



Installation and operating manual

Universal Panel Mount Display / Controller

GIA 20EB

with electrically insulated supply



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1. Safety

1.1. General note

Read this document carefully and get used to the operation of the device before you use it. Keep this document within easy reach near the device for consulting in case of doubt.

Mounting, start-up, operating, maintenance and removing from operation must be done by qualified, specially trained staff that have carefully read and understood this manual before starting any work.

The manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring advices of this manual, operating by unqualified staff as well as unauthorized modifications to the device-

1.2. Intended use

The GIA 20 EB is a universal microcontroller based display unit.

The device has additional outputs and therefore is also applicable for monitoring and controlling purposes.

The devices are only to be operated in control panels or suitable electric housings, where the connection terminal area is sufficiently protected against touch.

They are designed for industrial or commercial use.

Outdoor installation without suitable means of protection is not allowed.

Due to the flexibly configurable universal input and the relay outputs of the GIA 20 EB they are applicable for many different applications. Both outputs are not galvanically isolated from the power supply.

Prior to fulfil the referring requirements, the device has to be configured on the base of this manual. Wrong configuration may lead to malfunction in the application. The commissioning expert / the operator is liable for a suitable configuration.

The counting function is not to be used for e.g. consumption metering in the sense of the measuring instruments directive 2014/32/EU.

The safety guidelines of the manual are followed!

The unit does not contain any components that you can service or repair yourself.

All the described operations are only to be performed of skilled personnel that are authorized by the operator.

Any other use or use exceeding this is considered as non-conforming and leads to the expiration of any liability or guarantee claims from the manufacturer.

Note: Combination / connection to other electrical equipment with CE marking does not automatically deliver a conform system. A new evaluation of the system's conformity to the low voltage directive (2014/35/EU) and EMC directive (2014/30/EU) by the manufacturer may be necessary, eventually others have to be considered (e.g. machinery directive).

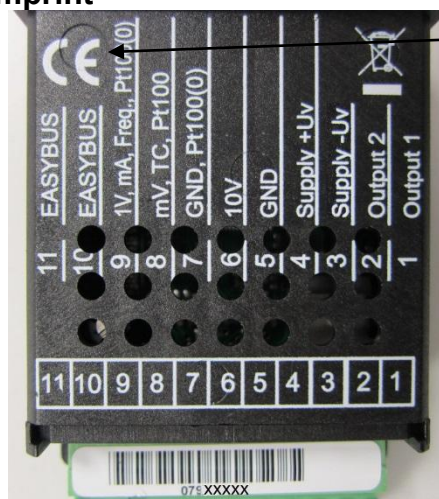
1.3. Skilled personnel

The mounting, electrical installation, start of operation, maintenance and decommissioning must only be performed by a skilled electrician.

Users of the readily installed device have to be sufficiently skilled in the operation of the device and able to avoid risks. The operator of the arrangement is responsible for sufficient qualification the operators.

1.4. Imprint and type label

Imprint

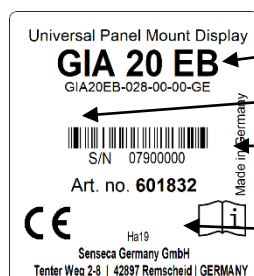


CE mark: see below

Disposal: refer Chapter 13.2

Electric connections, refer chapter 5.1

Type label (example)



Type

Please refer to manual: see below

Serial number

Manufacturer address

Symbol explanation



Please refer to manual:

Read the mounting- and operating manual carefully, before you connect and use the device.



CE mark:

With the CE-Sign declares the manufacturer, that the Product is conform with the prevailing requirements of EG.

1.5. Safety signs and symbols

Warnings are labelled in this document with the followings signs:



DANGER

Caution!

This symbol warns of imminent danger, death, serious injuries and significant damage to property at non-observance.



ATTENTION

Attention!

This symbol warns of possible dangers or dangerous situations which can provoke damage to the device or environment at non-observance.



Note!

This symbol point out processes which can indirectly influence operation, possibly cause incorrect measurement or provoke unforeseen reactions at non-observance.

1.6. Reasonably foreseeable misuse

1.  **DANGER**
This device must not be used at potentially explosive areas!
Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage. Failure to comply with these instructions could result in death or serious injury and material damage.
2.  **ATTENTION**
This device must not be used at a patient for diagnostic or other medical purpose.
3.  **DANGER**
The device is not intended for direct connection to 230V AC power supply.

1.7. Safety guidelines

1. Faultless operation and reliability in operation of the measuring device can only be assured if the device is used within the climatic conditions specified in the chapter "Specifications".
2. Always disconnect the device from its supply before opening it. Take care that nobody can touch any of the unit's contacts after installing the device.
3. Standard regulations for operation and safety for electrical, light and heavy current equipment have to be observed, with particular attention paid to the national safety regulations (e.g. VDE 0100).
4. When connecting the device to other devices (e.g. the PC) the interconnection has to be designed most thoroughly, as internal connections in third-party devices (e.g. connection of ground with protective earth) may lead to undesired voltage potentials.
5.  **DANGER**
The device must be switched off and must be marked against using again, in case of obvious malfunctions of the device which are e.g.:
 - Visible damage.
 - Device does not work like prescribed.
 - Storing the device under inappropriate conditions for longer time.
When not sure, the device should be sent to the manufacturer for repairing or servicing.
6. Modifications or repairs of the device may not be performed by the customer. For maintenance or repair the device must be sent to the manufacturer.
7.  **ATTENTION**
If the device is operated at an ambient temperature $> 40\text{ }^{\circ}\text{C}$ the connections may heat up above $60\text{ }^{\circ}\text{C}$.
Please keep this in mind when electing suitable connection cables.

2. Product description

2.1. Scope of supply

- monitoring- / controlling device
- 1 mounting bracket
- screw-in/plug-in clamps
- mounting and operating manual

2.2. Function

The GIA 20 EB is a universally applicable microprocessor controlled displaying, monitoring and controlling device.



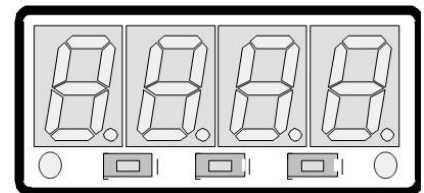
The power supply-connection is electrically insulated towards the device's other connections.

