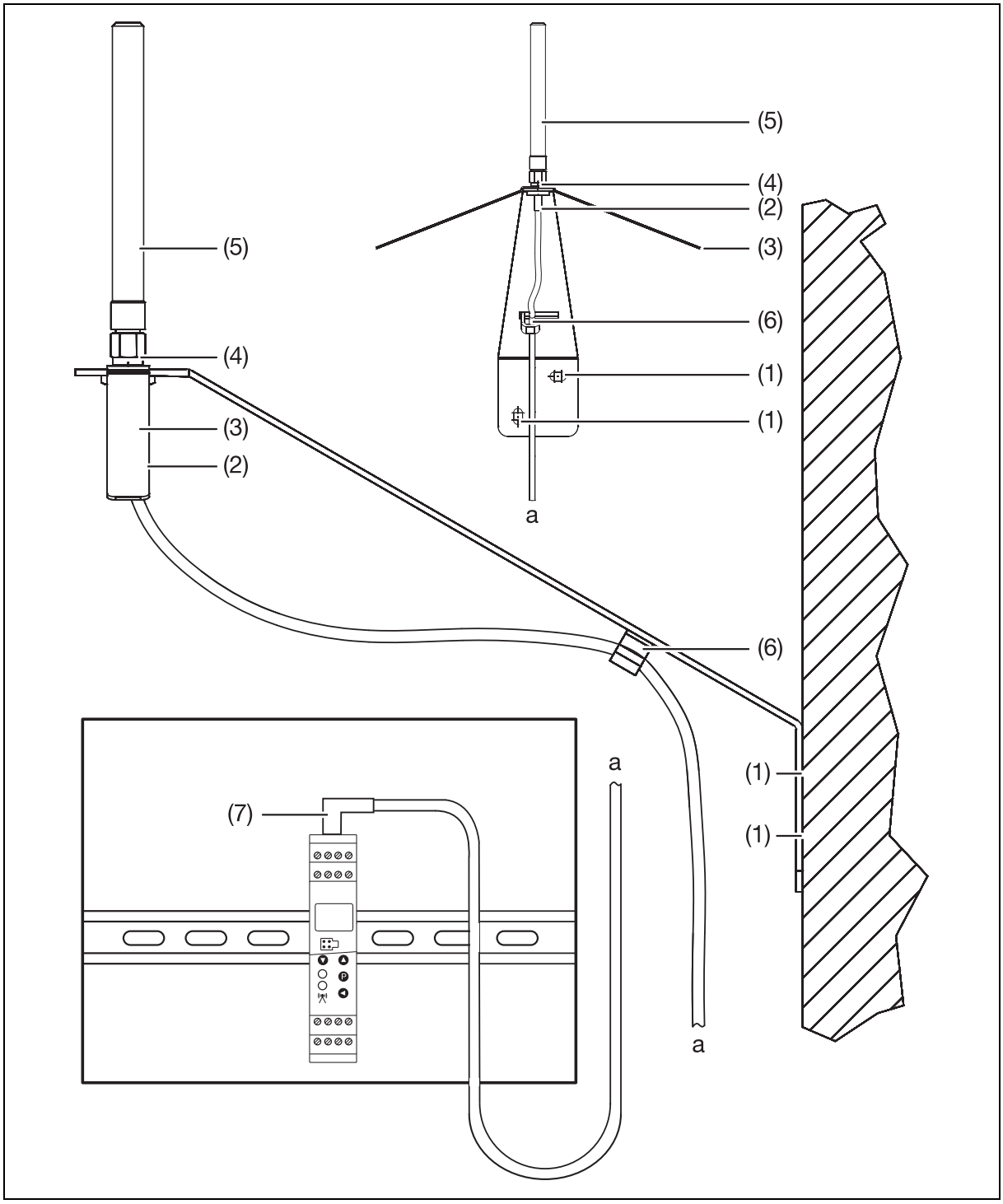


Fig. 4-6 Antenna installation on the antenna wall holder

(1) Drilled holes for wall holder fastening
(2) Screw-connector for the antenna cable
(3) Antenna antipole
(4) Counter nut M10
(5) Lambda/4 antenna
(6) Cable guide for antenna cable
(7) SMA angled connector of the antenna cable

Best results for data transmission can be achieved with the optional antenna wall holder. The lambda/4 antenna supplied as standard (length 85 mm) is simply screw-fitted to this antenna wall holder. An antenna cable with pre-assembled screw-type connections of 3 m, 5 m or 10 m length is available to connect the lambda/4 antenna to the receiver.

The procedure for mounting the antenna holder for wall mounting and the lambda/4 antenna is described below.

Step	Action
1	Fit the antenna wall holder to the wall using the two half-round slotted wood screws M4 × 35 mm supplied and the attendant dowels UV 6 × 35 R.
2	Push the screw-type connection through the bore hole into the antenna wall holder from below.
3	Fit the antipole at a right angle in relation to the antenna wall holder from above onto the thread of the screw-type connection.
4	Use nut M10 to fasten the screw-type connection and the antipole clockwise to the antenna wall holder.
5	Screw-fit the antenna clockwise.
6	Suspend the antenna cable into the cable guide provided for this purpose.
7	Route the antenna cable to the switch cabinet, then screw the angled connector clockwise onto the receiver from above.

4 Installation

5.1 Installation notes

- The choice of cable material, the installation, and the electrical connection of the device must conform to the requirements of VDE 0100 "Regulations on the Installation of Power Circuits with Nominal Voltages below 1000 V" or the appropriate local regulations.
- The electrical connection must only be carried out by qualified personnel.
- The device is intended to be installed in switch cabinets, machines, or plants. Ensure that the customer's fuse protection does not exceed 20 A. Disconnect the device from the mains voltage on all poles prior to starting service or repair work.
- The load circuit must be fused for the maximum relay current, in order to prevent the output relay contacts becoming welded in the event of a short circuit occurring at that point.
- The electromagnetic compatibility meets the standards and regulations cited in the technical data.
- Run input, output and supply cables separately and not in parallel with one another.
- Probe and interface cables should be shielded cables with twisted conductors. Do not run cables close to current-carrying components or cables. Ground the shielding on one side.
- No other consumers can be connected to the power terminals of the instrument.
- The device is not suitable for installation in potentially explosive areas.
- In addition to a faulty installation, incorrectly set parameters may also impair the proper function of the following process or lead to damage.

5 Electrical connection

5.2 Connection diagram

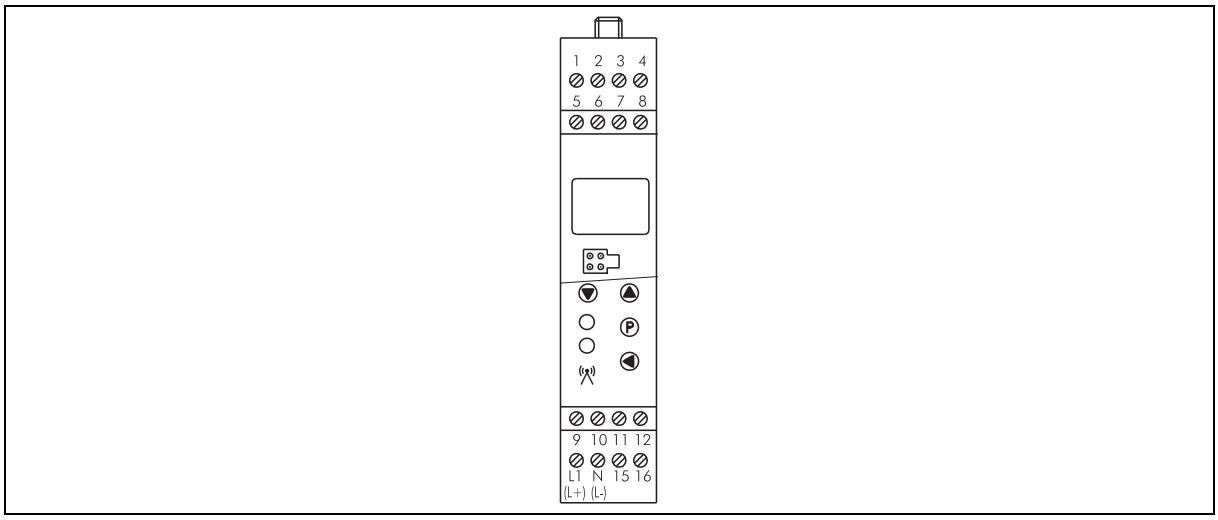


Fig. 5-1 Front view with terminal designation

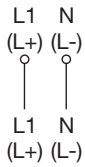
DANGER!

The electrical installation may carry voltage.

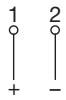
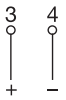
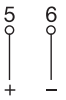
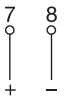
This poses the risk of electrocution.

▶ The electrical connection must only be carried out by qualified personnel.

Voltage supply

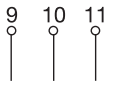
Voltage supply according to nameplate: L1 and N at AC 110 to 240 V L+ and L- at AC/DC 20 to 30 V	

Outputs

Basic type 902931/10	Analog output 1	Analog output 2	Analog output 3	Analog output 4
Voltage 0 to 10 V or current 0(4) to 20 mA				

Basic type 902931/30	Relay output 1	Relay output 2	Analog output 3	Analog output 4
Voltage 0 to 10 V or current 0(4) to 20 mA				
Relay N/O, configurable as an N/C				

Digital interface

RS485		9 TxD+/RxD+ 10 GND 11 TxD-/RxD-	Transmission/receiving data + Mass Transmission/receiving data -

5 Electrical connection

6.1 Normal display (NA) (displaying measured values and signal quality)

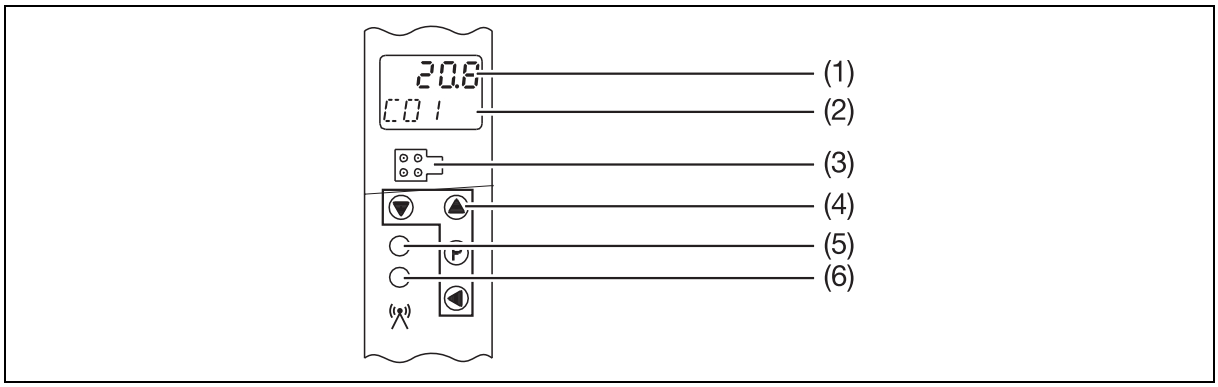


Fig. 6-1 Partial front view of the receiver in the normal display

(1) 7-segment LCD display, 4.5 mm, 4-digit
(2) 16-segment LCD display, 4.0 mm, 5-digit
(3) Setup interface
(4) Function keys and key combinations
(5) Bicolor LED
- green light = Operating display
- red flashing light = collective alarm

(6) Yellow LED briefly flashing
- Receipt control for each radio telegram from the transmitter

Top line, 4 digit

Display	Function
123.4	Measured value without/with decimal point(s).
oooo	Overrange.
uuuu	Underrange.
t.Err	Only with thermocouple: Terminal temperature of the internal Pt1000 exceeds the valid range or internal Pt1000 is defective.
----	Radio timeout of the channel.
100	Display of the transmitter signal quality of the current channel (key P), Display range: 0 to 100 % in increments, Increments displayed: 0/20/40/60/80/100 %, 0 % = no transmission signal, 20 to 40 % = insufficient transmitter signal, 60 to 100 % = transmitter signal OK.
A1 A2 A1A2	Flashing (alternating with measured value): Configurable alarm limit 1 or 2 or both are reached. ⇨ chapter 8.2.3 "Channel-specific parameters", page 60

6 Display and key functions

⇨ chapter 12 "Detect and remedy errors", page 91

Bottom line, 5 digit

Display	Function
C01	Display of the current channel C01 to C16.
°C	Display of unit, e.g. °C. In cases of longer unit texts, the display switches automatically to ticker display.
Low	Flashing (alternating with C01 to C16): The transmitter of this channel signals Battery low. Replace battery immediately.

Top line and bottom line

Display	Function
no Link	No linked channel available. Only channels are displayed that are linked with transmitters. If no channel is linked, the display shows this information.

Keys and key combinations

Keys	Function
▲ or ▼	Selection of channels C01 to C16.
P	Display of the signal quality of the current channel and automatic return to the normal display.
◀ > 2 s	Change to the startup level.
P > 2 s	Change-over to the parameter level.

6.2 Startup level (In) (allocating the transmitter ID to a channel)

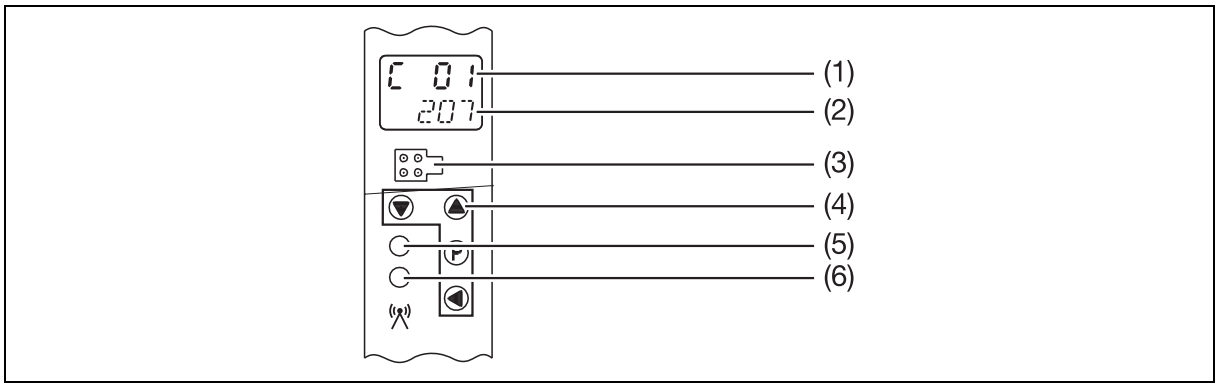


Fig. 6-2 Partial front view of the receiver in the startup level

(1) 7-segment LCD display, 4.5 mm, 4-digit
(2) 16-segment LCD display, 4.0 mm, 5-digit
(3) Setup interface
(4) Function keys and key combinations
(5) Bicolor LED
- green light = Operating display
- red flashing light = Collective alarm

(6) Yellow LED briefly flashing
- Receipt control for each radio telegram from the transmitter

Top line, 4 digit

Display	Function
C 01	Display of the current channel C01 to C16.

Bottom line, 5 digit

Display	Function
207	Display of the transmitter ID linked to the current channel.
_208	Position display with a default transmitter ID by editing digit by digit.
(flashing) 208	Display of the transmitter ID from the list of ID's received but not yet linked.
0	Display when the transmitter ID list is empty or when no transmitter on the channel is linked.

6 Display and key functions

Keys and key combinations

Keys	Function
▲ or ▼	Selection of channels C01 to C16.
P	Change to the **next** transmitter ID from the transmitter ID list of non-linked IDs, application following digit-by-digit editing or deletion of transmitter ID = 0.
P > 2 s	Linking currently displayed ID with channel.
◀	Direct input of the transmitter ID to be linked by editing the desired transmitter ID digit by digit.
◀ > 2 s	Return to the normal display (NA).

6.3 Parameter level (PA) (configuring parameters)

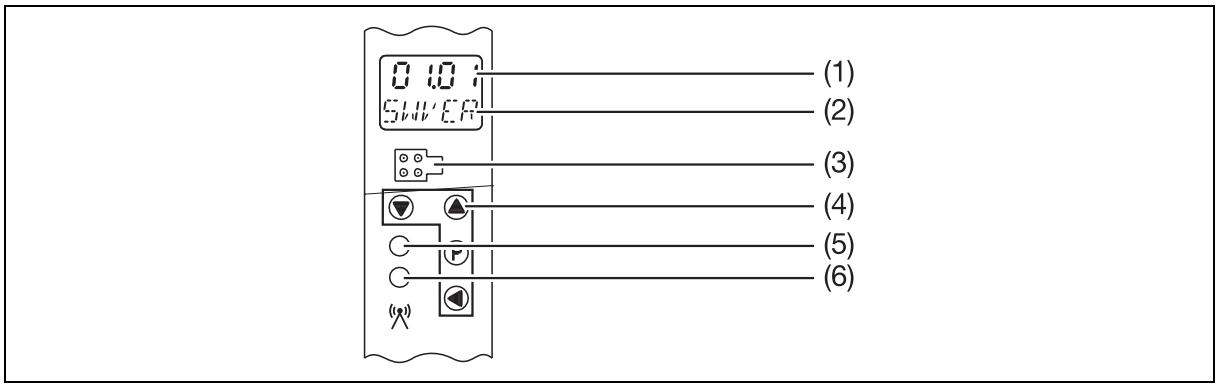


Fig. 6-3 Partial front view of the receiver in the parameter level

(1) 7-segment LCD display, 4.5 mm, 4-digit
(2) 16-segment LCD display, 4.0 mm, 5-digit
(3) Setup interface
(4) Function keys and key combinations
(5) Bicolor LED
- green light = Operating display
- red flashing light = Collective alarm

(6) Yellow LED briefly flashing
- Receipt control for each radio telegram from the transmitter

Top line, 4 digit

Display	Function
°C	Display of the current parameter level, e.g. °C.

