

Technical manual BA 1110



Signal converter

## GWA – 250 / GWAP-250

### Limit value switch

for limit value supervision of  
electrical signals

#### Evaluable Signals

- Standard signals 0...10V / 0...20mA resp. 4...20mA
- Temperature resistor Pt100 from -50°C...+650°C

#### Two limit value relays with different operation modes

- Safety function with minimum or maximum safety
- Double limit value function – two separated limit values
- Two-position-control function – a limit value with hysteresis

#### Configurable switching delay

Simple operation per key coding switch for adjusting the  
limit values from 0...99% of the signal range in steps of 1%

Integrated measurand transducer supply

Version with remote control available

Wide range power supply from 20 to 253V AC and DC

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know how mit system



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## Index

Order code .....	2
Application .....	3
Function .....	3 / 4
Safety notes .....	5
Installation .....	5
Maintenance .....	5
Repair .....	5
Electrical connection .....	6
Operation and display elements .....	7
Technical data .....	8

## Order code

GWA – 250 – U0	Version input signals 0...10V / 0...20mA resp. 4...20mA with on-site control
GWAS – 250 – U0	Version input signals 0...10V / 0...20mA resp. 4...20mA with remote control
GWAP – 250 – U0	Version input signal Pt100 from –50°C...+650°C with on-site control
GWAPS – 250 – U0	Version input signal Pt100 from –50°C...+650°C with remote control

## Application

The limit value switch **GWA – 250** is used for supervising electrical standard signals 0...10V / 0...20mA resp. 4...20mA or temperature resistors Pt100 regarding transgression resp. underrun of limit values.

The device allows it, additionally to continuous measurements, to set up to two switching limits without the need for additional measurement devices.

The version GWA – 250 is suitable for supervision of supply and control voltages, e.g. in the water and waste water industry for filling level monitoring and pump control (e.g. 15% pump on, 95% pump off).

The version GWAP – 250, for connection of a temperature resistor Pt100, can be used for supervision of process temperatures in all fields of industry.

Alternatively to the on-site operation, where the key coding switches for setting the switching limit are integrated in the device, the version S is available, where the key coding switches can be installed separately from the device, using them as remote control. These are suitable for the installations into control cubicle doors resp. front panels.

## Function

### Measuring principle

#### **Version GWA – 250 / GWAS – 250**

The connected electrical standard signal 0...10V / 0...20mA resp. 4...20mA is compared by the evaluation circuit with the set limit value at the key coding switches in % of the nominal signal range (10V / 20mA / 16mA), with reference to the respective signal zero value (0V / 0mA bzw. 4mA).

#### Examples:

- At standard signal 0...10V the setting 50% equals a signal voltage of 5V
  - At standard signal 0...20mA the setting 50% equals a signal current of 10mA
  - At standard signal 4...20mA the setting 50% equals a signal current of 8mA (50% of 16mA) + 4mA = 12mA
- The connected signal device at the input can be powered by the integrated measurand transducer supply.

#### **Version GWAP – 250 / GWAPS – 250**

The voltage drop at the connected temperature sensor Pt100 is compared by the evaluation circuit with the set limit value at the key coding switches in % of the set temperature signal range (30K / 50K / 100K / 600K), with reference to the set signal zero value (-50°C / 0°C / +50°C).

#### Examples:

- At zero value -50°C and range 100K the setting 50% equals a temperature of -50°C + 50K = 0°C
- At zero value 0°C and range 600K the setting 50% equals a temperature of 0°C + 300K = 300°C
- At zero value +50°C and range 30K the setting 50% equals a temperature of +50°C + 15K = 65°C

The connected Pt100 in 2-wire resp. 3-wire technology is supplied by an internal constant current source and is supervised for wire break or short circuit.

### Signal evaluation

The transgression resp. underrun of the set limit value causes the switching of the relay resp. the relays depending on the configured safety function (minimum resp. maximum safety) resp. operation function (double limit value function resp. two-position-control function).

The switching state of the relays is indicated at the front side of the device by two red LED's.

### Switching delay

In some applications it is necessary to compensate heavy signal fluctuations that may be produced by mixing machines or at fill-in resp. emptying of containers, to avoid spurious switching actions.

Two switches inside the device allow the configuration of a switching delay of 0,4 s or 4 s, separately for each output relay, at activation and deactivation of the respective output relay.

**Safety function**

The safety function defines the operation principle of the output relays.