Universal input

The device supports one universal interface for the connection of:

Standard transmitter signals

- (0-20 mA, 4-20 mA, 0-50 mV, 0-1 V, 0-2 V and 0-10 V),
- RTD (for Pt100 and Pt1000),
- Thermocouple probes (type K, J, N, T and S),
- Frequency (TTL and switching contact).



As well as flow rate and rotation measuring, counting, etc. ...

Switching output and alarm

The GIA 20EB features two outputs, which can be configured as 2-point-controller, 3-point-controller, 2-point-controller with min./max. alarm, common or individual min./max. alarm.

The state of the outputs is displayed with the LED's below the front 4-digit LED-display

The left LED displays the state of the 1st output, the right LED displays the state of the 2nd output.

Interface

Furthermore both devices supports one EASYBus-interface for communicating with a host computer that makes the device to a full functions EASYBus-module.

When leaving our factory the GIA 20 EB has been subjected to various inspection tests and is completely calibrated.

Before the GIA 20 EB can be used, it has to be configured for the customer's application!

Important: At the configuration of the device you have to adjust the input signal (see chapter 6) first and then the output function (see chapter 7) or the offset-/slope- adjustment (see chapter 8)



ATTENTION

In order to avoid undefined input states and unwanted or wrong switching processes, we suggest to connect the device's switching outputs after You have configured the device properly.

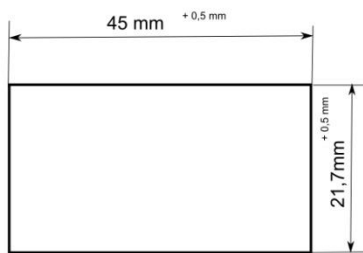


By calling a configuration menu the measurement and regulation of the device will be deactivated.

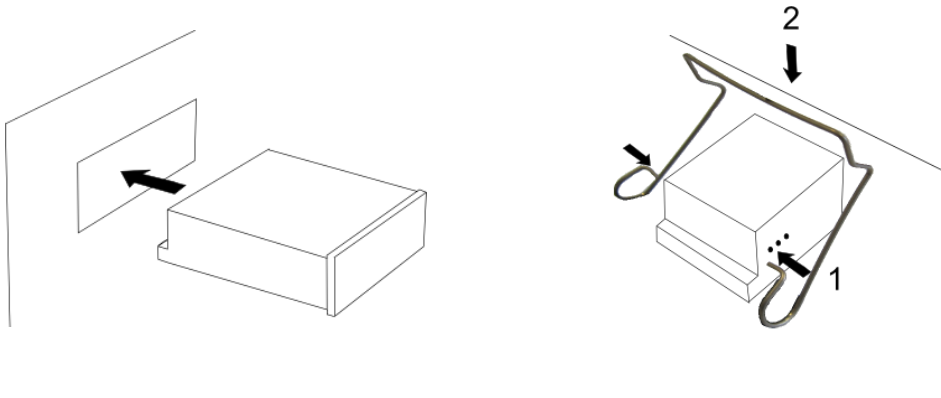
By leaving the menu the device will be reinitialised and the measuring/regulation will be started again. At the input function "counter" the counter state will be reset by leaving the menu.

3. Mounting in panels / housings

Panel cut-out:



Mounting:

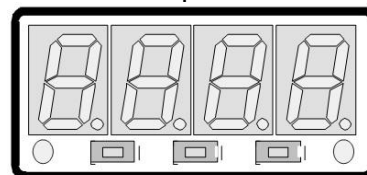


4. Display and operating elements

Front:



Front without pane



button 1 button 2 button 3

4.1. Display elements



Main display:

Display element to show minimum / maximum and measuring value.
It also displays errors and parameters.



LED 1:

Indicates the state of output 1

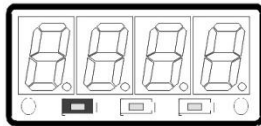
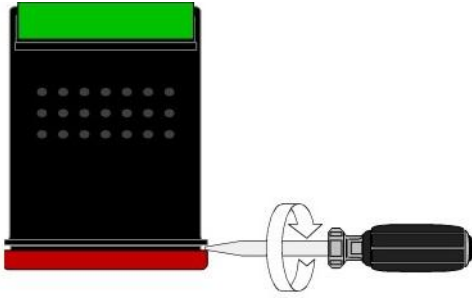


LED 2:

Indicates the state of output 2

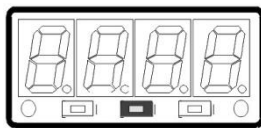
4.2. Operating elements

Disassemble front plate:



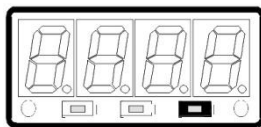
Button 1:

> 2 sec : activates menu "Switching points and alarm boundaries".
Menu: step to next parameter
after the last Parameter press again to save.



Button 2:

display max. value
> 2 sec : activates menu "Configuration".
Button 2 + 3, >2s: reset min-/max. value
Menu: press short = increase value.
press long = roll-function with overflow-function *)



Button 3:

display min. value
>2s: activates menu „Offset- and slope adjustment“
Button 3 + 2, >2s: reset min-/max. value
Menu: press short = decrease value.
press long = roll-function with overflow-function *)

*) The buttons 2 and 3 are featured with a 'roll-function'. When pressing the button once the value will be raised (button 2) by one or lowered (button 3) by one. When holding the button pressed for longer than 1 sec. the value starts counting up or down, the counting speed will be raised after a short period of time. The device also features a 'overflow-function', when reaching the upper limit of the range, the device switches to the lower limit, vice versa.

5. Electric connection

Wiring and commissioning of the device must be carried out by skilled personnel only.

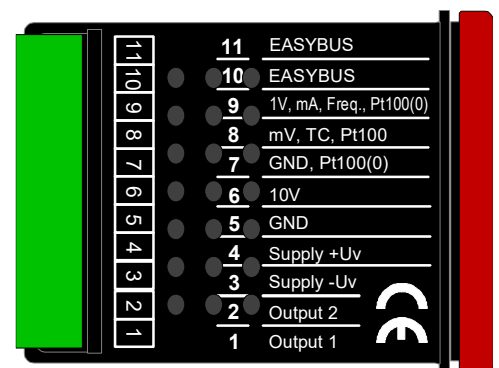


ATTENTION

Use the device only for panel mounting or with suitable electrically housings.
The electrical connections must be protected against direct contact.
In case of wrong wiring the device may be destroyed. We cannot assume any warranty in case of wrong wiring of the device.