Bottom line, 5 digit

Display	Function
T-Unit	Designation of the current parameter level.

⇨ chapter 8.2 "Parameter level (PA)", page 54

6 Display and key functions

Keys and key combinations

Keys	Function
▲ or ▼	Change to the next or previous parameter.
▲ > 2 s	Change to the first parameter of the next group (large step).
▼ > 2 s	Change to the first parameter of the previous current group (large step).
◀ > 2 s	Return to the normal display (NA).
P	For editing, select the currently displayed parameter value.
P > 2 s	If parameter editing is selected: Save the currently displayed value in Parameters.
▲ or ▼	If parameter editing is selected: Select possible parameter settings, in case of number values, change these digit by digit.
◀	If parameter editing is selected: Direct entry of the parameter value through digit by digit editing of the desired parameter values (only possible with number values!).

6.4 Light diodes (independent of level)

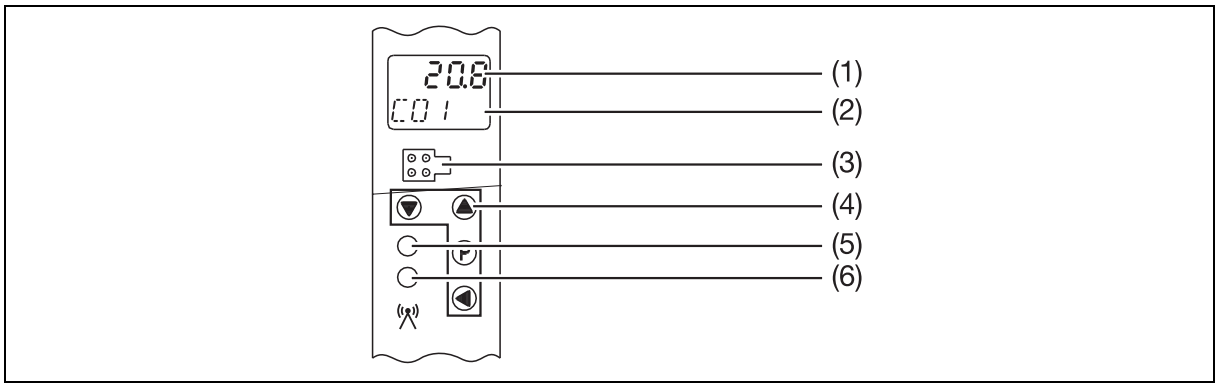


Fig. 6-4 Partial front view of the receiver in all levels

(1) 7-segment LCD display, 4.5 mm, 4-digit
(2) 16-segment LCD display, 4.0 mm, 5-digit
(3) Setup interface
(4) Function keys and key combinations
(5) Bicolor LED
- green light = Operating display
- red flashing light = Collective alarm

(6) Yellow LED briefly flashing
- Receipt control for each radio telegram from the transmitter

Top bicolor LED

Display	Function
Green	Operating display: • Voltage applied • No alarm
Flashing red	Collective alarm The collective alarm accepts the following error types: • OR link of all individual alarms • Wireless timeout, channel 1 to 16 • Analog alarms 1, channel 1 to 16 • Analog alarms 2, channel 1 to 16 • Low battery, channel 1 to 16 • Save errors detected with power ON

⇨ chapter 8.2 "Parameter level (PA)", page 54

Bottom yellow LED

Display	Function
yellow briefly lighting up	Receipt control for each (radio telegram) data packet from the transmitter. The more transmissions received the higher the flashing speed.

6 Display and key functions

7 Receiver operation

At the receiver

Operation and configuration of the receiver require four keys located at the front. These have various functions depending on the menu. The dialog is supported by a 2-line LCD display. Two light emitting diodes (LEDs) signal various operating statuses. The operation and configuration of the parameters are organized into three different levels:

- Normal display (display of measured values and signal quality)

⇨ chapter 7.1 "Normal display (NA)", page 44

- Startup level (channel linking to transmitter ID)

⇨ chapter 8.1 "Startup level (In)", page 49

- Parameter level (editing configuration parameters)

⇨ chapter 8.2 "Parameter level (PA)", page 54

Each of the two levels can be protected against unauthorized access by a code.

Via setup program for PC

Configuration via the setup program is more comfortable than using the receiver keypad. The configuration data can be archived on data carriers and printed.

⇨ chapter 11 "Setup program", page 79

7 Receiver operation

7.1 Normal display (NA)

The normal display is active when the receiver is connected and the voltage supply activated.
The measured value of the first transmitter is visible in the top line of the LCD display.
The channel designation is visible on the left and the selected unit is on the right in the bottom line of the LCD display. If more than five characters have to be displayed, the display automatically switches to the ticker mode.
In the normal display, a maximum of 16 channels and their measured values or the signal quality of the transmitter signal received can be displayed.

7.2 Displaying channels and their measured values

Linked channels available:

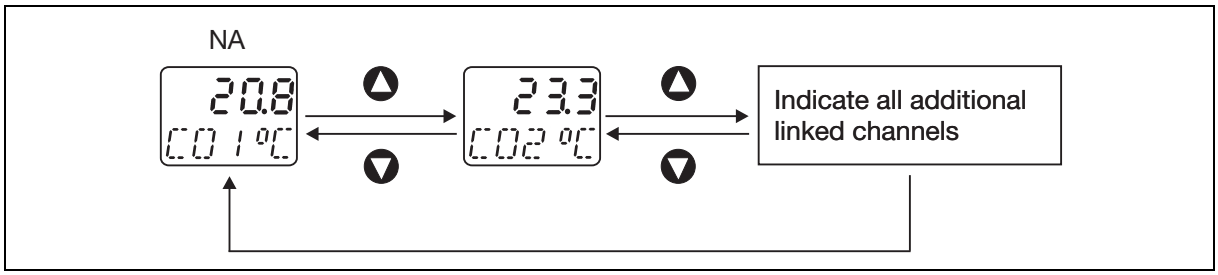


Fig. 7-1 Display of all linked channels

The ▲ and ▼ keys can be used to display in succession all channels linked to transmitters and their measured values either in an ascending or descending order.

No linked channels available:

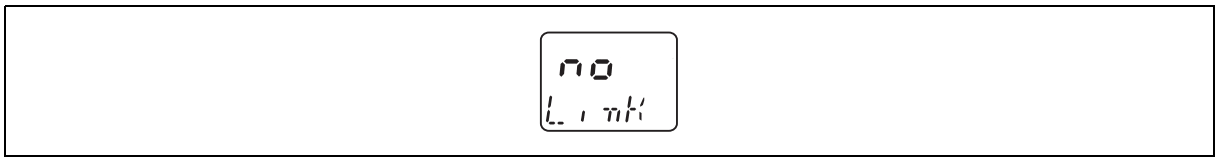


Fig. 7-2 Display when no linked channels are available

The „no Link“ note signals that there are no channels linked to transmitters.

7.3 Display signal quality of the transmitters received

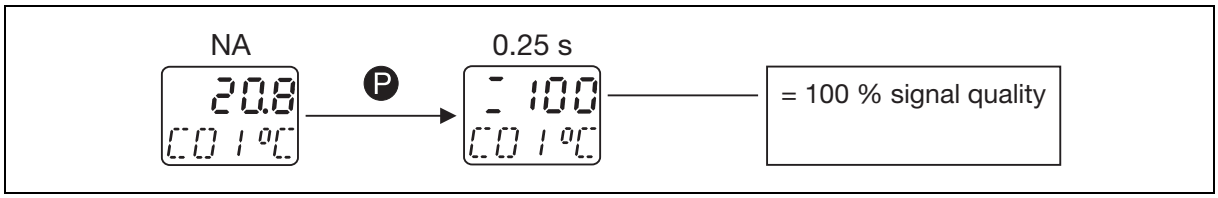


Fig. 7-3 Display of signal quality

The P key is used to show the signal quality value of the current channel in percent in the normal display (NA) (see Fig. 7-3, 100 %).
The display range between 0 and 100 % is displayed in increments.

Steps:	0/20/40/60/80/100 %
Display 0:	No transmission signal.
Remedy:	Check transmitter battery, optimize wireless transmit distance.
Display 20 to 40:	Insufficient transmission signal.
Remedy:	Check receiver antenna mounting site.
Display 60 to 100:	The signal quality is sufficient for reliable system operation.

⇨ chapter 4 "Installation", page 23

NOTE!

The displayed signal quality is calculated from the last five transmission intervals to be expected.

If a telegram is received in all five transmission intervals, the signal quality is 100 %. If only four telegrams are received, the signal quality is reduced to 80 %, etc.

Number of telegrams received in the last 5 transmission intervals	**Display of signal quality**
5	100 %
4	80 %
3	60 %
2	40 %
1	20 %
0	0 %

Tab. 7-1 Number of telegrams received and signal quality display

For an optimum positioning of transmitter and reception antenna, we recommend to set a very small transmission interval as a test. This reduces the waiting period until the signal quality display is updated.

7 Receiver operation

7.4 Changing to different levels

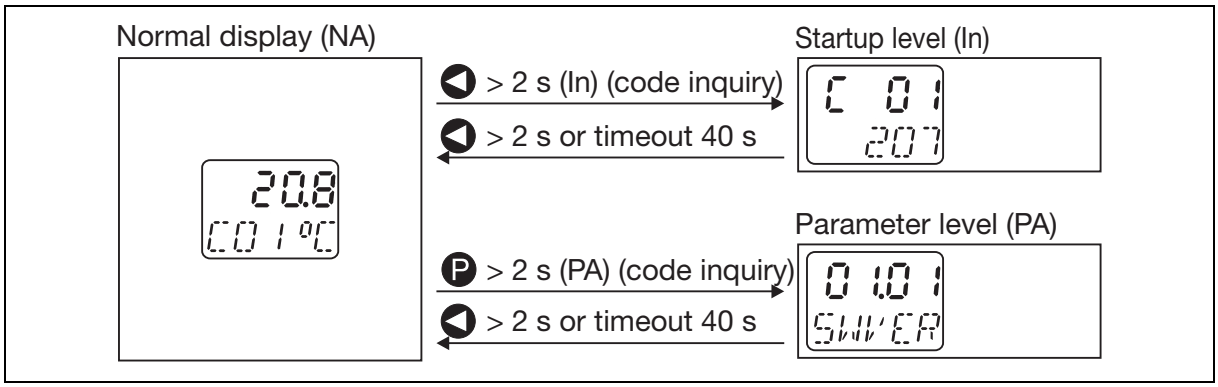


Fig. 7-4 Changing to different levels

Hold the ◀ key for > 2 s to change to the startup level (In). The receiving channels of the unit are linked with the transmitter ID here.

Hold the P key for > 2 s to change to the parameter level (PA). All functions of the receiver and the corresponding parameters are defined here.

Key timeout

If no key is pressed in these two levels for a period of 40 s the receiver automatically returns to the normal display (NA).

Code request

The receiver features one code request for each changeover to the startup level or the parameter level. This code request, however, is not active when delivered. In the parameter level (PA), a code (minimum 1 digit, maximum 4 digits) can be assigned separately for each level (In and PA).

⇨ chapter 7.5 "Code request", page 47

7.5 Code request

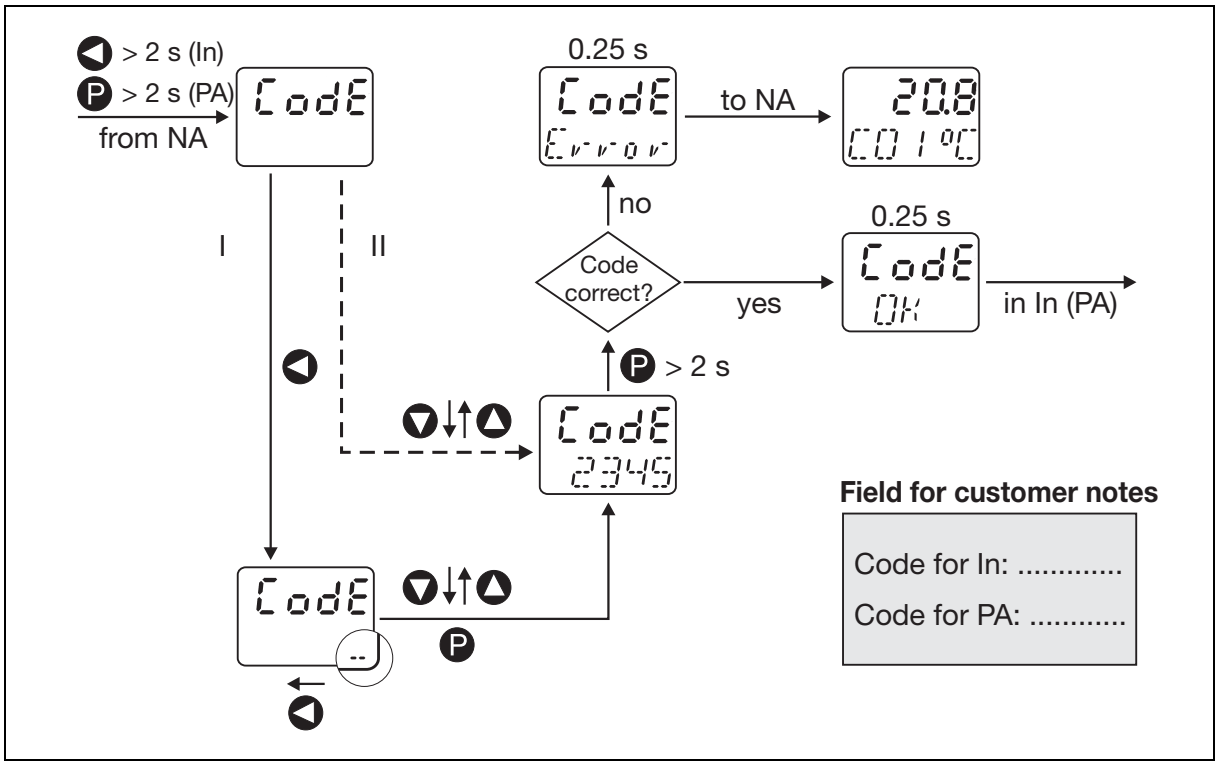


Fig. 7-5 Code request for the startup level or parameter level

The code for changing from the normal display (NA) to the startup level or parameter level can be edited either directly or digit by digit.

Direct editing

This approach is selected if short codes are generally sufficient (see path II in Fig. 7-5).

Step	Action
1	To change from the normal display (NA) to the startup level (In), hold the ◀ key for > 2 s or to change to the parameter level (PA), hold the P key for > 2 s. *When a code is assigned for the selected level, "CodE" appears on the display.* *The device waits for a code to be entered (min. 1 digit, max. 4 digits).*
2	Edit code using keys ▲ and ▼.
3	Confirm the code entry by pressing the P key for > 2 s. *When the code is correct, "CodE OK" appears for 0.25 s.* *The receiver changes over to the desired level.* *In case the code is incorrect, "CodE Error" appears for 0.25 s.* *The receiver returns to the normal display.*

Editing digit by digit

This approach is practical if longer codes are generally required (see path I in Fig. 7-5).

Step	Action
1	To change from the normal display to the startup level (In), hold the ◀ key for > 2 s or to change to the parameter level (PA), hold the P key for > 2 s. *When a code is assigned for the selected level, "CodE" appears on the display.* *The device waits for a code to be entered (min. 1 digit, max. 4 digits).*
2	Initiate code editing by pressing the ◀ key. *The bottom segments of the right digit are flashing.*
3	Edit digits using keys ▲ and ▼.
4	To confirm the first digit, press the ◀ key. *The bottom segments of the second digit from the right are flashing.*
5	Repeat steps 3 and 4 until all digits are edited (min. 1 digit, max. 4 digits).
6	To confirm the code, press the P key. *The bottom segments of the digits entered last have stopped flashing.*
7	Confirm the code entry by pressing the P key for > 2 s. *When the code is correct, "CodE OK" appears for 0.25 s.* *The receiver changes over to the desired level.* *In case the code is incorrect, "CodE Error" appears for 0.25 s.* *The receiver returns to the normal display.*

NOTE!

To deactivate, set the code for the startup or parameter level to 0.

⇨ chapter 8.2.2 "General parameters", page 57

8.1 Startup level (In)

The receiver channels are assigned to the transmitters in this level (linked). This can be done conveniently using the setup program, or manually via the keypad. The options are described below.