- Maximum safety: The relay switches off, if the switching level is transgressed, or the power supply fails.
- Minimum safety: The relay switches off, if the switching level is underrun, or the power supply fails.

signal V/mA/Ω	minimum safety			maximum safety		
	output relay A	output relay B	LED	output relay A	output relay B	LED
			● red A ☀ green ● red B			☀ red A ☀ green ☀ red B
			● red A ☀ green ☀ red B			☀ red A ☀ green ● red B
			☀ red A ☀ green ☀ red B			● red A ☀ green ● red B

For both output relays, A and B, the safety function can be set separately. This can be carried out by two switches, one per relay, inside the device.

**Two-position-control Δs**

The activation of the two-position-control is made by a switch inside the device.

Two-position-control with minimum safety

Two-position-control with maximum safety

signal V/mA/Ω	output relay A	output relay B	LED		
			red A	green	red B
			●	☀	●
			●	☀	●
			☀	☀	☀
			☀	☀	☀
			●	☀	●
			☀	☀	☀

The set limit value A equals the switching value and the limit value B equals the switch back value.

At two-position-control the safety function must be set identically for both output relays.

## Safety notes

Each person that is engaged with inauguration and operation of this device, must have read and understood this technical manual and especially the safety notes.

Installation, electrical connection, inauguration and operation of the device must be made by a qualified employee according to the informations in this technical manual and the relevant standards and rules.

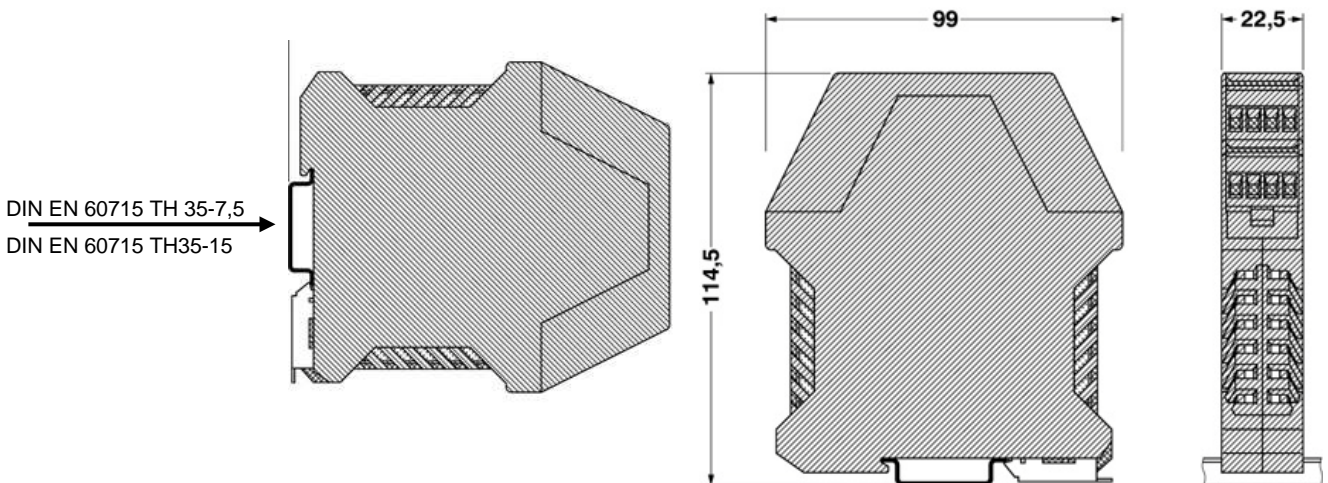
The device may only be used within the permitted operation limits that are listed in this technical manual. Every use besides these limits as agreed can lead to serious dangers.

The device meets the legal requirements of all relevant EC directives. **CE**



## Installation

The device is conceived for vertical installation on a standard fastening rail acc. to DIN EN 60715 TH 35-7,5 resp. TH35-15.



The device must be installed protected against dust and humidity, e.g. in control stations or in a suitable protection housing with a minimum protection classification IP55 acc. to DIN EN 60529.

The devices must be installed weather and stroke protected, ideally at places without direct solar radiation. This is especially important in warm climatic regions.

At the version S, with remote control, the remote control is suitable for installation into control cubicle doors or front panels.

The necessary cut dimensions are (W x H) 24 x 14mm. The optimum wall thickness is 0,7mm.

## Maintenance

The device is free of maintenance.