5.1. Terminal assignment:

11	EASYBus-Interface
10	EASYBus- Interface
9	Input: 0-1V, 0-2V, mA, frequency, Pt100, Pt1000
8	Input: 0-50mV, thermocouples, Pt100
7	Input: GND, Pt100, Pt1000
6	Input: 0-10V
5	Switching output: GND
4	Supply voltage: +Us
3	Supply voltage: -Us
2	Switching output: 2
1	Switching output: 1



Hint:

The contacts 5 and 7 are connected internally – there is no connection to contact 3

5.2. Connection data



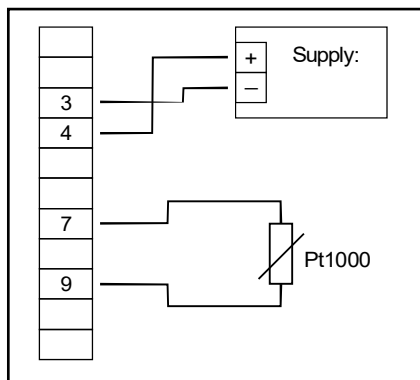
These limits must not be exceeded (not even for a short time)!

		Between terminals	Typical		Limitations		notes
			min.	max.	min.	max.	
Supply voltage	12 V	3 - 4	11 V _{DC}	14 V _{DC}	0 V _{AC}	14 V _{DC}	<i>Attend to construction of the device!</i>
	24 V		22 V _{DC}	27 V _{DC}	0 V _{AC}	27 V _{DC}	
Switching output 1 and 2:	NPN	1, 5				30 V _{DC} , <1A	<i>Not short circuit protected</i>
	PNP	2, 5				I < 25 mA	
Input mA		7, 9	0 mA	20 mA	0 mA	30 mA	
Input 0-1(2)V, Freq., ...		7, 9	0 V	3.3 V	-1 V	30 V, I<10mA	
Input 0-50mV, TC, ...		7, 8	0 V	3.3 V	-1 V	10 V, I<10mA	
Input 0-10V		6 - 7	0 V	10 V	-1 V	20 V	

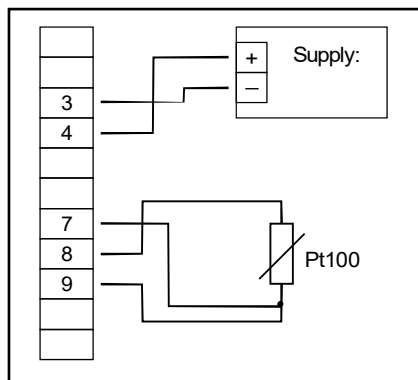
5.3. Connecting an Input signal

Please take care not to exceed the limitations of the inputs when connecting the device as this may lead to destruction of the device.

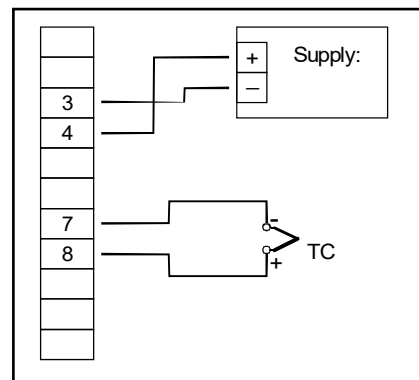
5.3.1. Connecting a Pt100 or Pt1000 RTD probe or a thermocouple probe



Pt1000-RTD probe (2-wire)

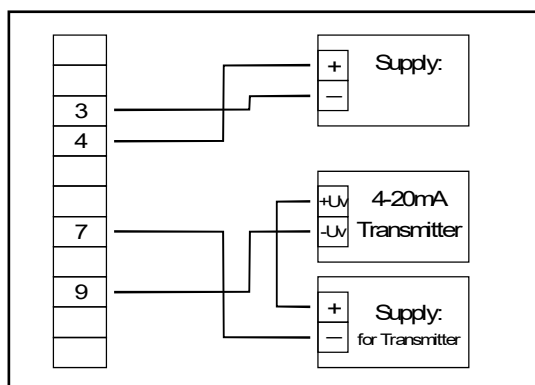


Pt100-RTD probe (3-wire)