Please note the following, independent of the method adopted:

- Assign each transmitter ID to a transmitter only once, as the receivers cannot differentiate between several transmitters having the same ID.
- A transmitter ID must also be linked to each individual receiver only once! After receiving a radio telegram, the receiver checks the channels 1 to 16, until it finds a coinciding link. As such, a second channel with the same link would not receive any input values.
  If for some reason the process value of a channel is emitted on two analog outputs simultaneously, the same channel has to be configured in two analog outputs with a selector.
- For the transmitter Wtrans E01, the assignment of the transmitter ID to the receiver channel is not sufficient for the startup level, since each transmitter Wtrans E01 can transmit up to 4 measured values. Here, the desired Wtrans E01 measured value no. can also be configured in the channel-specific parameters.

⇨ chapter 3.6 "Data flow diagram", page 21

8 Configuration of the receiver

8.1.1 Convenient selection of a received transmitter ID from the link list and assignment to a channel

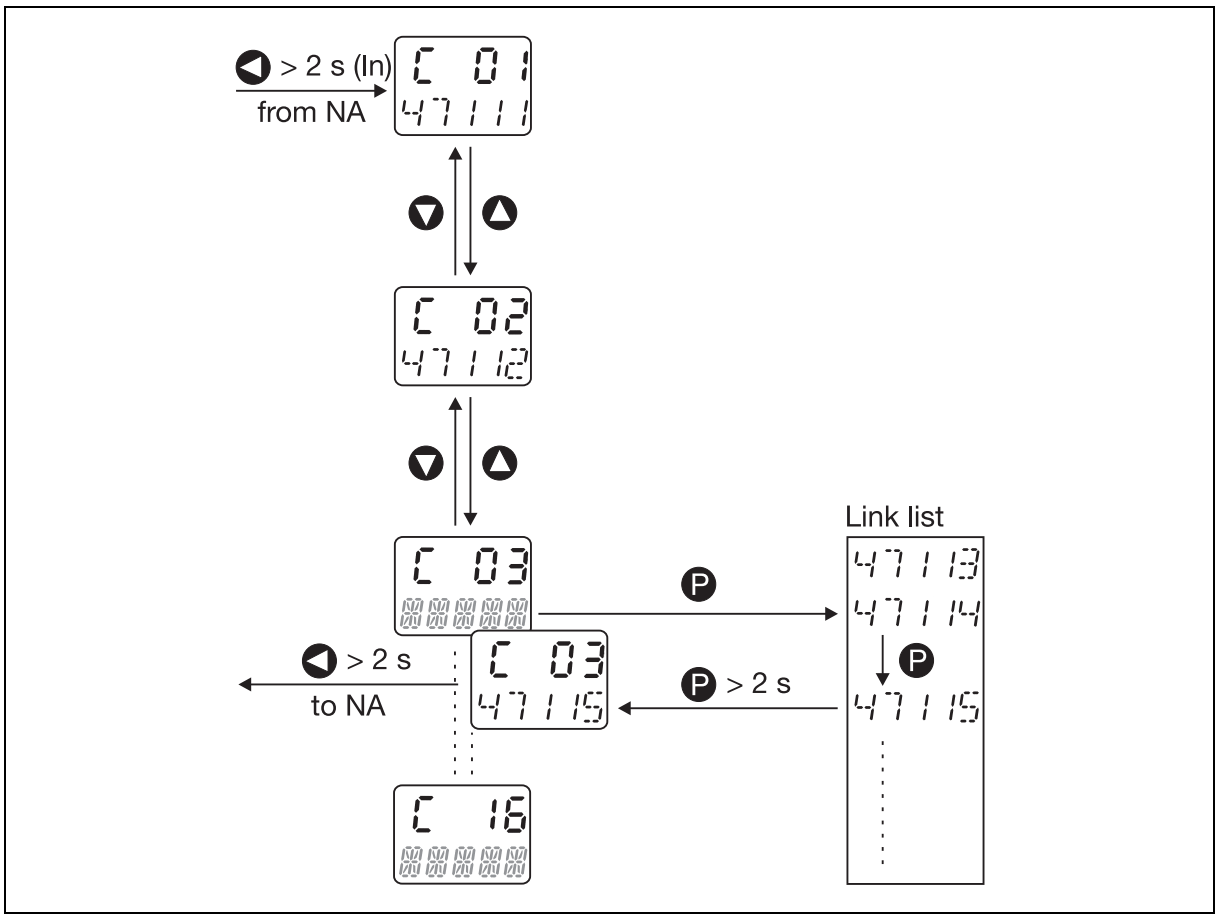


Fig. 8-1 Selection of a received transmitter ID from the link list and assignment to a channel

NOTE!

The link list contains the non-linked ID's received in the last ten minutes.
Transmitter ID's already linked are no longer displayed in the link list.

NOTE!

Received transmitter IDs from transmitters Wtrans E01 are entered into the list of unlinked IDs even though these IDs are linked, because for transmitters Wtrans E01, one may wish to link several measured values from one transmitter ID.

This way of proceeding is selected when both the transmitters and the receiver are active. Each receiver registers all transmitters received but not linked by itself in a link list allowing a maximum of 25 entries. This list is automatically generated. New transmitters are added automatically. If a transmitter does not signal for a period of 10 minutes, it is removed from the list. When opened, this list is „frozen“. The ID received last is offered first. It can be used to link the transmitter ID received with the individual receiver channels in the following manner.

Step	Action
1	Hold the ◀ key for > 2 s to change from the normal display to the startup level (In).
2	Select the channel of the receiver to be linked using the ▲ or ▼ keys (in Fig. 8-1, channel 3).
3	Call up the link list with the P key. *The link list is frozen and the transmitter ID's sorted in the order reflecting the time they are received. The channel is displayed in the top line of the display (in the example 3). The currently assigned transmitter ID flashes in the bottom line.*
4	Use the P key to select the transmitter ID to be linked. *The selected transmitter ID flashes.*
5	Hold the P key for > 2 s to link the transmitter ID to channel 3. *The selected transmitter ID no longer flashes.* *The "Link" information appears for 0.25 s in the bottom line of the display.*
6	To return to the normal display, hold the ◀ key for > 2 s or use the 40 s key timeout. *The display returns to the channel displayed last in the normal display.*

All channels can be linked with the received transmitter ID's in the manner explained above.

8 Configuration of the receiver

8.1.2 Manual assignment of a transmitter ID to a channel

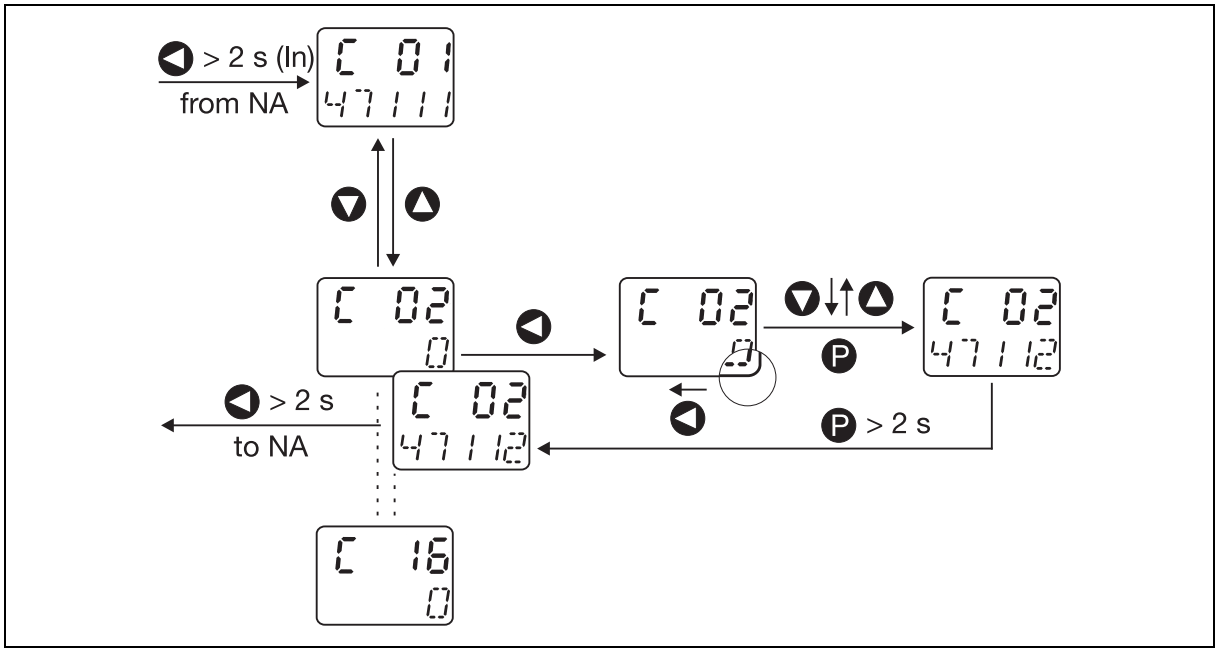


Fig. 8-2 Manual assignment of a transmitter ID to a channel

This way of proceeding is selected when the receiver is to be prepared prior to putting the transmitters into operation. The transmitter ID (max. 5 digits) on the transmitter can be manually entered for a receiver channel. The function keys of the receiver can be used to assign the individual transmitter to a receiver channel. This guarantees unambiguous assignment of a transmitter (the measured value) to the selected receiving channel. Link the transmitters as follows:

Step	Action
1	Hold the ◀ key for > 2 s to change from the normal display to the startup level (In). *The display changes to the startup level.*
2	Select the channel of the receiver to be linked using the ▲ or ▼ keys (in Fig. 8-2, channel 2). *0 appears on the right in the bottom line of the display.*
3	Initiate editing with the ◀ key. *The bottom segments of the RH digit 0 are flashing.*
4	Use the ▲ or ▼ keys to edit the digits.
5	To confirm the first digit, press the ◀ key. *The bottom segments of the second digit from the right are flashing.*
6	Repeat steps 3 and 4 until all digits are edited (minimum 1 digit, maximum 5 digits).
7	Confirm the transmitter ID to be linked with the P key. *The entered transmitter ID completely flashes.*
8	Hold the P key for > 2 s to link the transmitter ID to channel 2 (see Fig. 8-2). *The entered transmitter ID no longer flashes.* *The "Link" information appears for 0.25 s in the bottom line of the display.*
9	To return to the normal display, hold the ◀ key for > 2 s or use the 40 s key timeout. *The measured value of the transmitter linked to channel 1 is displayed in the top line of the display. Channel designation 1 and the unit re-appear in the bottom line.*

All other transmitter ID's can be directly assigned to the desired channel in the manner explained above.

8.1.3 Assignment of a transmitter ID to a channel via interface

Select this way of proceeding if receiving channels are to be linked with permanently changing transmitters.

This could be necessary, for instance, for continuous furnaces or production lines that require a large number of throughfeeding transmitters to be read out at one single channel of a stationary receiver. Linking can then be carried out, e.g., by a PLC that has information on the currently throughfeeding product.

⇨ Interface description Modbus, section "Modbus address table", entry "Linked transmitter ID"

8.1.4 Pre-configuration of all transmitter ID's using the setup program

This way of proceeding can be selected when the receiver is to be prepared prior to putting the transmitters into operation.

To do this, tick "Channel active" in the receiver channels of the setup program and insert the ID specified on the transmitter for "Transmitter ID".

The setup data can be transmitted to the receiver in a block and as a file.

8.1.5 Configuration of customized transmitter ID's on the transmitter side

This method is selected when there are good reasons not to use the factory-provided transmitter ID's. Instead of the factory transmitter ID's, the transmitter can be assigned a customized transmitter ID. This requires the use of the setup program, knowing that the customized transmitter ID has to be stored in the transmitter beforehand via the setup interface. It should be clearly visible and durably affixed to the transmitter, or noted and kept at a different place.

The customized transmitter ID is linked on the receiver side in the same manner as the factory-provided transmitter ID's.

⇨ chapter 8.1.1 "Convenient selection of a received transmitter ID from the link list and assignment to a channel", page 50

⇨ chapter 8.1.2 "Manual assignment of a transmitter ID to a channel", page 52

The difference in the way of proceeding is that the ID assignment in pairs can also be changed on the transmitter side, which permits the use of, e.g., low, easy to remember ID's 1 to 16. However, it must be ensured that IDs are not assigned twice, as otherwise the receiver cannot differentiate between the transmitters that have the same ID.

8 Configuration of the receiver

8.2 Parameter level (PA)

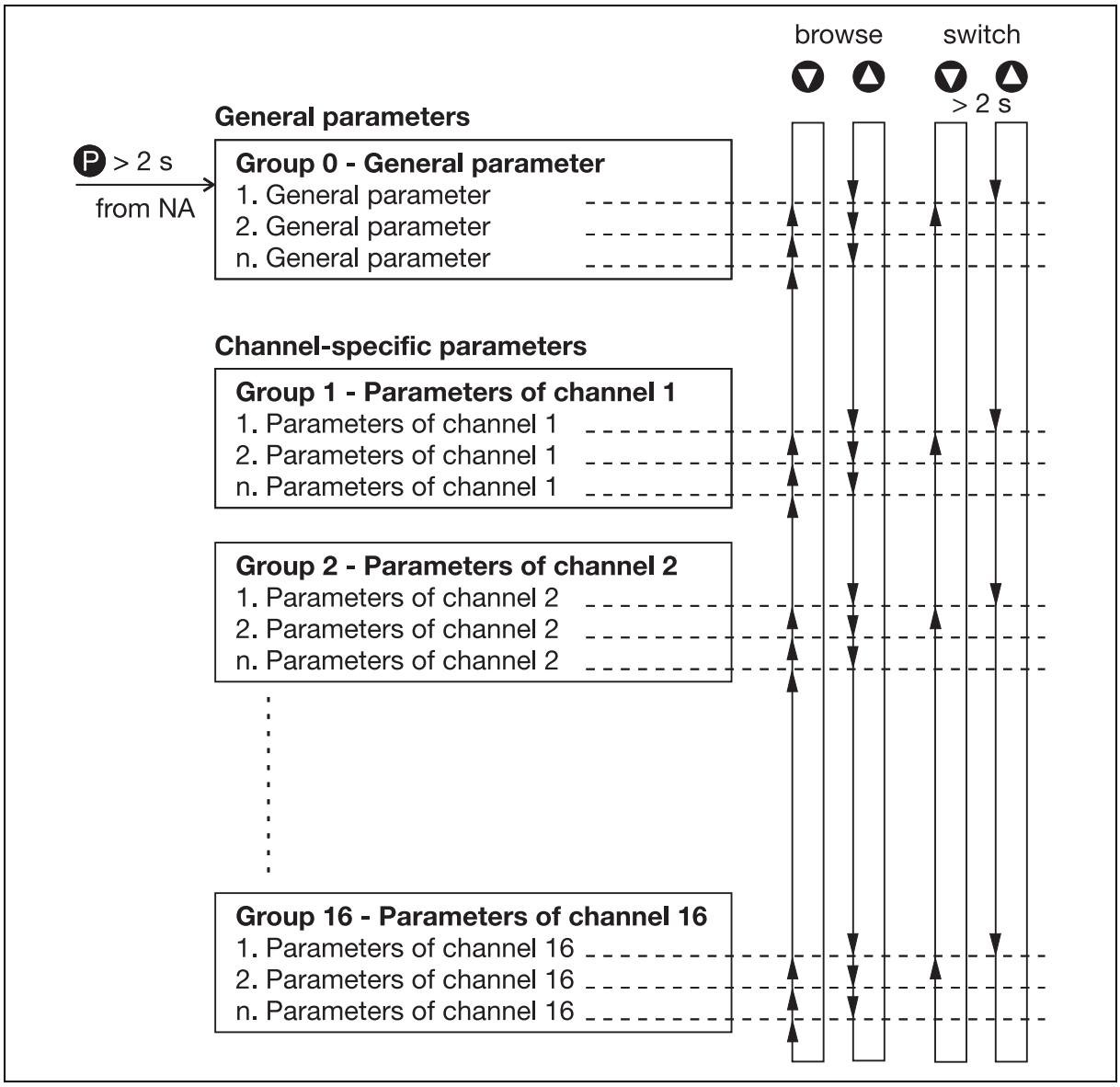


Fig. 8-3 Browsing in steps and jumping in groups

The parameter level comprises an extensive list of editable parameters that are grouped in a user-friendly manner. The key functions shown permit quick browsing up and down or jumping from one group to another.

In this level, the receiver is adapted to its task. Settings can be selected for the individual parameters or values can be entered within the default limits. All parameters are described in chapter 9 "Term definition", page 63 to keep instructive and descriptive texts in the following tables separate from each other.

NOTE!

Default settings are shown in bold.

Step	Action
1	Read the parameter descriptions contained in chapter 9 "Term definition", page 63.
2	Enter the desired settings/values in the right column ! of the following tables.
3	Individually select and edit the parameters one after the other. *This is the only way to ensure parameter entry within the factory-set key timeout of 40 s, after the elapse of which the receiver automatically returns to the normal display.* *The selections/settings carried out so far remain unchanged.*

CAUTION!