## Repair

A repair may only be carried out by the manufacturer. When sending back the device, add a note with the description of the error and the application.



## Electrical connection

The electrical connection of the device must be carried out according to the respective country specific standards. Incorrect installation or adjustment could cause applicationally conditioned risks.

Power supply input, measuring input and relay output channels are safe galvanically isolated from each other. This is also valid for both relay output channels among each other.

### Connection of the signaling transmitter resp. measuring transducer – measuring inputs

For the two, three or four-wire connection cable between the limit value switch and the signaling transmitter resp. measuring transducer a standard installation cable or multi-wire cable for measuring intends with a maximum of 25 Ω per wire can be used.

The use of a shielded signal cable is recommended, if strong electromagnetic influences could happens, e.g. due to machines or radio equipment. In that case the shielding of the cable should be connected to earth only at the side of signaling transmitter resp. measuring transducer.

The signal cable should be installed separated from power leading wires.

The connected signaling transmitter resp. measuring transducer can be powered by the integrated measuring transducer supply. The supply is overload and short circuit protected.

The maximum values of the inputs at the limit value switch GWA – 250 (current input maximum 400mA - 30V / voltage input 50V) must not be transgressed. The current input is equipped with a self resetting fuse. At activation of the fuse the signal current wire must be disconnected for app. 5 seconds.

If more than two limit values to a standard signal (V / mA) should be evaluated at the limit value switch GWA – 250, additional devices could be connected in series (mA) resp. in parallel (V).

At a current signal, the signal must be feed to both current inputs (2 – I-In / 1 – GND) in series. At a voltage signal, the reference terminal (1 – GND) and the signal input (3 – U-In) of the limit value switches must be connected together.

At the type GWAP – 250 a signal sided (Pt100) device coupling is not possible.

### Connection of the signaling and control equipments – relay outputs

Inductive loads at the relay contacts, e.g. auxiliary contactors or magnetic vents may only be used with a free-wheeling diode or a RC protection circuit to avoid high voltage peaks.

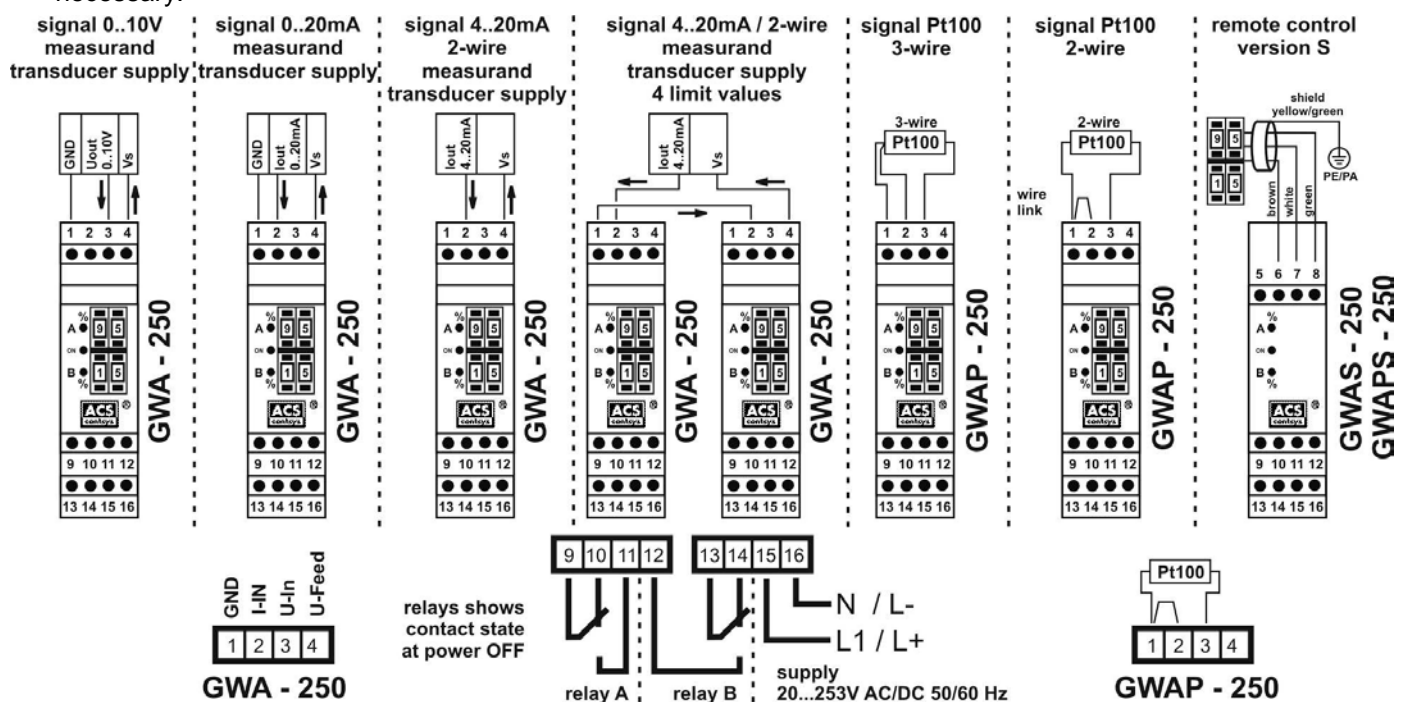
For inauguration it is suggested, to deactivate all connected control devices, to avoid unwanted control reactions.