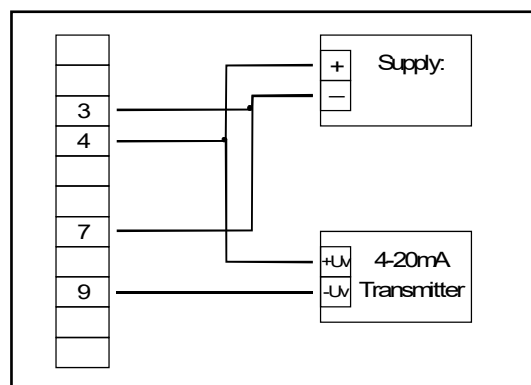


Thermocouple probe

5.3.2. Connecting a 4-20mA transmitter in 2-wire-technology

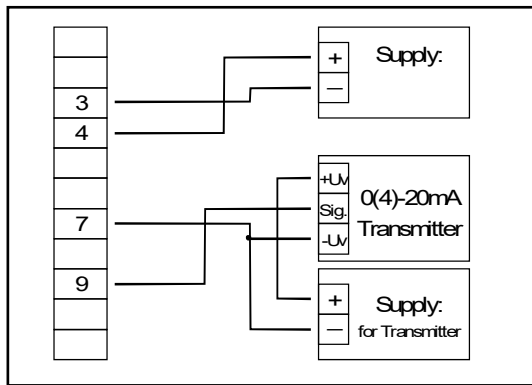


with individual transmitter supply

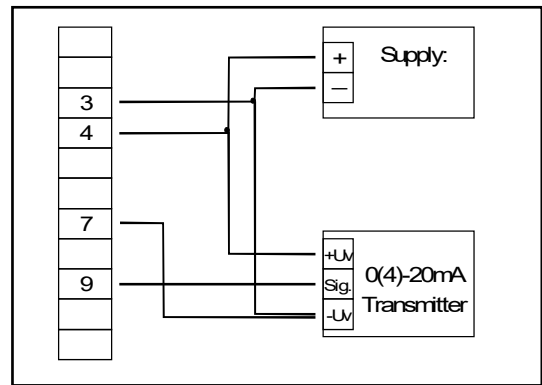


without individual transmitter supply

5.3.3. Connecting a 0(4)-20mA transmitter in 3-wire-technology

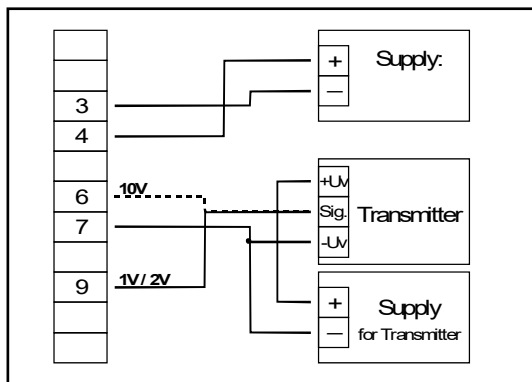


with individual transmitter supply

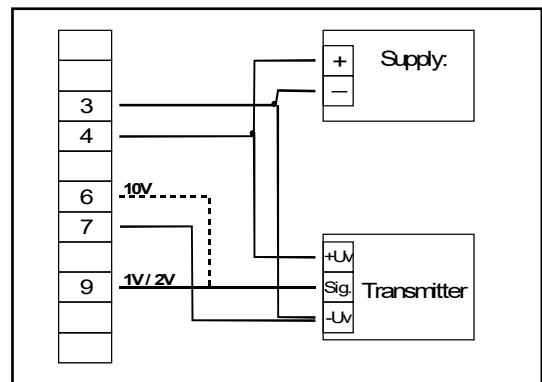


without individual transmitter supply

5.3.4. Connecting a 0-1V, 0-2V or 0-10V transmitter in 3-wire-technology

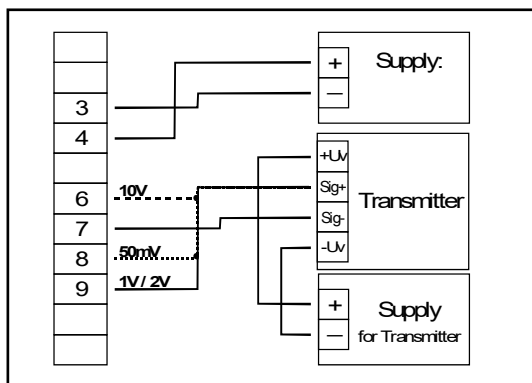


with individual transmitter supply

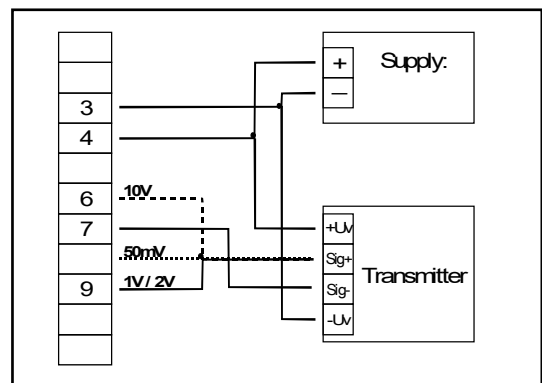


without individual transmitter supply

5.3.5. Connecting a 0-1/2/10V or 0-50mV transmitter in 4-wire-technology



with individual transmitter supply



without individual transmitter supply
(Note: Sig- and -Uv must be the same potential)

5.3.6. Connecting a frequency- or rotation-signal

Measuring frequency or rotation three different input signals can be selected in the device's configuration. There is the possibility of connecting an active signal (= TTL, ...), a passive sensor-signal with NPN (= NPN-output, push-button, relay, ...) or PNP (= a PNP output switching to +Us, high-side push-button, ...).

When configuring the device with a NPN switching output, a pull-up-resistor (~11kΩ referring to +3.3V) is connected internally. So when you use a device with NPN output You don't need to connect a resistor externally.

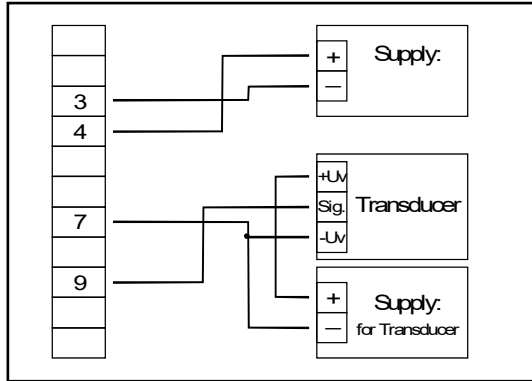
When configuring the device with a PNP switching output, a pull-down resistor (~11kΩ referring to GND) is connected internally. So when you use a device with PNP output You don't need a resistor externally.

It may be that your measuring-signal source needs the connection of an external resistor e.g. the pull-up-voltage of 3.3V is not enough for the signal source, or you want to measure in the top level

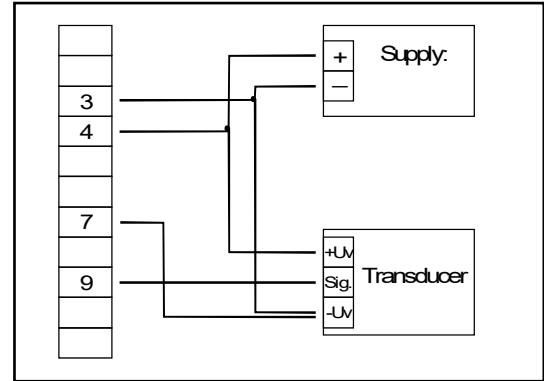
frequency range. In this case the input signal has to be treated like an active signal and you have to configure the device as „TTL“.