Following each parameter change, wait at least 15 s prior to switching the receiver off, otherwise the change will not yet be saved.
This automatically takes place in the background. Premature deactivation will entail a checksum error of the configuration data when switching the system on the next time.
The bit 0 of Parameters Error is set, the top LED flashes red due to the collective alarm and the parameters will be changed to their factory-setting!

8 Configuration of the receiver

8.2.1 Editing parameters

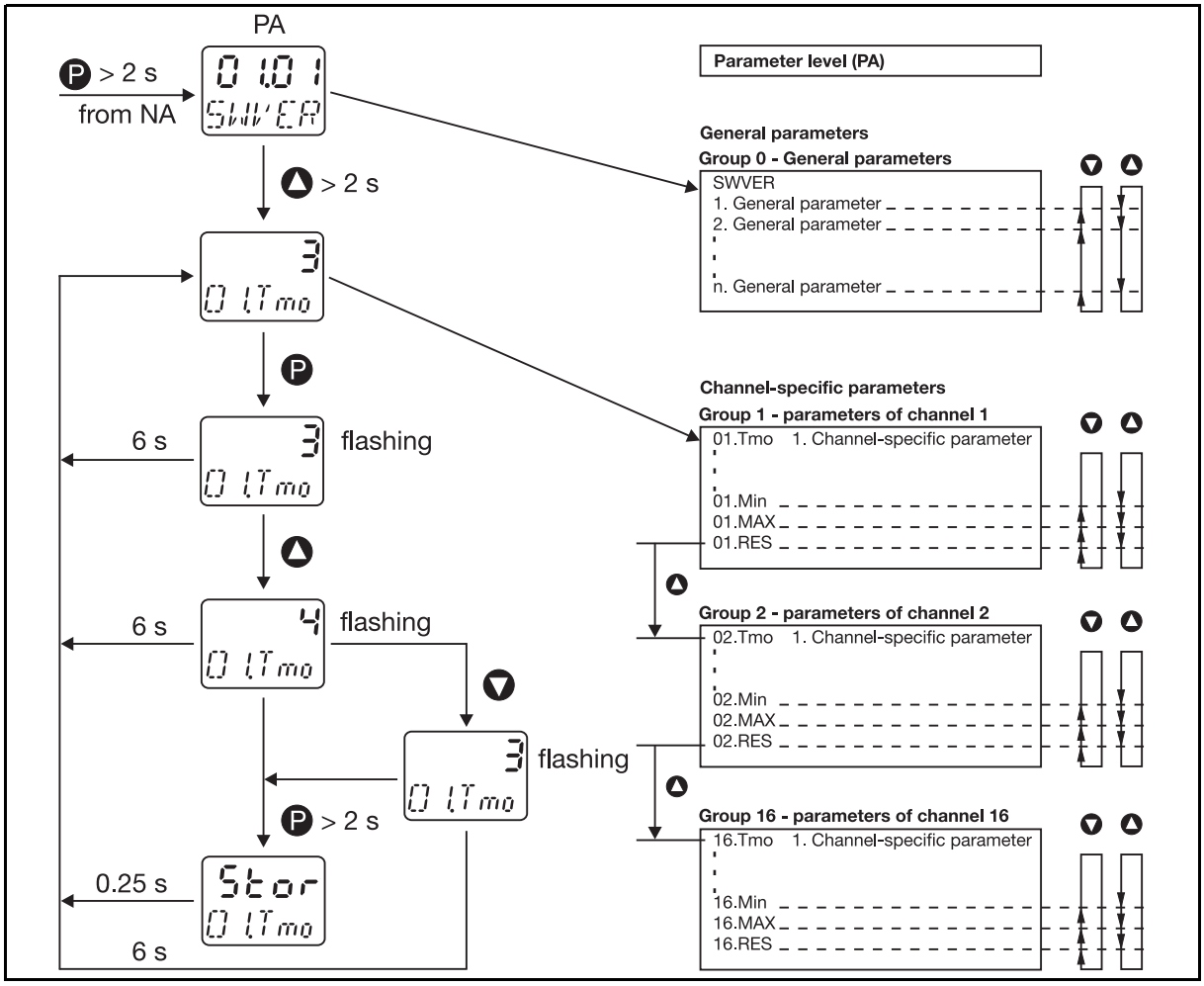


Fig. 8-4 Editing parameters

8.2.2 General parameters

Device information

Parameter	Bottom line display	Top line display	Value range/selection	✎
Software version	SWVER	01.01	**Display only, cannot be edited!**	
Hardware identification	HArdw	0 to 15	**Display only, cannot be edited!**	
Error (system error bits)	Error	0 to 3	**Display only, cannot be edited!** = Save errors detected with power ON	

CAUTION!

Error (system error bit) means:
With bit 0 (0x01) the receiver has initialized the configuration data with their factory-setting.
Please check the settings and reconfigure, if necessary!
With bit 1 (0x02) the receiver has initialized the calibration data with their factory-setting.
Recalibrate the receiver!

Device data

Parameter	Bottom line display	Top line display	Value range/selection	✎
Temperature Unit	T-Uni	°C	**°C** °F	
Code for startup level	Cod.In	0	**0** to 9999 with 0 no password request	
Code for parameter level	Cod.PA	0	**0** to 9999 with 0 no password request	
Radio frequency	RF.FrQ	868.4 912.6 913.0 913.6 914.0 914.6 915.4 916.0 916.4 917.0 917.4	**868.4 MHz** Display only, cannot be edited! **915 MHz** In the 915 MHz frequency band, ten frequencies are configurable.	

NOTE!

The radio frequency change is only valid once the device has been restarted (power on/off).

RS485 interface

The following table displays the parameters of interface RS485 to be set. The setup connector is operated with fixed parameters independent of these parameters.

Parameter	Bottom line display	Top line display	Value range/selection	✎
Baud rate	485.Bd	9600 19.2 38.4	**9600** bit/s 19200 bit/s 38400 bit/s	
Data format (data bits/parity/ stop bits)	485.Fo	8n1 8o1 8E1 8n2	**8/none/1** 8/odd/1 8/even/1 8/none/2	
Min. response time	485.tA	**30**	0 to 500 ms	
Device address	485.Ad	1	**1** to 254	
Customer replacement actual values in the event of an error	485.Er	**0**	-9999 to +9999	

Analog outputs 1 to 4

The following table shows the parameters of analog output 1 that are to be set. Identical setting options apply for analog outputs 2 to 4 (for type T01.EC3 analog outputs 3 and 4).

Parameter	Bottom line display	Top line display	Value range/selection		✎
Output signal type	A1.Mod	0-20 4-20 0-10	**0 to 20 mA** 4 to 20 mA 0 to 10 V		
Output size (analog selector)	A1.SEL	1	0 **1 to 16** 17 to 20	No analog value **Actual value channel 1 to 16** Modbus remote control values analog 1 to 4	
Zero point	A1.Zer	**-30**	-9999 to +9999		
End point	A1.End	**+260**	-9999 to +9999		
Error behavior	A1.Err	ErLo **ErHi**	Negative signaling: < -0.1 mA/< 3.6 mA/< -0.1 V **Positive signaling**: > 21 mA/> 21 mA/> 10.5 V (depending on the output signal type)		

Relay outputs 1 to 2

The following table shows the parameters of relay output 1 to be set. Identical setting possibilities apply to relay output 2 (relay outputs exist with type T01.EC3).

Parameter	**Bottom line display**	**Top line display**	**Value range/selection**	✎
Pulse	K1.Mod	**no** nc	**Normally open** Normally closed	
Control signal (binary selector)	K1.SEL	0	0 not assigned 1 to 16 Wireless timeout, channel 1 to 16 17 to 32 Analog alarm 1, channel 1 to 16 33 to 48 Analog alarm 2, channel 1 to 16 49 to 64 Low battery, channel 1 to 16 65 to 66 Relay status 1 to 2 67 Collective alarm 68 Collective alarm Wireless timeout, channel 1 to 16 69 Collective alarm Analog alarms 1, channel 1 to 16 70 Collective alarm Analog alarms 2, channel 1 to 16 71 Collective alarm Low battery, channel 1 to 16 72 Collective alarm Analog alarms 1/2, channel 1 to 16 73 to 76 Modbus remote control values, binary 1 to 4 77 Fixed value ON 78 Fixed value OFF	

Modbus remote control values

Parameter	Bottom line display	Top line display	Value range/selection	✎
Remote control value Float 1	FVAL1	**0**	Float Value 1 (-9999 to +9999)	
Remote control value Float 2	FVAL2	**0**	Float Value 2 (-9999 to +9999)	
Remote control value Float 3	FVAL3	**0**	Float Value 3 (-9999 to +9999)	
Remote control value Float 4	FVAL4	**0**	Float Value 4 (-9999 to +9999)	

8.2.3 Channel-specific parameters

Channels 1 to 16

The following table shows the parameters of channel 1 that are to be set. The next table contains the same setting options for channels 2 to 16.

Parameter	Bottom line display	Top line display	Value range/selection	✎
Radio telegram timeout (Radio timeout)	01.Tmo	**3**	2 to 20 transmission intervals	
Offset (process value correction)	01.OFF	**0.00**	-99.99 to +99.99	
Filter Time Constant	01.dF	0	**0** to 100 s	
Decimal place	01.dP	Auto 0 1 2	Automatic point xxxx. **xxx.x** xx.xx	
E01 measured value no.	01.ENr	**1**	1 to 4	
Customized linearization	01.Lin	Lin tAb1 tAb2 tAb3 tAb4	**Linear** Table 1 Table 2 Table 3 Table 4	
Unit for resistance transmitter types, potentiometer or voltage	01.Un1	0	0 to 16 (0 = none, mm, cm, m, ml, liters, hl, m^3, %, °C, °F, ohm, k ohm, mV, kg, tonnes, free text entry)	
Unit for pressure transmitter types	01.Un2	1	0 to 6 (0 = mbar, bar, kPa, MPa, psi, %, free text entry)	
Scaling active	01.Sca	**OFF**	OFF, on	
Scale start	01.SLo	**0**	-9999 to +9999	
Scale end	01.SHi	**100**	-9999 to +9999	
Limit value alarm 1				

Parameter	Bottom line display	Top line display	Value range/selection	✎
Alarm type 1	01.A1m	OFF LoAL HiAL	**No alarm** Min. alarm (actual value < limit value 1) Max. alarm (actual value > limit value 1)	
Limit value 1 for alarm type 1	01.A1L	**0**	-9999 to +9999	
Limit value alarm 2				
Alarm type 2	01.A2m	OFF LoAL HiAL	**No alarm** Min. alarm (actual value < limit value 2) Max. alarm (actual value > limit value 2)	
Limit value 2 for alarm type 2	01.A2L	**0**	-9999 to +9999	
Hysteresis for alarm Min.+Max.	01.HYS	0	**0.00** to 99.99 Difference from the limit values for alarm deactivation	
Alarm delay	01.ALd	0	**0** to 999 s	
Drag indicator, bottom	01.Min	-9999 to +9999	**Display only, cannot be edited!** Minimum value drag indicator, with automatic decimal point.	
Drag indicator, top	01.MAX	-9999 to +9999	**Display only, cannot be edited!** Maximum value drag indicator, with automatic decimal point.	
Reset drag indicator	01.RES	0 1	do not reset reset	

NOTE!

The parameter "E01 measured value no." is only meaningful for transmitter types Wtrans E01!

NOTE!

The parameter "customized linearization, unit, scaling active, scale start and scale end" are only significant for the transmitter types resistance transmitter, potentiometer, voltage and pressure!

NOTE!

If the "free text entry" is configured for the "unit" parameter, the corresponding text must be entered with the setup program!

8 Configuration of the receiver

9.1 General parameters

9.1.1 Device information

Software version

The software version indicates the current device software (firmware) version. This information may be required for servicing.

The various Wtrans transmitters are shown in the following table.

For correct wireless operation, the Wtrans receiver must have the same or higher software version as the minimum requirement for the respective Wtrans transmitter!

Wtrans transmitter type T01.G1 type T02.G1 type T03.G1 Ex	Food insertion RTD temperature probe (for Wtrans receivers as of software version 01.01) Ambient temperature for the case: -30 to +85 °C Ambient temperature for the case: -25 to +125 °C Ambient temperature for the case: -30 to +85 °C	Detailed information in the type sheet 902930
Wtrans transmitter type T01.G1 type T02.G1 type T03.G1 Ex	Mineral-insulated RTD temperature probe with flexible protection tube (for Wtrans receivers as of software version 01.01) Ambient temperature for the case: -30 to +85 °C Ambient temperature for the case: -25 to +125 °C Ambient temperature for the case: -30 to +85 °C	902930
Wtrans transmitter type T01.G2 type T02.G2	With M12 × 1 plug connection for RTD temperature probes (for Wtrans receivers as of software version 01.01) Ambient temperature for the case: -30 to +85 °C Ambient temperature for the case: -25 to +125 °C	902930
Wtrans transmitter type T03.G2 Ex	With M12 × 1 plug connection and RTD temperature probe with PTFE connecting cable (for Wtrans receivers as of software version 01.01) Ambient temperature for the case: -30 to +85 °C	902930
Wtrans B	Programmable head transducer with wireless data transmission (for Wtrans receivers as of software version 03.01)	707060
Wtrans p	Pressure transmitter with wireless data transmission (for Wtrans receivers as of software version 04.01)	402060
Wtrans E01	Measuring probe for humidity, temperature, and CO_2 with wireless data transmission (for Wtrans receivers as of software version 05.01)	902928

Hardware version

The hardware version contains information about the installed receiver hardware (e.g. the reception frequency).

15 = 868.4 MHz reception frequency, 4 analog outputs
14 = 915 MHz reception frequency, 4 analog outputs

13 = 868.4 MHz reception frequency, 2 analog outputs and 2 relay outputs
12 = 915 MHz reception frequency, 2 analog outputs and 2 relay outputs

9 Term definition

Error (system error bit)

Error (system error bit) means:
With bit 0 (0x01) the receiver has initialized the configuration data with their factory-setting.
Please check the settings and reconfigure, if necessary!
With bit 1 (0x02) the receiver has initialized the calibration data with their factory-setting.
Recalibrate the receiver!

9.1.2 Device data

Temperature Unit

Unit (°C or °F) of the measured temperature displayed. The unit appears on the right in the bottom line of the normal display.

CAUTION!

The following is recommended after a change-over:
1. reset the drag indicator.
2. check the scaling of the analog outputs.
3. check the settings of the limit value alarms.

Code for the startup level or parameter level

The startup level and the parameter level can be protected with a code request. A code of a different length (min. 1 digit, max. 4 digits) in the range of 0 to 9999 can be assigned to each level. If you select 0 for the code, the code request will be inactive for the selected level.

Radio frequency

868.4 MHz (Europe) or
915 MHz (America, Australia, Canada, and New Zealand)

In the 915 MHz frequency band, ten frequencies can be configured.

9.1.3 RS485 interface

NOTE!

Modbus interface description
(The Modbus interface description is available as a free download on the Internet at www.jumo.net.)

Baud rate

RS485 interface transmission speed.
If a master (PC or PLC) is connected to the interface, select the same baud rate on the master side.

Data bits/Parity/Stop bits

RS485 interface data formatIf a master (PC or PLC) is connected to the interface, select the same data format at the master side.

Min. response time

The minimum response time is adhered to by the receiver prior to sending a response following a data request. The response time is required by the RS485 interface in the master, to be able to switch over the interface drivers from transmit to receive.

Device address

The receiver can be accessed with the set unit address via the RS485 interface. For this interface, the device address of the receiver may only appear once within a connection (several devices on one bus).

CAUTION!

These settings only refer to the RS485 interface.
Independent of these parameters, the setup plug is operated with fixed parameters for transmission speed: 9600 baud, data format: 8n1, minimum response time: 0 ms and device address: 1.

Customer replacement actual values

The current display values can be read out from a receiver by a Modbus master via the addresses (hex) 00E7 to 0105.
In the event of an error (timeout, overrange, underrange, etc.) it reads a very large value (e.g. 9.0×10^{37} for wireless timeout – see chapter 2.9.2 in the "Modbus interface description") via these addresses.
The new customer replacement actual values for the addresses (hex) 0407 to 0425 are intended for all users who are unable to evaluate these large values with their Modbus masters.
In a normal case (no errors present), the customer replacement actual values contain the same values as the display values. In the event of an error, the customer replacement actual value programmed in the receiver is transmitted. This allows the user to identify errors.