### Connection of the power supply voltage

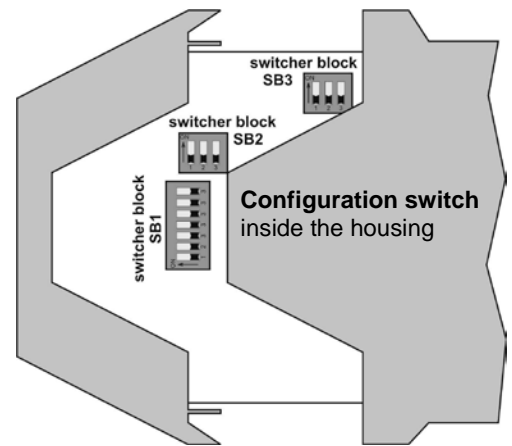
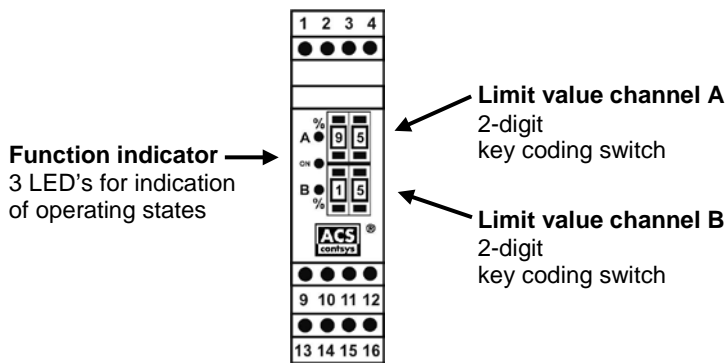
Due to the integrated wide range power supply, for connection to supply voltages from 20...253V AC / DC, the limit value switch is suitable for using in all common energy supply networks.

The connection is reverse polarity protected.

A fuse is integrated internally at the power supply circuit. Due to this the installation of a fine protection is not necessary.



## Operation and display elements



### Function indicator

- ON → green LED → ready status, power supply voltage on
- A → red LED → output relay A switched on
- B → red LED → output relay B switched on

### Key coding switch

For setting the limit value from 0...99% of the configured signal range in steps of 1%.

At two-position-control  $\Delta$ s the limit value A represents the switching value and the limit value B the switching back value.

### Configuration switches

The configuration of the input signal range as well as the relay functions is made per dip switches inside the housing.



#### Dangerous voltage

Ensure a safe switching off the supply voltage when opening the housing

For configuration release the upper housing part at top and bottom side behind the terminals by using a screwdriver and pull it out of the housing. Drop-in pin's avoid a complete pulling out. Following the respective dip switches can be set according to the desired functions to ON or OFF.

#### Relay functions switcher block SB1

Switch 1, 2, 5, 6 (SB1) → Safety function

switching state S1	switching state S2	safety function
ON	OFF	channel B – minimum safety
OFF	ON	channel B – maximum safety
switching state S5	switching state S6	safety function
ON	OFF	channel A – minimum safety
OFF	ON	channel A – maximum safety

Switch 3, 7 (SB1) → switching delay

switch	switching state ON	switching state OFF
3	channel B – 4 seconds	channel B – 0,4 seconds
7	channel A – 4 seconds	channel A – 0,4 seconds

Switch 4 (SB1) → operation function

switch	switching state ON	switching state OFF
4	two-position-control $\Delta$ s	double limit value switch function