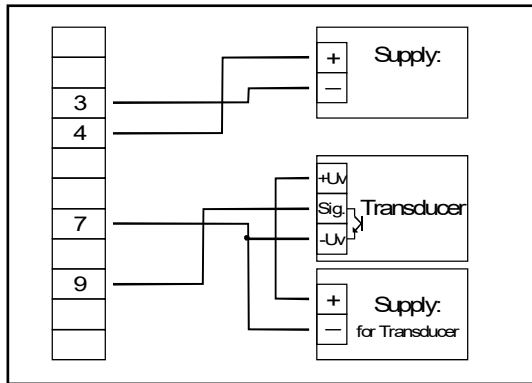
When connecting the device You have to take care not to exceed the limits of the input voltage respective the input current of the frequency-input.



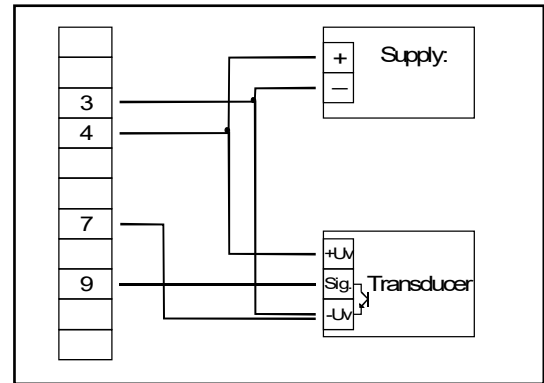
Connection of a transducer with TTL or PNP output (separate power supply)



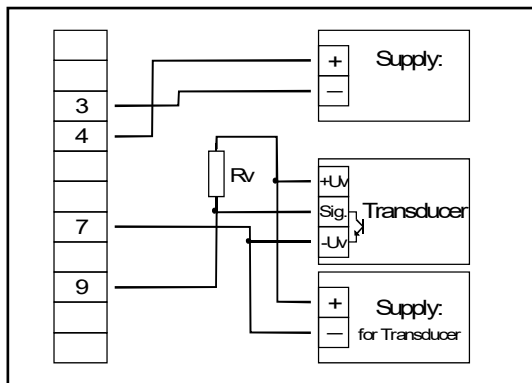
Connection of a transducer with TTL or PNP output (without separate power supply)



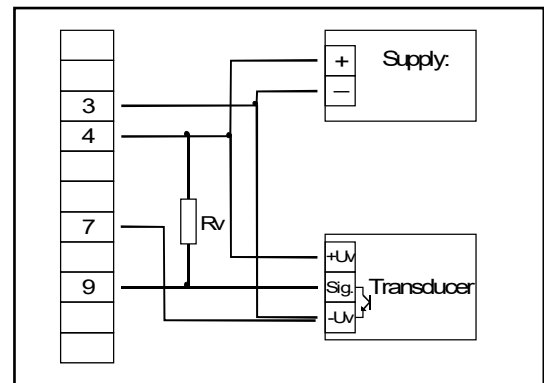
Connection of a transducer with NPN output (separate power supply).



Connection of a transducer with NPN output (without separate power supply).



Connection of a transducer with NPN output and necessary external resistor (with separate power supply)

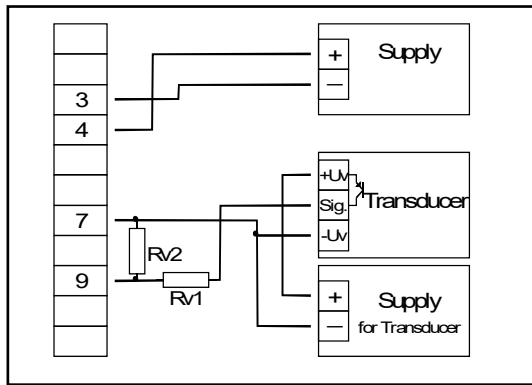


Connection of a transducer with NPN output and necessary external resistor (without separate power supply).

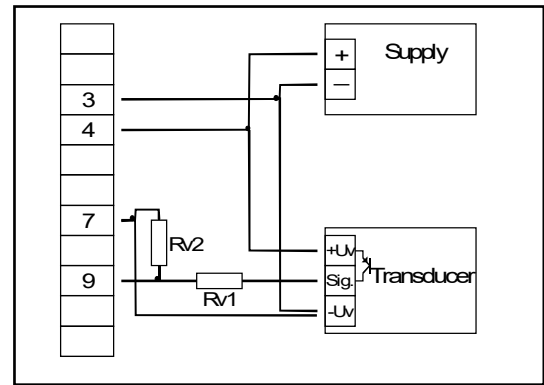


Hint:

3kΩ (with power supply voltage = 12V) or 7kΩ (with power supply voltage = 24V), device configuration: Sens = TTL



Connecting of a transducer with PNP output and external resistor wiring. (with individual power supply)



Connecting of a transducer with PNP output and external resistor wiring. (without individual power supply)



Hint: $R_{v2} = 600\Omega$, $R_{v1} = 1.8k\Omega$ (power supply voltage = 12V) or $4.2k\Omega$ (power supply voltage = 24V), device config.: Sens = TTL
(R_{v1} is a current limiting resistor and may be shorted if necessary. It should never exceed the mentioned value.)

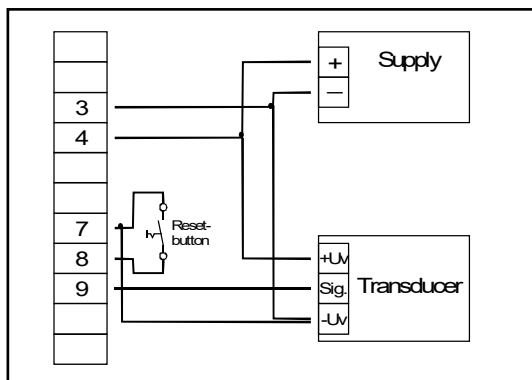
5.3.7. Connecting a counter signal

When configuring the device you can select 3 different input signal modes similar to the connection of frequency- and rotation-signals. The connection of a sensor-signal for a counter-signal is the same used for the frequency- and rotation-signal. Please use the wiring diagram given in this chapter.