9 Term definition

9.1.4 Analog outputs 1 to 4

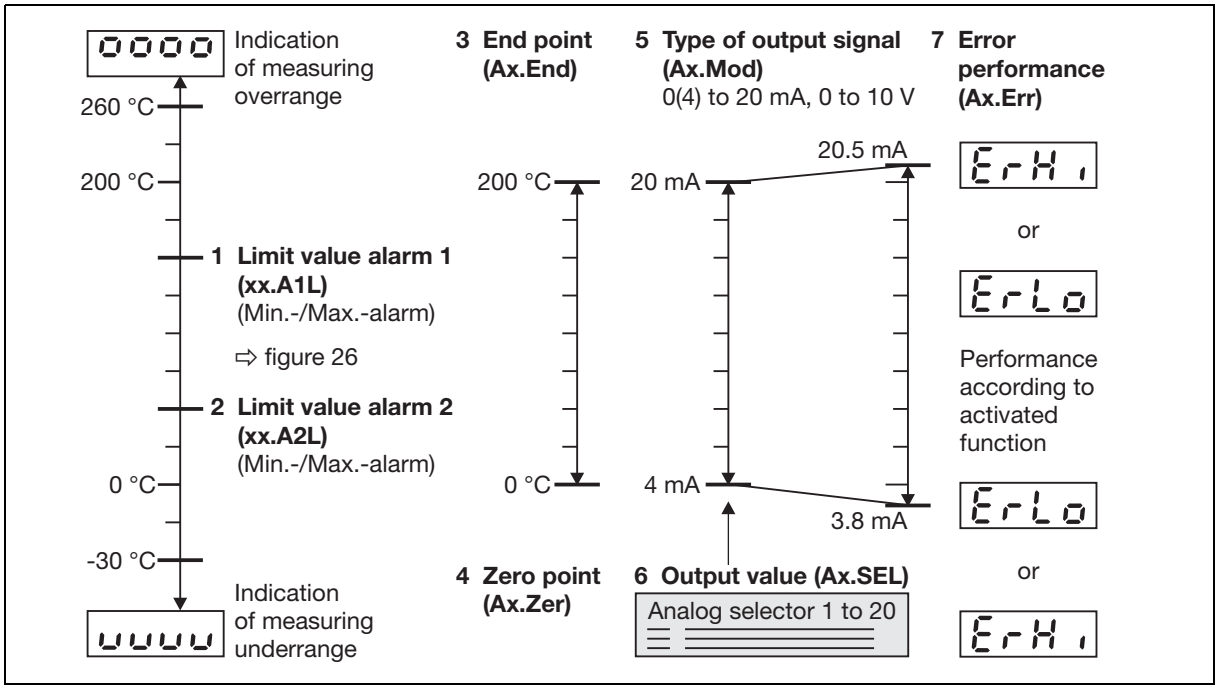


Fig. 9-1 Analog outputs 1 to 4

Output signal type (Ax.Mod)

This function defines how the output is operated (see Fig. 9-1, item 5). Current and voltage outputs can be used. Depending on the receiver type, two or four analog outputs are available.

⇨ chapter 2.2 "Order details", page 10

Output value (Ax.SEL)

The actual value to be issued at the selected output is defined here (see Fig. 9-1, item 6). In addition to the actual values of the 16 wireless inputs, four Modbus remote control values are available in the analog selector.

Zero point (Ax.Zer) and end point (Ax.End)

The zero point and the end point (see Fig. 9-1, item 3 and item 4) permit the entire measuring range or part of it to be displayed at the output (e.g. 0 to 200 °C).

Error behavior (Ax.Err)

The type of error message to become active under the following conditions is set here (see Fig. 9-1, item 7):

- Underrange / overrange
- Probe short circuit
- Probe/cable break and
- Alarms

ErHi (positive signals) and ErLo (negative signals) are possible.

The performance of the output signal in the event of underrange or overrange is shown in the following table.

Measuring circuit monitoring of the analog outputs

Underrange: - Current output 4 to 20 mA - Current output 0 to 20 mA - Voltage output 0 to 10 V	 dropping to 3.8 mA, then jump to the configured signals dropping to -0.1 mA, then jump to the configured signals dropping to -0.1 V, then jump to the configured signals
Overrange: - Current output 4 to 20 mA - Current output 0 to 20 mA - Voltage output 0 to 10 V	 rising to 20.5 mA, then jump to the configured signals rising to 20.5 mA, then jump to the configured signals rising to 10.25 V, then jump to the configured signals
Probe short circuit or probe/cable break and alarms: - Current output 4 to 20 mA - Current output 0 to 20 mA - Voltage output 0 to 10 V	 Positive signaling: > 21.6 mA Negative signaling: < 3.6 mA Positive signaling: > 21.6 mA Negative signaling: < -0.1 mA Positive signaling: > 10.5 V Negative signaling: < -0.1 V
Output behavior	The output behavior (positive or negative signaling) can be configured.

9.1.5 Relay outputs 1 to 2

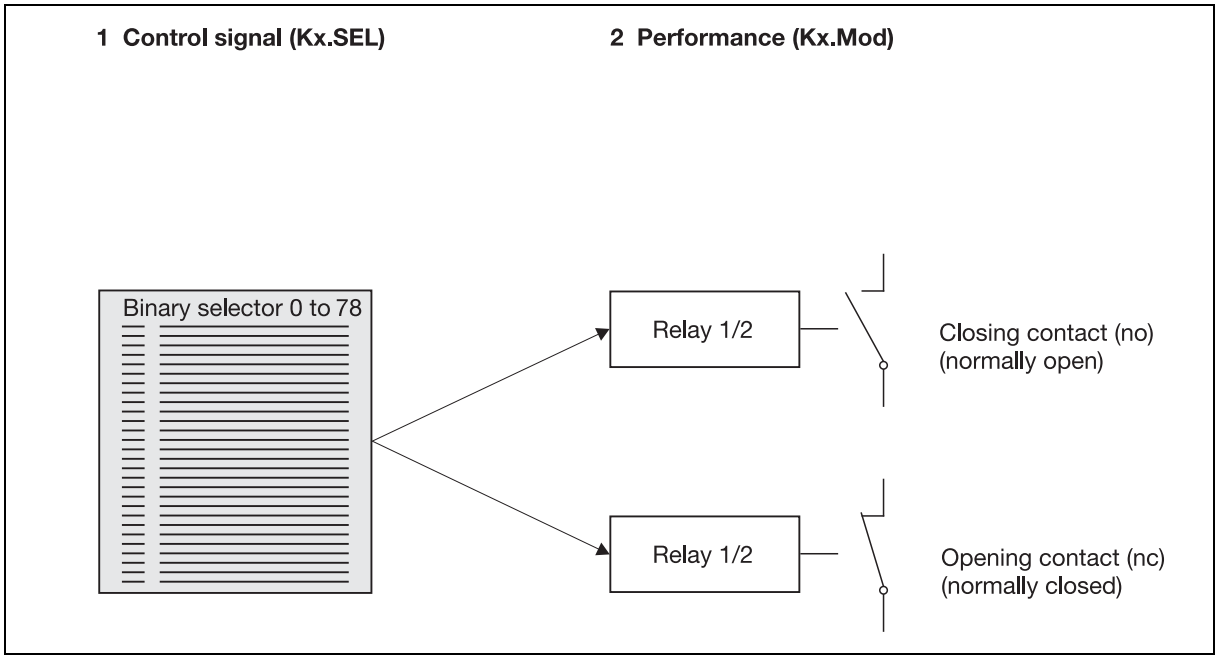


Fig. 9-2 Behavior of the relay outputs 1 to 2

Performance (Kx.Mod)

This function defines the manner in which the relay output is operated. N/C and N/O contacts are available (see Fig. 9-2, item 2). Not every receiver type provides relay outputs.

⇨ chapter 2.2 "Order details", page 10

Control signal (Kx.SEL)

The control signal (see Fig. 9-2, item 1) defines the status used to switch relay output 1 or 2.
The following conditions can be set in the binary selector:

Relay inactive (not assigned)

The relays remain in their configured basic position (no/nc).

Wireless timeout, channel 1 to 16

A relay is switched when the radio timeout is exceeded.
Radio timeout is a configurable alarm bit which is set when the radio signal of a linked transmitter was not received for a long time.

Analog alarm 1 and 2, channel 1 to 16

A relay is switched when the limit value alarm 1 or 2 is activated.

Low battery, channel 1 to 16

A relay is switched when a transmitter battery has to be replaced.

Relay status 1 and 2

A relay is switched when it is accessed by another relay.

Due to the fact that the relay outputs in the receiver have only two pins, it is possible to get one change-over contact out of two relays: e.g. relay 2 is configured as a logical inverter (N/C).

Collective alarms

A relay is switched when an alarm is activated.
Collective alarms can be:

- OR link of all individual alarms
- Wireless timeout, channel 1 to 16
- Analog alarms 1, channel 1 to 16
- Analog alarms 2, channel 1 to 16
- Low battery, channel 1 to 16
- Save errors detected with power ON

⇨ chapter 8.2 "Parameter level (PA)", page 54

Remote control values BOOLEAN 1 to 4

A relay is switched when the remote control value is set to ON.
Remote control values are controlled via interface.

Fixed value ON/OFF

Depending on the selection, a relay is activated or deactivated.

9.1.6 Modbus remote control values FLOAT 1 to 4

Radio control values can be transmitted via the interface by a Modbus master (e.g. PLC) and displayed and processed by a receiver.

⇨ Operating manual "Modbus interface description"

If the analog outputs are guided to these control variables via selector, the Wtrans receiver can also be used as a 4-channel analog output module.

This means that control variables calculated by a PC program can be supplied in the process. Even a simultaneous operation as a 16-channel radio reception module and 4-channel analog output module is possible (see Fig. 9-3).

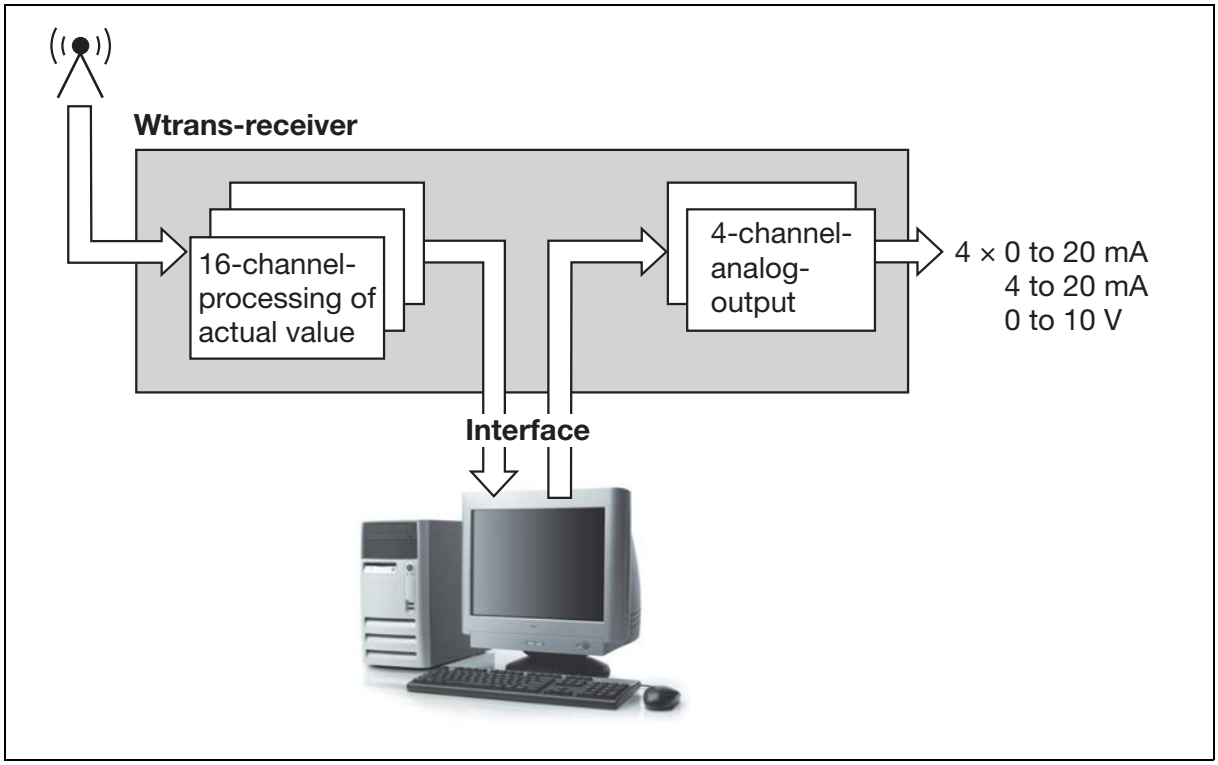


Fig. 9-3 PC with visualization/control software

9.2 Channel-specific parameters

Wireless telegram timeout [Wireless timeout (xx.Tmo)]

Number of transmitter intervals during which one new probe value must have arrived. The set transmission interval of the transmitter is transmitted with the radio telegram. When the first telegram is received, this value is saved in the receiver and the wireless timeout monitoring function is activated.
If no new value from the transmitter is received throughout the entire timeout period, the measured value is set to "no input value", the alarm bit "Wireless timeout" of the channel is set, and the top LED flashes red.

Offset (xx.OFF)

This offset value (actual value correction) is added to the measured input value with the correct sign. This permits a correction in the "+" as well as the "-" direction.

Examples:

Measured value	Offset (Process value correction)	Displayed value
294.7	+0.3	295.0
295.3	-0.3	295.0

CAUTION!

The following is recommended after an offset is changed:
1. reset the drag indicator.
2. check the scaling of the analog outputs.
3. check the settings of the limit value alarms.

Filter time constant (xx.dF)

This parameter is used to adapt the digital input filter to the task. 63 % of the alterations are acquired after 2× filter time constant at a step change. If the filter time is long, it means:

- high damping of interference signals
- slow reaction of the process value display to process value changes
- low limit frequency (2nd order low-pass filter)

Decimal point format (xx.dP)

Here the position of the decimal point is selected. No to max. 2 digits behind the decimal point are possible or the automatic display (one digit behind the decimal point as standard).

If the process value exceeds the dimension which can be displayed with the decimal point format, decimal place(s) are discarded after the decimal point.

Measured value no. (xx.ENo)

Here, the no. of the desired measured value from the transmitter Wtrans E01 is selected. The measured value 1 to 4 is possible (in series, measured value 1).

This parameter is only effective for transmitters E01.

The parameter is only available for device software version 05.01 or above.

Customer specific linearization

Four customer specific linearizations are available in addition to the linear linearization. The corresponding linearization tables must be created with the setup program.

To be able to use the customer specific linearization, a suitable transmitter must be linked and the probe type of the transmitter must be configured to Resistance transmitter, Potentiometer, Voltage or Pressure.

The parameter is only available for receivers with a hardware version of 1 or above, or with a device software version equivalent to 03.01 or above.

⇨ chapter 2.1 "Nameplate", page 9

⇨ "Software version", page 63

⇨ chapter 11.5 "Customized linearization", page 85

CAUTION!

After an customer-specific linearization change, you should perform the following steps if necessary:
1. Reset the drag indicator.
2. Check the scaling of the analog outputs.
3. Check the settings of the limit value alarms.

Unit for resistance transmitter types, potentiometer or voltage

Here, the one of 16 units (17 units as of device software version 04.01 and higher) can be selected. The unit is shown in the receiver display.

The parameter is only available for receivers with a hardware version of 1 or above, or with a device software version equivalent to 03.01 or above.

⇨ chapter 2.1 "Nameplate", page 9

⇨ "Software version", page 63

Unit for pressure transmitter types

Here, the one of 7 units can be selected. The unit is shown in the receiver display. The numerical value along with this unit is automatically converted here (except for "free text entry").

The parameter is only available for receivers with a hardware version of 1 or above, or with a device software version equivalent to 04.01 or above.

⇨ chapter 2.1 "Nameplate", page 9

⇨ "Software version", page 63

CAUTION!

After an pressure unit change, you should perform the following steps if necessary:
1. Reset the drag indicator.
2. Check the scaling of the analog outputs.
3. Check the settings of the limit value alarms.

Scaling active

A scaling procedure is carried out if the parameter is at On. The parameter is only available for as of device software version 04.01 or higher.

Scaling start, scaling end

For transmitters, the probe type of which is configured to Potentiometer, Voltage, or Pressure the input measuring range (e.g. 0 to 50 mV) can be scaled to a range defined by the user (e.g. 0 to 250). The corresponding unit is configured by the Unit parameter.

The parameter is only available for receivers with a hardware version of 1 or above, or with a device software version equivalent to 03.01 or above.

⇨ chapter 2.1 "Nameplate", page 9

⇨ "Software version", page 63

CAUTION!

After a scaling change, you should perform the following steps if necessary:
1. Reset the drag indicator.
2. Check the scaling of the analog outputs.
3. Check the settings of the limit value alarms.