#### Input signal range GWA – 250 switcher block SB2

Switch 1 (SB2) → measuring range – only at GWA – 250

switch	switching state ON	switching state OFF
1	input signal 4...20mA	input signal 0...10V / 0...20mA

#### Input signal range GWAP – 250 switcher block SB2 / SB3

Switch 2, 3 (SB2) → measuring range signal zero value – only at GWAP – 250

switching state S2	switching state S3	signal zero value
ON	ON	zero value – 50°C
OFF	ON	zero value 0°C
OFF	OFF	zero value + 50°C

Switch 1, 2, 3 (SB3) → measuring range signal range – only at GWAP – 250

switching state S1	switching state S2	switching state S3	signal range
ON	ON	ON	30 Kelvin
ON	OFF	ON	50 Kelvin
OFF	OFF	ON	100 Kelvin
OFF	OFF	OFF	600 Kelvin

## Technical data

### Auxiliary power supply

Permitted supply voltage:	20 V to 253 V AC / DC 48...62 Hz, reverse polarity protected
Power consumption:	≤ 2,5 VA / 1,75 W
Overvoltage category:	II acc. to DIN EN 61010-1
Protection classification:	II double or reinforced insulation
Isolation voltage:	4kV~ Auxiliary power to relay outputs to signal inputs
Galvanic isolation:	All supply, input and output channels among each other as well as both relay outputs from each other are safe galvanically isolated.

### Relay outputs

Function:	2x potential-free changeover contact
Switching power of the contacts:	U~ maximum 253 V AC I~ maximum 6 A AC (maximum switch-on current 10A) P~ maximum 1500 VA at ohmic load / 300 VA at cos ≥ 0,7

at U-	maximum I-	maximum P-
30 V	6 A	180 W
110 V	0,3 A	33 W
220 V	0,12 A	26,4 W

Minimum switching load:	≥ 50mW (0,5 V / 1 mA)
Switching cycles:	≥ 100.000 switching cycles at maximum contact load
Delay time:	≤ 0,4s ± 0,1s resp. ≤ 4s ± 1s
Switching hysteresis	0,5% ± 0,2% / at two-position-control Δs: limit value A – limit value B

### Signal input GWA – 250

Direct voltage:	0...10 V / maximum 50V / input resistance 100kΩ
Direct current:	0...20mA / 4...20mA / maximum 400mA at 30V – self resetting fuse Input resistance 50Ω + 0,2V
Measuring deviation:	≤ 0,4% of nominal measuring range
Temperature deviation:	≤ 0,2% / 10 K of nominal measuring range
Measurand transmitter supply:	overload and short circuit protected 3-wire-sensor: ≥ 21,2V at 20mA ≥ 20,7V at 27,5mA min. 27,5mA / max. 25V 2-wire-sensor: ≥ 20,0V at 20mA ≥ 19,0V at 27,5mA min. 27,5mA / max. 25V

### Signal input GWAP – 250

Temperature resistor Pt100:	3-wire- / 2-wire-measuring, resistance linear, measuring current 2 x 0,515mA ± 10μA
Measuring range:	Zero value: -50°C, 0°C +50°C / range: 30 Kelvin, 50 Kelvin, 100 Kelvin, 600 Kelvin
Measuring deviation:	≤ 0,4% (at zero value -50 / +50°C end value error ≤ 2%) of nominal meas. range
Temperature deviation:	≤ 0,2% / 10 K of nominal measuring range
Wire resistance:	≤ 40 Ω per wire
Error supervising:	At wire break / short circuit of one or multiple Pt100 connection wires the output relays are switched off (at safety function minimum safety). At short circuit resp. wire link between terminals 1 and 2 the device operates in 2-wire-measuring

### Materials

Connection housing:	PA – polyamide
Terminal housing:	PA – polyamide
Sticker:	PE – polyester

### Connection terminals

Number:	3 resp. 4 terminal blocks with each 4 terminals, everlasting screws
Connection cross-section:	maximum 1 x 2,5 mm or 2 x 1,5 mm

### Housing style

Housing:	Series installation housing, 22,5mm wide
Weight:	100 g

### Environmental conditions

Environmental temperature:	Single installation – 40°C...+85°C Series installation – 40°C...+70°C
Climatic classification:	3K3 resp. 3M2 DIN EN 60721-3-3
Protection classification:	IP20 DIN EN 60529
EM – compatibility:	emission DIN EN 61326-1 operation device class B immunity DIN EN 61326-1 industrial range