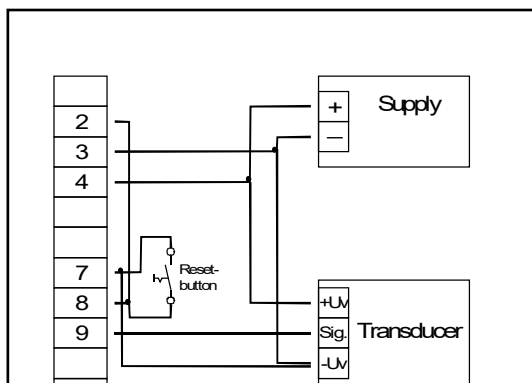
There is the possibility to reset the counter. When connecting contact 8 with GND (e.g. contact 7) the counter will be reset. You can do this manually (e.g. with the help of a push-button) or automatically (with one switching output of the device).



When connecting the device, take care not to exceed the limits of the input-voltage or the input-current of the frequency input.

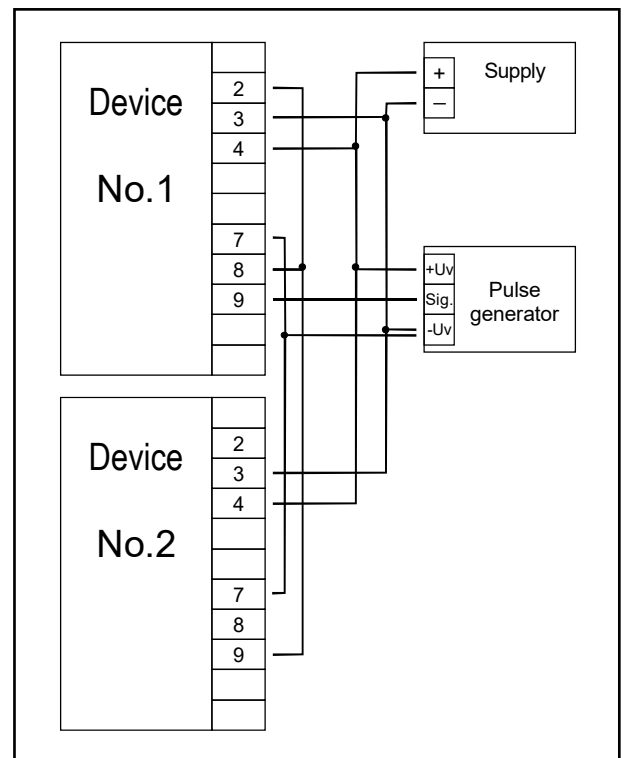


Manually reset the device with the help of a push-button



Automatically resetting with the help of output 2 and additional resetting the device via push-button

Hint: Output 2 has to be configured as NPN output



Cascading of GIA20EB's

Hint for GIA20EB:

Device 1 – Input signal like impuls-transmitter,
Output 2 configured as NPN output
Device 2 – Input-signal = switching-contact

5.4. Connecting switching outputs



In order to avoid unwanted or wrong switching processes, we suggest to connect the device's switching outputs after you have configured the device's switching outputs properly.



Please take care that you must not exceed the limits of the voltage and of the maximum current of the switching outputs (not even for a short period of time). Please take extreme care when switching inductive loads (like coils or relays, etc.) because of their high voltage peaks, protective measures to limit these peaks have to be taken.

When switching large capacitive loads a series resistor for current limitation needed, because of the high turn-on-current of high capacitive loads. The same applies to incandescent lamps, whose turn-on-current is also quite high due to their low cold resistance.

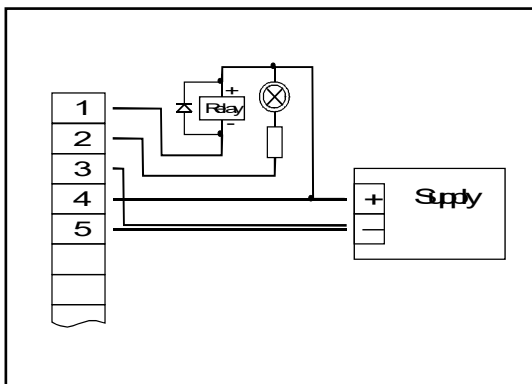


In case of configuring one output as an alarm output, the output will be active in idle state (no alarm present). The output transistor opens or the push-pull output changes from +9V to 0V when an alarm condition occurred

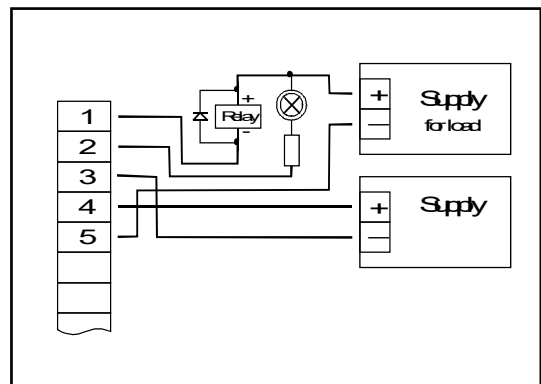
5.4.1. Switching option

Low-Side	“GND-switching“ NPN output (open-collector)	The switching output is connected to GND (connection 5) when active (switching output on).
High-Side	“+Us-switching“ PNP output (open-collector)	The switching output is connected to an internal voltage (about +9V) when active (switching output on).
Push-Pull		The switching output is connected to GND (connection 5) when inactive. When the switching output is active, it's connected to an internal voltage (about +9V).

5.4.2. Connection with configured low-side-switching output (NPN output, switching to GND)

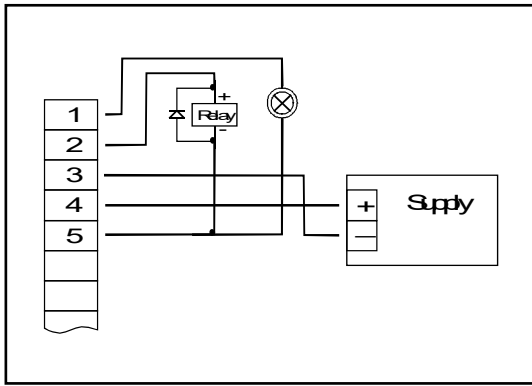


Connection of consumer loads (relay and lamp)
(without individual supply voltage)



Connection of consumer loads (relay and lamp)
(with individual supply voltage)

5.4.3. Connection with configured high-side-switching output (PNP output, switching to +Us)



Connection of consumer loads (relay and lamp)



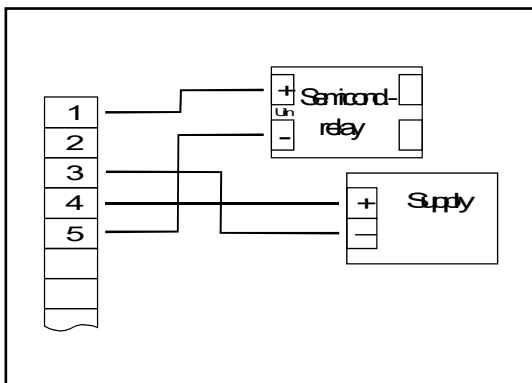
Hint:

Connections 3 and 5 are internally electrically connected.