Alarm type 1/2 (xx.A1m/xx.A2m)

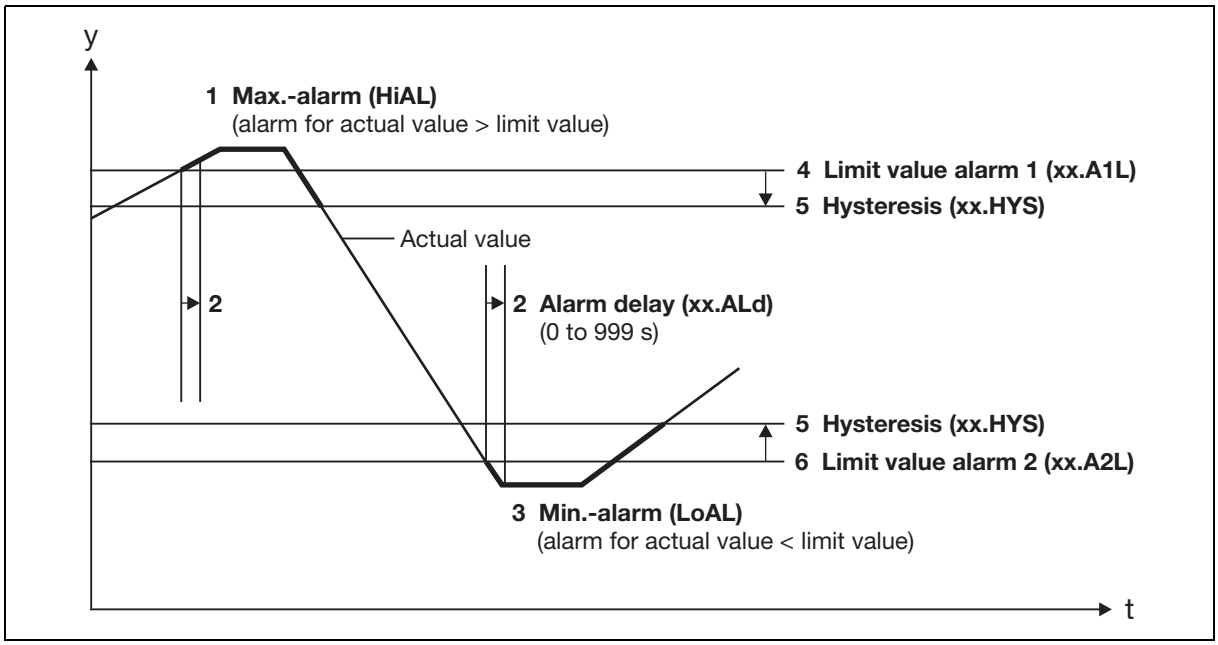


Fig. 9-4 Setting the alarm functions

High alarm (HiAL)

An alarm is issued when the positive limit value is exceeded (after the alarm delay time has elapsed), not taking the hysteresis into account (see Fig. 9-4, item 1).
Reset conditions: return to a value below the positive limit value minus hysteresis.

Low alarm (LoAL)

An alarm is issued when the negative limit value is not met (after the alarm delay time has elapsed), not taking the hysteresis into account (see Fig. 9-4, item 3).
Reset conditions: return to a value above the negative limit value plus hysteresis.

Limit value alarm 1/2 (xx.A1L/xx.A2L)

The limit value for the selected alarm type 1 and 2 is set here (see Fig. 9-4, item 4 and item 6).

Hysteresis (xx.HYS)

The hysteresis is the difference between the set limit value alarms. 1 or 2 is always set as a positive value for the Max. alarm and Min. alarm (see Fig. 9-4, item 5).

Alarm delay (xx.ALd)

This parameter is used to suppress short-term faults (see Fig. 9-4, item 2). The alarm signal is only activated after the set time has elapsed and the limit value overrange or underrange is still pending.

NOTE!

The alarms can be configured as window function (min/max) or as pre-alarm or main alarm (min/min or max/max).

9 Term definition

CAUTION!

Alarm in the event of probe break or short-circuit:
Even the guaranteed faulty values probe break (display "oooo“) or short-circuit (display "uuuu“) only lead to a set alarm bit and, thus, to a multi-input alarm with the LED flashing red when at least one alarm (regardless whether LoAL or HiAL) was configured!
If you only want to receive probe break / short-circuit alarms without any other limit value monitoring, activate an alarm using a limit value outside of the range of occurring actual values.
Example:
Your actual value can be between -10 to +200 °C.
Pure probe break / short-circuit alarms can be achieved, e.g. by a HiAL configuration with a limit value of 300 °C or a LoAL configuration with a limit value of -100 °C.

Drag indicator down/up (xx.Min) and up (xx.MAX)

The minimum and maximum values for each channel are saved and shown on the display when requested. In this context, overrange and underrange are not taken into account. These values can be reset using the keyboard or via interface. Having reset the drag indicator, the current value is taken over and the drag indicator function restarts.

⇨ chapter 8.2.3 "Channel-specific parameters", page 60

⇨ chapter 10 "Display and reset drag indicator", page 75

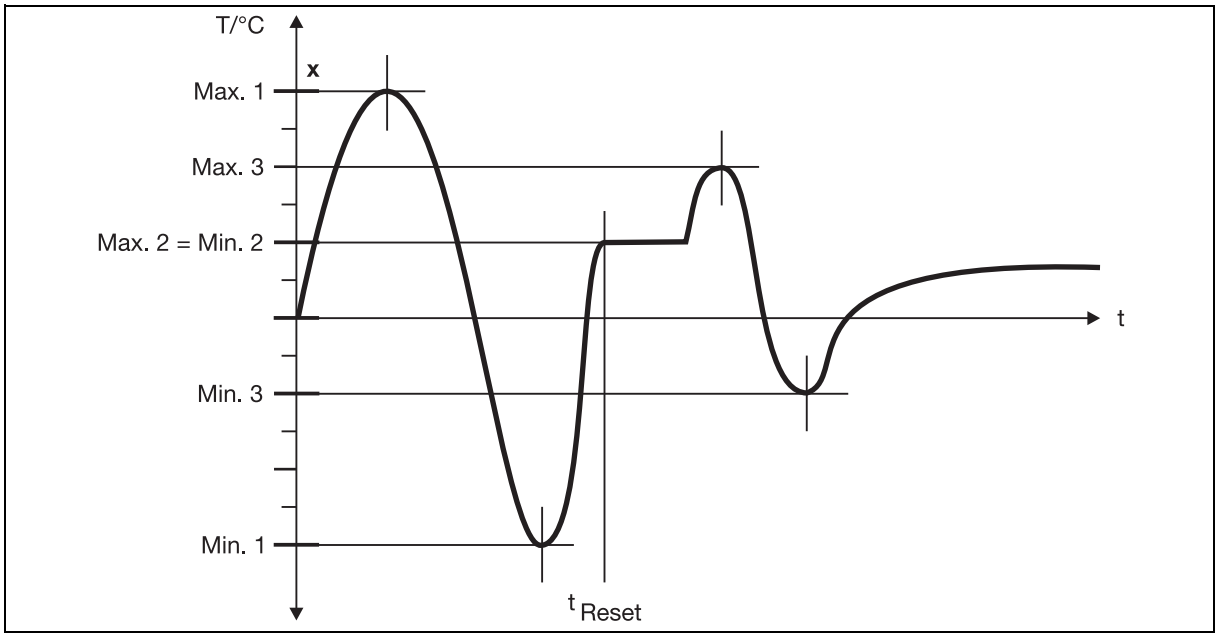


Fig. 9-5 Time sequence of the drag indicator functions

Fig. 9-5 shows the time sequence of the drag indicator functions down (xx.Min) and up (xx.MAX). The Value Max.1 is saved in the first positive half-wave of the process value curve, value Min.1 in the first negative half-wave. The keyboard can be used to reset these values, for instance, at time t_{Reset}.
Once the drag indicator is reset, the current value is taken over (Max.2 = Min.2). The drag indicator function restarts. The next saved values are Max.3 and Min.3.

The drag indicator values of channels 1 to 16 cannot be shown in the normal display. For this purpose, change to the parameter level and therein to 'channel-specific parameters'. At the end of the selection list of groups 1 to 16 (channels 1 to 16) three parameters (see table) relevant for the drag indicator function are shown.

Parameter	**Bottom line display**	**Top line display**	**Value range/ Selection**
Drag indicator, bottom	xx.Min	-9999 to +9999	Display only, cannot be edited! Minimum value drag indicator with automatic decimal point.
Drag indicator, top	xx.MAX	-9999 to +9999	Display only, cannot be edited! Maximum value drag indicator with automatic decimal point.
Reset drag indicator	xx.RES	0 1	do not reset reset

NOTE!

To use this function, you must know how to jump between groups 1 to 16 (channels 1 to 16) and how to browse step-by-step between parameters in these groups.

⇨ chapter 8.2 "Parameter level (PA)", page 54

The display shows the two drag indicator values at the top and bottom in two lines. The bottom line has the drag indicator type xx.Min or xx.MAX. In the display of the device, xx is replaced by the numbers 1/ 2/3/ to 16 indicating the selected channel. The measured value of the first transmitter is visible in the top line.

For the „Reset drag indicator“ parameter, the bottom display shows xx.RES (for Reset).

This parameter offers the following setting possibilities:

- no reset, i.e. the drag indicator function of the selected channels remains.
- reset, i.e. both drag indicator values (Min. and Max.) are deleted.

The next two pages describe how to display and reset the drag indicator values of channels 1 to 16.

10 Display and reset drag indicator

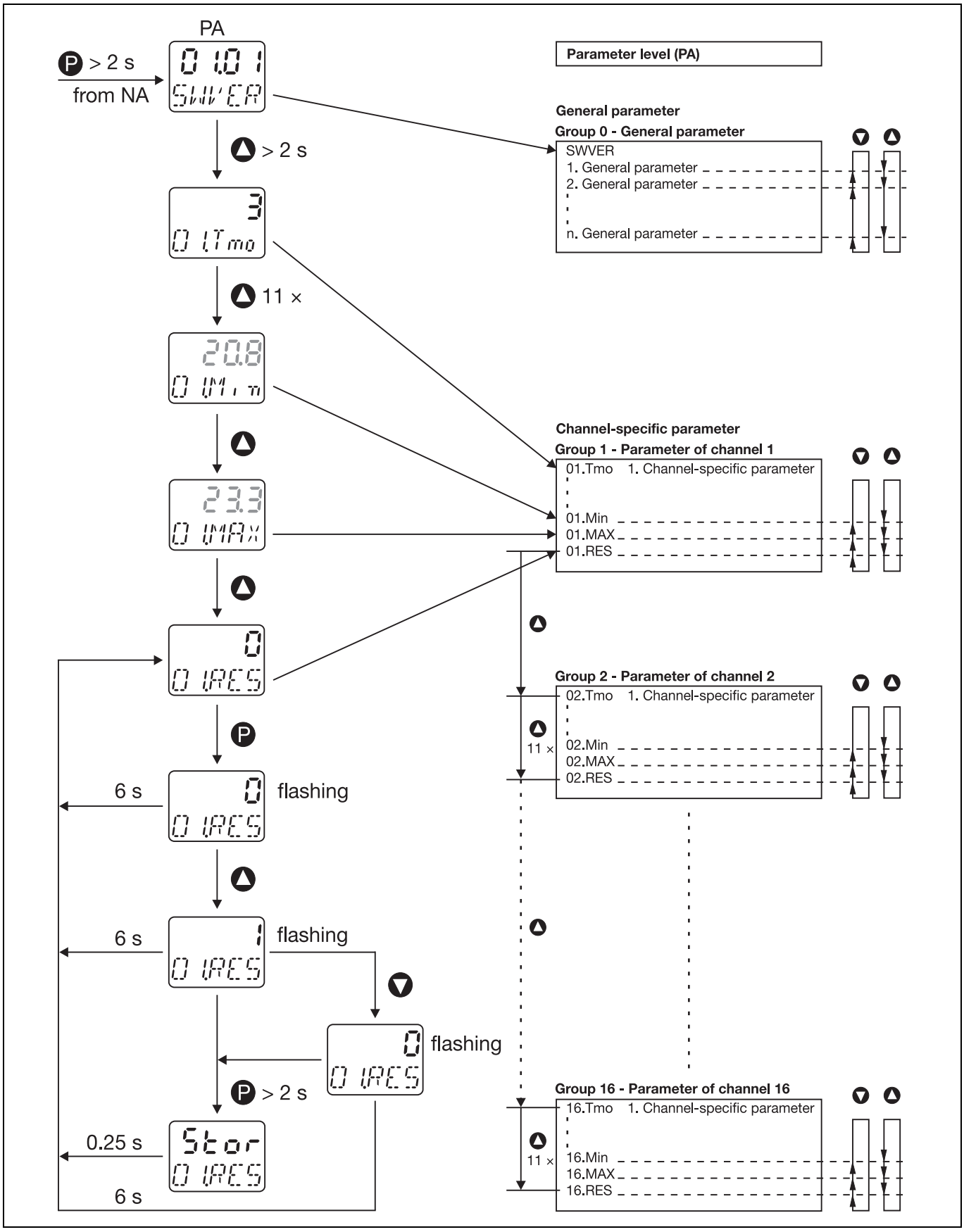


Fig. 10-1 Drag indicator functions

Step	Action
1	Hold the P key for > 2 s to leave the normal display (NA) and move to the parameter level (PA). *In the bottom line, the display shows the first General Parameter Software version (SWVER).*
2	Hold the ▲ key for > 2 s to jump to a channel-specific parameter. *In the bottom line, the display shows the 1st parameter for the 1st channel timeout of the wireless telegram [wireless timeout (01.Tmo)].*
3	Use the ▲ key to browse to the lower drag indicator parameter (01.Min) of the 1st channel. *In the top line, the display shows the minimum value of the 1st channel.*
4	Use the ▲ key to browse to the upper drag indicator parameter (01.MAX) of the 1st channel. *In the top line, the display shows the maximum value of the 1st channel.*
5	Use the ▲ key to browse to the "reset drag indicator" parameter (01.RES) of the 1st channel. *The display shows "0", i.e. the drag indicator is active.*
6	Use the P key to select the "reset drag indicator" parameter. *The display "0" flashes.*
7	Use the ▲ key to select the "reset drag indicator" parameter. *The display shows a flashing "1" in the top line.* *This selection can be reversed using step 8.*
8	Use the ▼ key to select the "do not reset drag indicator" parameter. *The display shows a flashing "0" in the top line.*
9	Hold the P key for > 2 s to apply the "reset drag indicator" function as in step 7 (or "do not reset drag indicator" function as in step 8). *The display shows Stor (storage) for 0.25 s and then jumps to Reset drag indicator (01.RES).*

10 Display and reset drag indicator

11.1 General information about the setup program

The configuration data from the receiver and transmitters can be archived in a single file on data carriers, printed, and documented.

The setup program can be used to overwrite changed parameters with the default settings at any time.

The connection between the receiver and PC is established via a PC interface (USB/TTL convertor).

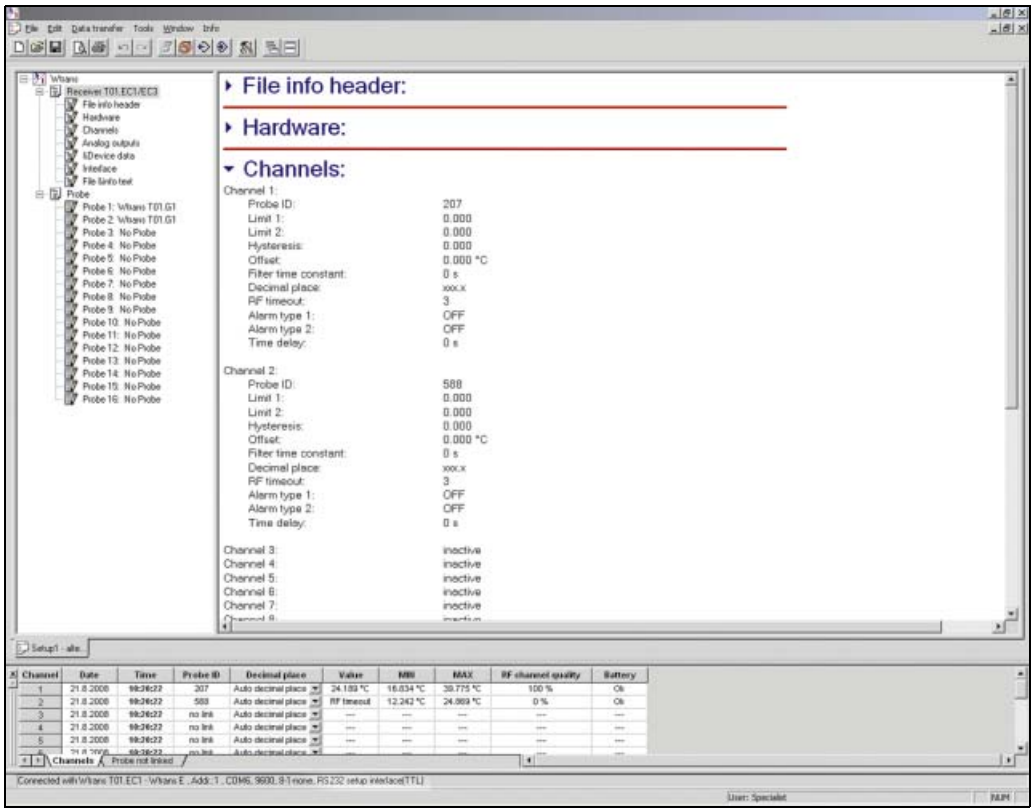


Fig. 11-1 Setup program

The setup program permits a comfortable and clearly structured setting of the large number of device parameters. Settings made once can be saved on a data carrier as a file and transmitted one to one to several devices.