When switching higher currents ($> 50 \text{ mA}$), the $-U_v$ connection should not be attached to the device (connection 3) but to the $-U_s$ connection of the external power supply unit.

When doing this, you get rid off ground displacement.

5.4.4. Connection with configured push-pull-switching output



Connection of a semiconductor-relay

5.5. Common wiring of several devices

Inputs and outputs are not electrically isolated. When interconnecting several GIA20EB's you have to make sure that there is no potential displacement.

Make sure to observe the following points:

- When several GIA20EB's are connected to the same power supply unit it is highly recommended to isolate the sensors, measuring transducers etc.
- When the sensors, measuring transducers etc. are electrically connected, and you can't manage to isolate them, you should use separate electrically isolated power supply units for each devices. Please note, that an electric connection may also be created via the medium to be measured (e.g. pH-electrodes and conductivity-electrodes in fluids)

6. Configuration of the device

Calling the Configuration:

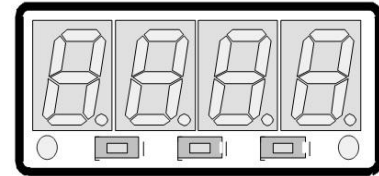
Press **Button 2** >2 Seconds.

General description and notes to the operating of the menu:

The display shows INP ('INPUT').

With **Button1** you can go to the next parameter resp. after the last parameter values will be **saved**.

With **Button 2** or **Button 3** you can adjust the value.



Button 1 Button 2 Button 3



If no key is pressed > 60 sec. the menu will be automatically closed.

6.1. Selecting an input signal type

Input Button 1	Selection Button 2 / 3	Description	Signal	proceed in chapter
INP	U	Voltage signal U	0 – 10 V	6.3
			0 – 2 V	
			0 – 1 V	
			0 – 50 mV	
	I	Current signal I	4 – 20 mA	6.3
			0 – 20 mA	
	T.RES	Temperature: RTD	Pt100	6.2
			Pt1000	
	T.TC	Temperature: Thermocouples	type K (NiCr-Ni)	6.2
			type S (Pt10Rh-Pt)	
			type N (NiCrSi-NiSi)	
			type J (Fe-CuNi)	
			type T (Cu-CuNi)	
	FREQ	Frequency	TTL-signal	6.4
			Switch-contact NPN, PNP	
	RPN	Rotation	TTL-signal	6.5
			Switch-contact NPN, PNP	
	(O. VP	Counter up	TTL-signal	6.6
			Switch-contact NPN, PNP	
	(O.DN	Counter down	TTL-signal	6.6
			Switch-contact NPN, PNP	
	SER,	Interface mode	Serial interface	6.7



When changing the measuring mode “InP“, the input signal “SEnS“ and the display-unit “Unit“ all settings will be changed to factory default. You have to set all the other settings. This also regards the settings for offset and slope-adjustment as well as the switching points!



When changing the measuring mode “InP” the values for the offset and slope-adjustment will be reset. Furthermore a change of the device scaling for standard signals (di.Lo, di.Hi, dP) or of the resolution and unit for temperature can possibly influence the values of the offset and slope-adjustment. Therefore you may check your offset and slope-adjustment after changing the input configuration.

The change of the device scaling for standard signals (di.Lo, di.Hi, dP) or of the resolution and unit for temperature can possibly change the switching and alarm points. Therefore you may check your output settings afterwards!

6.2. Measuring temperature

(Pt100, Pt1000 RTD probes and thermocouple type J, K, N, S or T)

This chapter describes how to configure the device for temperature measuring with the help of external platinum RTD probes or thermocouple probes.. This instruction demands that you selected “t.res” or “t.tc” as your desired input type like it is explained in chapter 6.1.

The display must show INP.

Parameter Button 1	Value Button 2 / 3	Description	Notes
SENS (with T.RES)	PT0.1	Pt100 (3-wire)	Meas.-range: -50.0 ... +200.0 °C (-58.0 ... + 392.0 °F)
	PT 1		Meas.-range: -200 ... + 850 °C (-328 ... + 1562 °F)
	1000	Pt1000 (2-wire)	Meas.-range: -200 ... + 850 °C (-328 ... + 1562 °F)
SENS (with T.TC)	N,CR	type K (NiCr-Ni)	Meas.-range: -270 ... +1350 °C (-454 ... + 2462 °F)
	S	type S (Pt10Rh-Pt)	Meas.-range: -50 ... +1750 °C (- 58 ... + 3182 °F)
	N	type N (NiCrSi-NiSi)	Meas.-range: -270 ... +1300 °C (-454 ... + 2372 °F)
	J	type J (Fe-CuNi)	Meas.-range: -170 ... + 950 °C (-274 ... + 1742 °F)
	T	type T (Cu-CuNi)	Meas.-range: -270 ... + 400 °C (-454 ... + 752 °F)
UN,T	°C oder °F	unit	
F, LT	0.01 ... 2.00 s	filter	see info filter
O VTP		output	Output configuration will be explained in chapter 7. According to your settings different parameters will be shown.

Finish configuration:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

F,LT: filter

this digital filter is a digital replica of a low pass filter.

A filter value of at least 0.1 is recommended for the input type S.

6.3. Measuring voltage and current (0-50mV, 0-1V, 0-2V, 0-10V, 0-20mA, 4-20mA)

This chapter describes how you configure the device for measuring voltage- or current-signals from an external transmitter. This instruction demands that you selected "U" or "I" as input type like it is explained in chapter 6.1.

The display must show INP.