With an online connection to the device, the bottom screen section, the „Diagnosis window“, shows process values and further informative values of all channels in parallel.

NOTE!

For configuration, the receiver must be connected to the voltage supply (exception: transmitter Wtrans p).

⇨ chapter 5.2 "Connection diagram", page 32

11 Setup program

11.2 Hardware and software requirements

The hardware and software requirements can be obtained from the manufacturer's website.

NOTE!

If no connection can be established with the transmitter or receiver using the setup program, the setup program must be updated. The latest version of the setup program can be downloaded from the manufacturer's website.

11.3 Establishing the connection between the PC and receiver

The connection between the transmitter and PC is established via a PC interface (USB/TTL converter) and adapter (socket).

CAUTION!

Continuous operation of the interface!
The TTL interface is not meant for configuring the device, and continuous operation is not permissible.
Please ensure that the interface connection is disconnected after the setup data transfer.

NOTE!

The device interrupts communication via the RS485, i.e. the setup connector has priority, when an interface cable is connected to the front setup plug.

USB/TTL

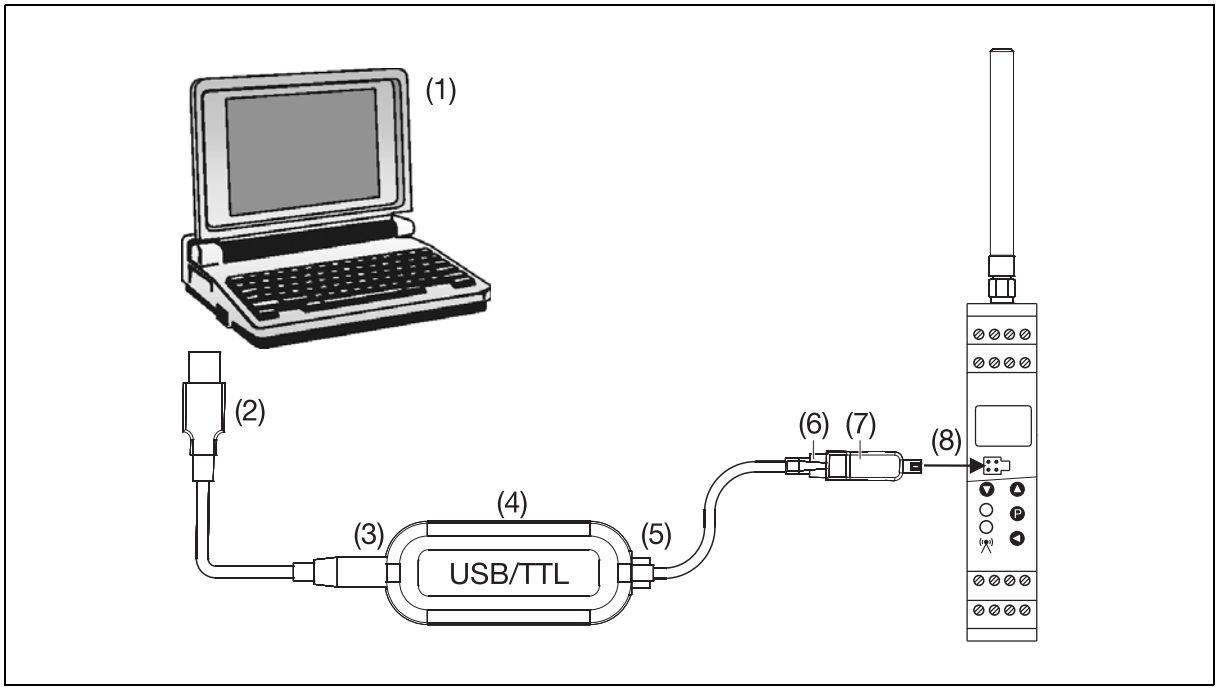


Fig. 11-2 Establishing the connection between the PC and receiver via USB/TTL converter and adapter socket

(1) PC
(2) USB connector
(3) USB socket
(4) USB/TTL converter
(5) Modular jack RJ-45
(6) Modular line adapter
(7) Adapter socket, 4-pin
(8) Receiver interface

Step	Action
1	Plug the USB plug of the USB cable (2) to the PC (1).
2	Insert the USB bush of the USB cable (3) into the plug of the USB/TTL converter (4).
3	Connect the RJ-45 plug (5) of the modular line to the RJ-45 socket of the USB/TTL converter (4).
4	Connect the 4-pin adapter socket (7) to the adapter of modular line (6).
5	Connect the 4-pin adapter socket (7) to the interface of the receiver (8).

11.4 Configuration of the receiver

This chapter explains the configuration of a receiver via the setup program. Prerequisite being that the receiver and the PC are connected via an interface.

11.4.1 Establishing the communication

A differentiation is made between two different way of proceeding when establishing the communication between receiver and setup program:

- Establish the communication with "Device settings assistant".
  This is used if the setup program is being used for the first time (device list is empty).
- Establish the communication without "Device settings assistant".
  This is the case when receiver/transmitter and setup program have already communicated (list of devices with entries).

Establishing the communication using the assistant

Step	Action
1	Start the setup program.
2	Select the "Establish connection" function in the "Data transfer" menu. *Once the setup program is started, the "Assistant for the device settings" appears.*
3	Select the receiver in "Device version" and confirm with "Next".
4	Confirm the PC communication interface "Serial interface" by pressing "Next".
5	Select the COM interface (e.g. COM1) and confirm with "Next".
6	Select the device address (e.g. 1) and confirm with "Next".
7	Exit the assistant by clicking "Finish". *The device list with the selected receiver appears.*
8	Click the "Connect" button. *The device list is closed, the assistant terminated and the communication between receiver and setup program established.*

Prerequisite for the procedure described above being the communication of the PC executed via a COM interface (virtual COM interface for USB/TTL).

When using the USB/TTL converter, the additional possibility exists to establish the connection via a USB interface.

Step	Action
1	Start the setup program.
2	Select the "Establish connection" function in the "Data transfer" menu. *Once the setup program is started, the "Assistant for the device settings" appears.*
3	Select the receiver in "Device version" and confirm with "Next".
4	Select the PC communication interface "USB-TTL converter" and confirm with "Next".
5	Select the connected converter (e.g. USB <-> Serial (LID:...)) and confirm with "Next".
6	Select the device address (e.g. 1) and confirm with "Next".
7	Exit the assistant by clicking "Finish". *The device list with the selected receiver appears.*
8	Click the "Connect" button. *The device list is closed, the assistant terminated and the communication between receiver and setup program established.*

Establishing the communication without using the assistant

Step	Action
1	Start the setup program.
2	Select the "Establish connection" function in the "Data transfer" menu. *The device list containing all devices entered is displayed.*
3	Select the desired receiver by clicking with the left mouse key.
4	Click the "Connect" button. *The device list is closed, the assistant terminated and the communication between receiver and setup program established.*

11.4.2 Reading out the current receiver parameters

Step	Action
1	In the "File" menu, select the "New" function. *The "Device assistant" starts.*
2	Select "Automatic detection and data transfer from the device" and confirm with "Next".
3	Exit the overview of the read out settings by pressing "Finish". *The current settings are imported into the setup program.*

11.4.3 Editing receiver parameters

Step	Action
1	Use the navigation tree to select the desired main parameter of the receiver (e.g. channels) by a double click with the left mouse key. *The channel parameters are mapped in.*
2	Edit the desired parameters.
3	Exit the editing procedure with "OK".
4	Save the parameters in the "File" menu with the "Save" function.

11.4.4 Transmit new parameters to the receiver

Step	Action
1	In the "Data transfer" menu, select the "Data transfer to device" function. *The current parameters are transmitted to the receiver.*
2	Finish communication between setup program and receiver in the "Data transfer" menu with the "Disconnect connection" function.

11.5 Customized linearization

Due to the customer specific linearization (max. 40 grid points or polynomial of fourth order), probes can be connected, which are not defined by the ex-factory linearization.

To activate the customer-specific linearization, ensure that "Potentiometer" or "Voltage" is configured as the sensor type on the transmitter. The customer-specific linearization parameter must be configured as "tAb1 to tAb4" in the channel-specific parameters on the receiver.

In the ***`Edit > Customer specific linearization`*** menu the user can define the linearization.

Step	Action
1	Select one of the tables 1 to 4.
2	Select the linearization method, table (grid points) or formula (polynomial).
3	Edit parameters.
4	Exit the entry by pressing OK.

Table

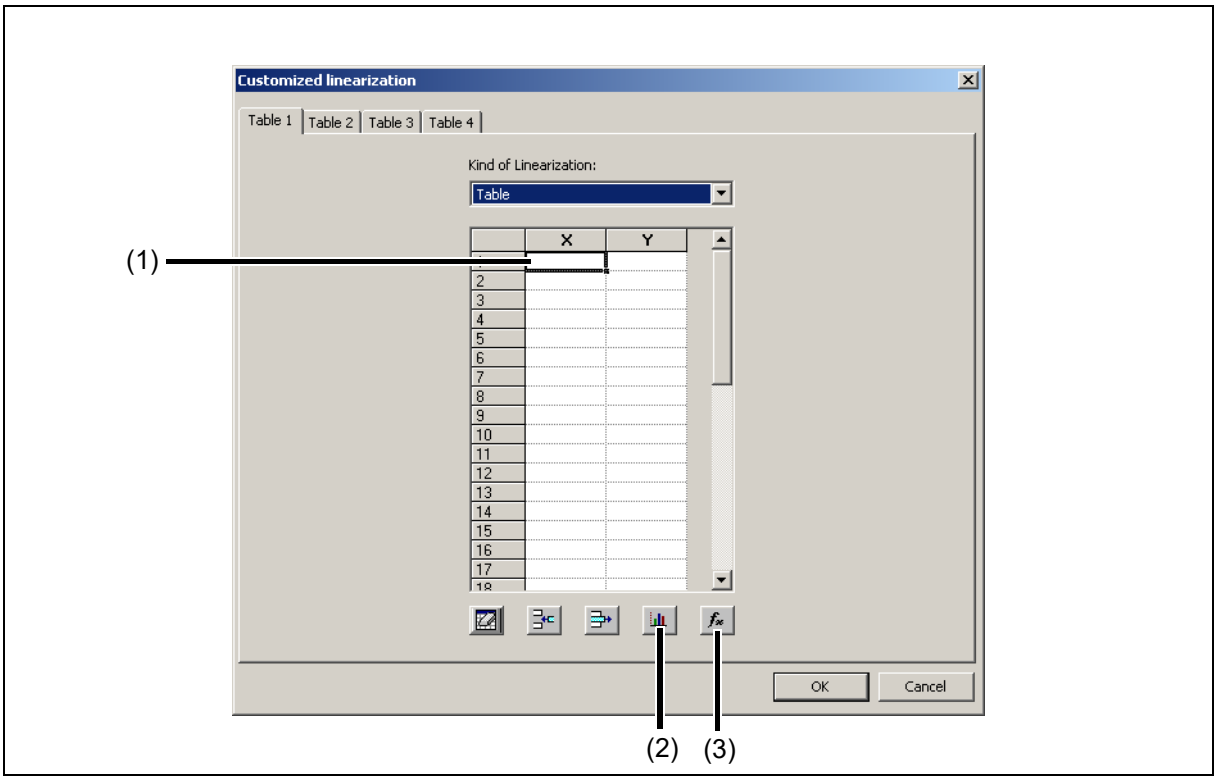


Fig. 11-3 Customer-specific linearization - Table

- The user enters the X and Y value pairs of the grid points in area (1).
- When actuating button (2), the user can display the linearization curve graphically and check it.
- The user can convert the entered grid points to a polynomial when using button (3). The view automatically changes from table to formula and can be toggled by the user. Both curves appear in the graphic display.

NOTE!

The linearization set when actuating the OK button is used by the device.

Formula

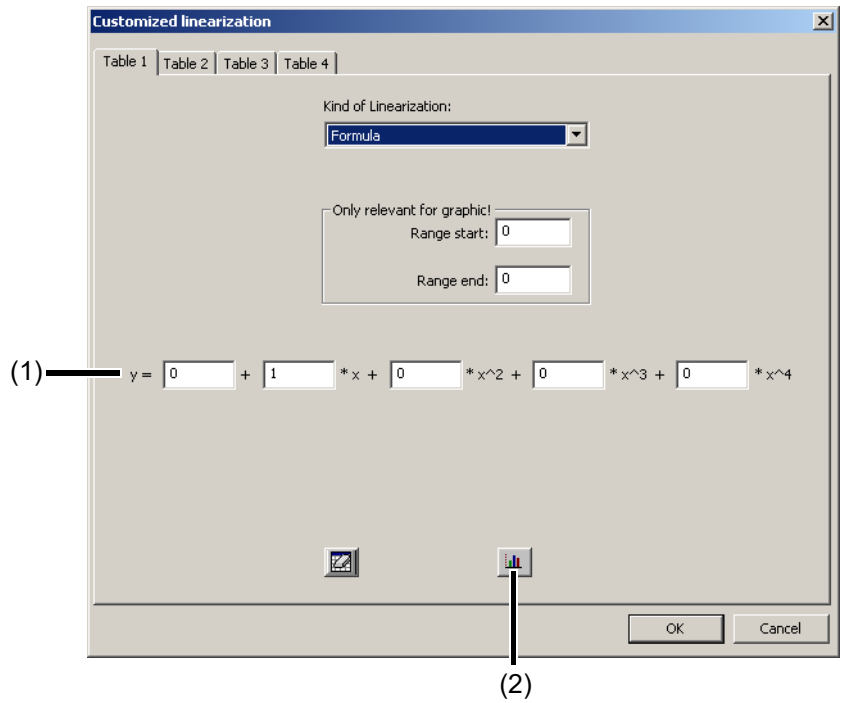


Fig. 11-4 Customer-specific linearization - Formula

- The user enters the coefficients and the polynomial formula in area (1).
- When actuating button (2), the user can display the linearization curve graphically and check it.

NOTE!

The manual entry of coefficients has no influence to the X and Y value pairs in the table.

11 Setup program

11.6 OnlineChart

The OnlineChart function is available as an option for the setup program (from version 216.03.xx). You can use this function to plot a maximum of 8 analog and 4 binary channels (sampling rate of 5 seconds) and record them over period of 14 days. The recorded data is saved together with the setup file.

OnlineChart is activated by the user, e.g. via the menu ***`View > OnlineChart`***.

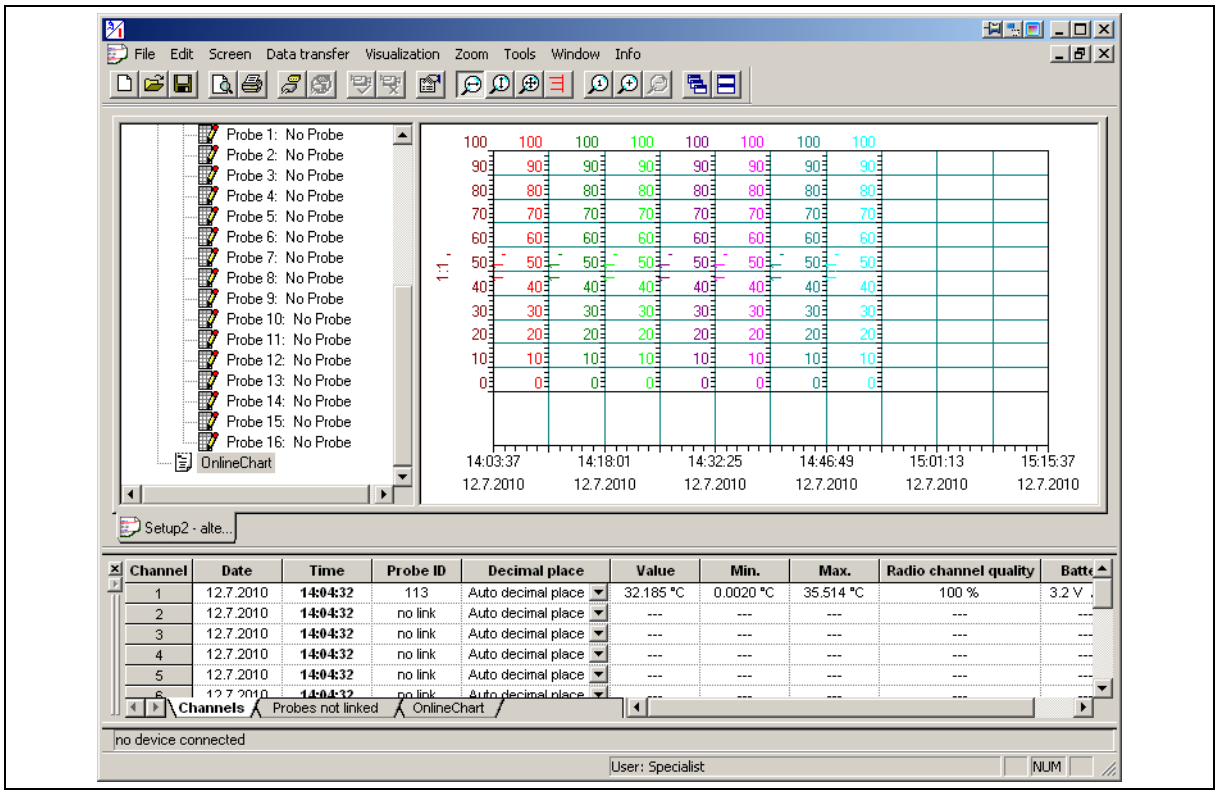


Fig. 11-5 OnlineChart after the first start

Start OnlineChart

Step	Action
1	Establish connection to the receiver (e.g. via the menu ***Data transfer > Establish connection***).
2	Start recording (e.g. via the menu ***Visualization > Start***).

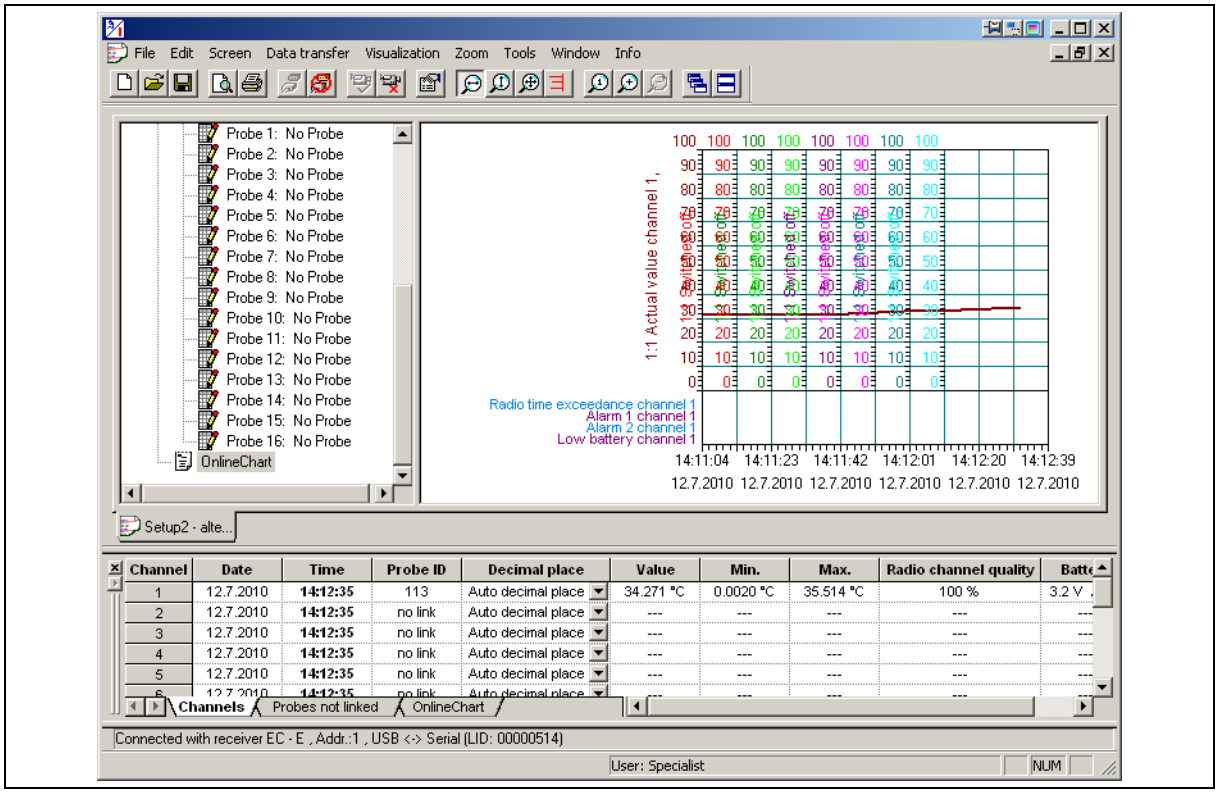


Fig. 11-6 OnlineChart with active recording

Exit OnlineChart

Step	Action
1	Stop recording (e.g. via the menu ***Visualization > Exit***).
2	Disconnect connection to the receiver (e.g. via the menu ***Data transfer > Exit connection***).

11 Setup program

OnlineChart evaluation

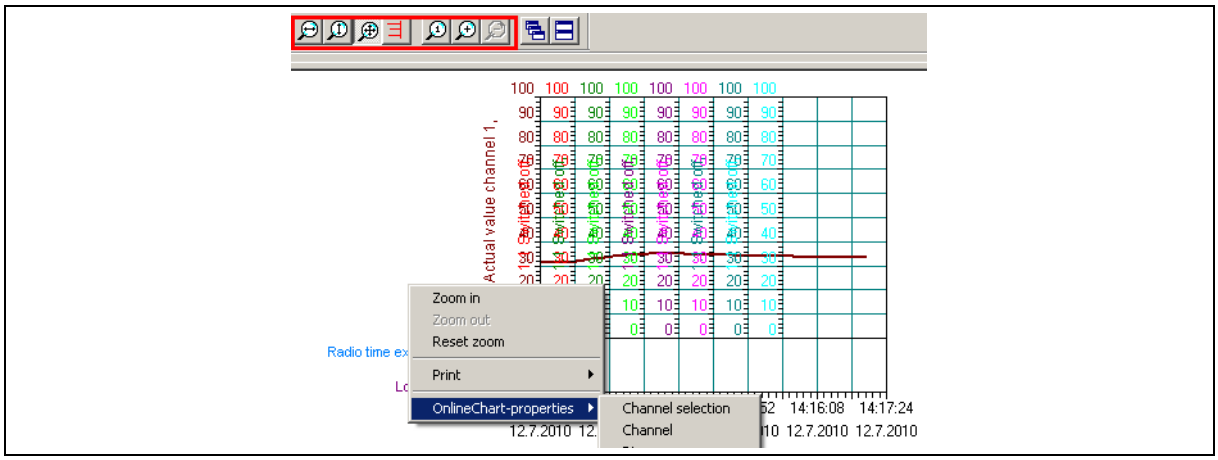


Fig. 11-7 Evaluation functions

You can use the symbols displayed in Fig. 11-7 to analyze the recorded measured values. You can also right-click anywhere on the chart to change the display properties.

Top line

Display	Error and remedy
oooo	Overrange Remedy: Check transmitter for probe break.
uuuu	Underrange Remedy: Check transmitter for short-circuit.
t.Err	Incorrect terminal temperature Remedy: Cool down the terminals of the thermocouple transmitter to the admissible temperature range.
- - - -	Radio timeout of the channel. Remedy: Optimize wireless transmission path and, if necessary, increase wireless timeout parameter and change transmitter battery.
- 0	No transmitter signals are available when the signal quality of the current channel (P key) is displayed. Remedy: Optimize wireless transmission path and, if necessary, increase wireless timeout parameter and change transmitter battery.
CodE	Code interrogation for changing to the commissioning/startup level or parameter level is active. Remedy: Enter code. This function is not active when delivered. The parameter level allows the assignment of a code (minimum 1 digit, maximum four digits) individually for each level (In and PA).

NOTE!

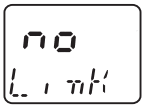
When a code was entered in the parameter level, keep this code in a safe place for future level access. This operating manual includes a field for a customer entry for this purpose.
If you have lost the code, please contact our customer service.

⇨ chapter 7.4 "Changing to different levels", page 46

Display	Error and remedy
Display dark	Device does not start. Remedy: Check voltage supply/cabling.
yellow LED does not light up	Device will not receive wireless telegrams. Remedy: Check the battery status of all existing transmitters. Do the set radio frequencies of transmitters and receivers correspond to each other? Is the antenna screw-fitted to the receiver or connected by cable? Are the locations of transmitter and receiver antennas suitable for wireless transmission (not enclosed in metal, etc.)?
	Interface RS485 does not function or is faulty. Remedy: Check cabling including polarity, use a screened cable for longer connection/interference source distances. With RS485 question and answer are on the same line. Especially with several slaves, set the minimum response time for all stations sufficiently high, so that even the slowest station will not discard telegrams directed to it.

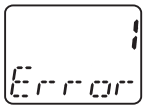
12 Detect and remedy errors

Top line and bottom line

Display	Error and remedy
	No linked transmitter available. Remedy: Link active transmitter.

⇨ chapter 8.1.1 "Convenient selection of a received transmitter ID from the link list and assignment to a channel", page 50

⇨ chapter 8.1.2 "Manual assignment of a transmitter ID to a channel", page 52

Display	Error and remedy
	Error (system error bit) means: At bit 0 (0x01) the receiver has initialized the configuration to the factory setting. Please check and, if necessary, reconfigure the settings! At bit 1 (0x02) the receiver has initialized the calibration data to the factory setting. The receiver needs to be recalibrated.

Top bicolor LED

Display	Error and remedy
flashing red	Collective alarm The collective alarm accepts the following error types: OR link of all individual alarms Remedy: Check the following alarms: • Wireless timeout, channel 1 to 16 • Analog alarm 1, channel 1 to 16 • Analog alarm 2, channel 1 to 16 Wireless timeout, channel 1 to 16 Remedy: Optimize wireless transmission path, increase wireless timeout parameter, change transmitter battery. Analog alarms 1, channel 1 to 16 Remedy: Check measured value or entry of the channel sending the alarm. Analog alarms 2, channel 1 to 16 Remedy: Check measured value or entry of the channel sending the alarm. Low battery signal of transmitters 1 to 16. Remedy: Change battery. Save errors detected with power ON. Remedy: see „Error“ parameter above.

13.1 Table: Assignment of transmitters to the receiver channels

Possibility to enter in this table, which transmitter is assigned with transmitter ID or transmitter color coding to which receiver channel.

For the transmitter Wtrans E01, the assignment of the transmitter ID to the receiver channel is not sufficient for the startup level, since each transmitter Wtrans E01 can transmit up to 4 measured values. Here, the desired Wtrans E01 measured value no. can also be configured in the channel-specific parameters.

⇨ chapter 8.1.1 "Convenient selection of a received transmitter ID from the link list and assignment to a channel", page 50

⇨ chapter 8.1.2 "Manual assignment of a transmitter ID to a channel", page 52

⇨ chapter 8.1.5 "Configuration of customized transmitter ID's on the transmitter side", page 53

Receiver-channel	**Transmitter ID**	**Transmitter color coding**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

13 Annex

Input

Number of transmitters	Up to 16 measured values can be received per receiver.
Radio frequency	868.4 MHz (Europe); 915 MHz (America, Australia, Canada, and New Zealand); 10 frequencies can be configured in the 915 MHz frequency band.
Open air range	Max. 300 m when using the antenna wall holder and the 3 meter long antenna cable. When installing the antenna directly onto the receiver, a reduced range of approx. 40 % must be taken into account.
Measuring range limits	Dependent on the set sensor
configuration	Using the keys on the device or with the setup program
Unit	The units for temperature, pressure, potentiometer, and voltage are configurable on the device or with the setup program.

Analog outputs

Number	4 analog outputs for basic type 902931/10 2 analog outputs for basic type 902931/30
Output signal: - current - voltage	Configurable with the keys on the device or with the setup program Load-independent direct current 0 to 20 mA or 4 to 20 mA Direct current 0 to 10 V
Transmission behavior	Linear, freely scalable
Burden (at current output)	≤ 500 Ohm
Load (at voltage output)	≥ 10 kOhm
Setting time for temperature changes	The setting time depends on the transmission interval that is set in the transmitter.
Setting time after switch-onor reset	≤ 5 s
Calibration conditions	AC 230 V/22 °C (±3 K) or DC 24 V/22 °C (±3 K)
Accuracy	≤ ±0.1 %[a] (accuracy includes calibration, linearization, burden influence, load error, and voltage supply error)
Residual ripple	≤ ±0.2 %[a]
Galvanic isolation	The analog outputs are galvanically isolated from each other and the interfaces.
Isolation voltage	50 V

[a] All accuracy specifications in % from the measuring range end value of 20 mA or 10 V.

Measuring circuit monitoring of the analog outputs

Underrange: - Current output 4 to 20 mA - Current output 0 to 20 mA - Voltage output 0 to 10 V	 dropping to 3.8 mA, then jump to the configured signals dropping to -0.1 mA, then jump to the configured signals dropping to -0.1 V, then jump to the configured signals
Overrange: - Current output 4 to 20 mA - Current output 0 to 20 mA - Voltage output 0 to 10 V	 rising to 20.5 mA, then jump to the configured signals rising to 20.5 mA, then jump to the configured signals rising to 10.25 V, then jump to the configured signals
Probe short circuit or probe/cable break and alarms: - Current output 4 to 20 mA - Current output 0 to 20 mA - Voltage output 0 to 10 V	 Positive signaling: > 21 mA Negative signaling: < 3.6 mA Positive signaling: > 21 mA Negative signaling: < -0.1 mA Positive signaling: > 10.5 V Negative signaling: < -0.1 V
Output behavior	The output behavior (positive or negative signaling) is configurable.

Relay outputs

Number	2 relay outputs for basic type 902931/30
Relay	N/O contact configurable as N/C contact
Switching capacity	Up to 3 A at AC 230 V resistive load
Contact life	150 000 operations at 3 A / AC 230 V resistive load 350 000 operations at 1 A / AC 230 V resistive load 310 000 operations at 1 A / AC 230 V and cos phi > 0.7
Galvanic isolation	Relay to analog outputs and interface; Test voltage AC 3700 V (reinforced insulation) Relay to relay; Test voltage AC 2300 V (basic insulation) **Mixed switching of mains voltage AC 230 V and SELV or PELV voltage is not admissible due to the basic insulation between the relays.**

Electrical data

Voltage supply	AC 110 to 240 V +10/-15 %, 48 to 63 Hz or AC/DC 20 to 30 V, 48 to 63 Hz
Power consumption	12 VA
Electrical connection	Screw terminals up to 2.5 mm^2
Electrical safety	According to DIN EN 61010, part 1 overvoltage category III, pollution degree 2, for installation into a control cabinet according to DIN EN 50178
Galvanic isolation	The voltage supply is electrically isolated from the analog outputs, relays, and interfaces.
Test voltage	AC 3700 V

Environmental influences

Ambient temperature range	-20 to +50 °C without condensation (even with close mounting)
Storage temperature range	-30 to +70 °C
Temperature influence	≤ ±0.005 %[a]/K; per K deviation from the reference temperature of 22 °C (±3 K)
Resistance to climatic conditions	Rel. humidity ≤ 85 % without condensation according to DIN EN 60721-3-3 3K3
Vibration resistance	Max. 1 g at 10 to 55 Hz according to DIN IEC 60068-2-6
EMC - Interference emission - Interference immunity - Radio frequency spectrum	DIN EN 61326-1 Class A – for industrial applications only – industrial requirements ETSI EN 300 220-1 and ETSI EN 300 220-2

[a] All accuracy specifications in % from the measuring range end value of 20 mA or 10 V.

Housing

Material	Polyamide
Flammability class	UL 94 V-2
Dimensions with antenna screw connection (W × H × D)	22.5 × 115.0 × 117.8 mm
Installation	DIN-rail 35 × 7.5 mm according to EN 60715
Protection type	IP20 according to DIN EN 60529
Installation position	Vertical ⊥
Weight	Approx. 200 g

Interfaces

Setup interface - Baud rate - PC interface	 9600 with TTL/RS232 or with USB/TTL converter
RS485 interface - Protocol - Baud rate - Device address - minimum response time	 Modbus 9600, 19200, 38400 1 to 254 0 to 500 ms

14 Technical data

LCD display

Top line	4-digit, 7-segment display, 4.5 mm high
Bottom line	5-digit, 16-segment display, 4.0 mm high

Approvals / approval marks

Approval mark	Test facility	Certificates/ Certification numbers	Inspection basis	Valid for
c UL us	Underwriters Laboratories	E201387	UL 61010-1 CAN/CSA-C22.2 No. 61010-1	915 MHz, 230 V, Basic type 902931/10
IC	Industry Canada	7472A-WTRANST01 7472A-WTRANST0102	RSS-210 Issue 7 RSS-210 Issue 8 RSS-GEN Issue 3 RSS-102 Issue 4	915 MHz, 230 V, Basic type 902931/10
FCC	Federal Communications Commission	VT4-WTRANST01 VT4-WTRANST01-02	FCC Rule Part 15C FCC Rule Part 15C	915 MHz, 230 V, Basic type 902931/10

部件名称 Product group: 902931	有毒有害物质或元素 Hazardous substances					
	铅（Pb）	汞（Hg）	镉（Cd）	六价铬（Cr(VI)）	多溴联苯（PBB）	多溴二苯醚（PBDE）
外壳 Housing (Gehäuse)	X	○	○	○	○	○
过程连接 Process connection (Prozessanschluss)	○	○	○	○	○	○
-螺母 Nut (Mutter)	X	○	○	○	○	○
螺钉 Screw (Schraube)	○	○	○	○	○	○

本表格依据 SJ/T 11364-2014的规定编制。
(This table is prepared in accordance with the provisions of SJ/T 11364-2014.)
O：**表示**该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
(O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.)
X：**表示**该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。
(X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.)

15 China RoHS

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