Parameter Button 1	Value Button 2 / 3	Notes
SENS (with U)	10.00	0 – 10 V
	2.00	0 – 2 V
	1.00	0 – 1 V
	0.050	0 – 50 mV
SENS (with I)	4-20	4 – 20 mA
	0-20	0 – 20 mA
DP	"_ _ _ _" " _ _ . _ _" " _ . _ _ _" " _ . _ _ _"	Decimal point
D,LO	-1999 ... 9999	Lower display value
D,K	-1999 ... 9999	High display value
L , (Limit)	OFF	Exceeding of the measuring range limit is tolerable until the measuring limit. (see info "limit")
	ON.ER	The measuring range limit is exactly bounded by the input signal. When exceeding or short falling the input signal the device will display an error message.
	ON.RG	The measuring range limit is exactly bounded by the input signal. When exceeding or short falling the input signal the device will display the selected lower/upper display value. <i>e.g. humidity: when exceeding, the device will display 0% or 100%</i>
F,LT	0.01 ... 2.00 s	filter (see info filter)
O VTP		Output configuration will be explained in chapter 7. According to your settings different parameters will be shown.

Finish configuration:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

L,: limit

When exceeding the measuring limit (~ upper measuring range + 5% or 21.0 mA at 4-20mA) independently from the limit setting, the device will always display the corresponding error message ("Err.1"). When short falling the measuring limit 3.6 mA) independently from the limit setting, the device will always be displaying the corresponding error message ("Err.2"), if the input signal 4-20mA is chosen. A short falling of 0V or 0mA is not detected.

F,LT: Filter

This digital filter is a digital replica of a low pass filter.

When using the input signal 0-50mV a filter value of at least 0.2 is recommended

6.4. Measuring of frequency (TTL, switching-contact)

This chapter describes how to configure the device for measuring frequency.

This instruction demands that you selected "**FrEq**" as your desired input type like it is explained in chapter 6.1.

The display must show INP.

Parameter Button 1	Value Button 2 / 3	Notes
SENS	TTL	TTL-signal (see info connection)
	NPN	Switching contact, NPN For direct connection of a passive switching contact (e.g. push button, relay) or transmitter with NPN output. There is a internal pull-up-resistor. (see info switching contact)
	PNP	Switching contact, PNP For direct connection of a transmitter with PNP output. There is a internal pull-down-resistor.
FR.LO	0 ... 9999	lower frequency range
FR.K,	FR.LO ... 9999	upper frequency range
DP	"- - - -" " - - - . -" " - - . - -" "- . - - -"	Decimal point
D,.LO	-1999 ... 9999	display at lower frequency range limit
D,.K,	-1999 ... 9999	display at upper frequency range limit
L , (Limit)	OFF	Exceeding of the measuring-frequency is tolerable until you reach the maximum measuring range limit.
	ON.ER	The measuring range is exactly bounded by the selected frequency-measuring-range-limit. When exceeding or short falling of the limit the device will display an error message.
	ON.RG	The measuring range is exactly bounded by the selected measuring-range-limit. When exceeding or short falling of the limit the device will display the lower or upper display-range-limit. <i>e.g. humidity: when exceeding, the device will display 0% or 100%</i>
F,LT	0.01 ... 2.00 s	Filter
O VTP		Output configuration will be explained in chapter 7. According to your settings different parameters will be shown.

Finish configuration:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

Switching contact, NPN:

when using push-buttons or relays, they must be bounce-free!

Connection:

For the connection of a frequency-transmitter, please follow the instructions given in chapter 5.3.6. When connecting a switching-contact-transmitter with increased frequency range (= with external circuitry) you have to select TTL as input signal.

Measuring:

When exceeding the maximum range limit (10kHz) independently from the limit setting an error message will be displayed ("Err.1").

6.5. Measuring of rotation speed (TTL, switching-contact)

This chapter describes how to configure the device for measuring rotation speed.

This instruction demands that you selected "**rPn**" as input type like it is explained in chapter 6.1.

The display must show INP.

Parameter Button 1	Value Button 2 / 3	Notes
SENS	TTL	TTL-signal
	NPN	Switching contact, NPN For direct connection of a passive switching contact (e.g. push button, relay) or transmitter with NPN output. There is a internal pull-up-resistor
	PNP	Switching contact, PNP For direct connection of a transmitter with PNP output. There is a internal pull-down-resistor.
D,V	1 ... 1000	divisor
DP	"- - - -" "- - - . -" "- - . - - -" "- . - - - -"	Decimal point (see info decimal point)
O VTP		Output configuration will be explained in chapter 7. According to your settings different parameters will be shown.

Finish configuration:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

Decimal point:

Use the decimal point position to change the resolution of your measurement. The more the decimal point position is on the left, the finer the resolution will become. Please note that you lower the maximum value that can be displayed, either

Example:

50 rotations per minute.

without decimal point: display = 50, the maximum value 9999 rotations per minute.

decimal point on the left e.g. XX.XX: display = 50.00, maximum value 99.99 rotations per minute.

Connection:

For the connection of a frequency-transmitter, please follow the instructions given in chapter 5.3.6. When connecting a switching-contact-transmitter with increased frequency range (= with external circuitry) you have to select TTL as input signal.

6.6. Up-/Downwards counter (TTL, switching-contact)

The upwards counter starts counting upwards from 0 according to its settings. The downwards counter starts counting downwards from the upper value that had been selected.

The current value of the counter can be reset anytime by connecting pin 8 to GND (e.g. pin 7). The counter starts from its beginning as you disconnect pin 8 and pin 7.

Feature: *The present counter value won't be lost if the voltage supply is disconnected. The counter starts from this value after restarting.*

This chapter describes how to configure the device as a counter.

This instruction demands that you selected **"Co.up"** or **"Co.dn"** as input type like it is explained in chapter 6.1.

The display must show INP.

Parameter Button 1	Value Button 2 / 3	Notes
SENS	TTL	TTL-signal
	NPN	Switching contact, NPN For direct connection of a passive switching contact (e.g. push button, relay) or transmitter with NPN output. There is a internal pull-up-resistor.
	PNP	Switching contact, PNP For direct connection of a transmitter with PNP output. There is a internal pull-down-resistor.
EDGE	POS	The counter is triggered on the positive (rising) edge.
	NEG	The counter is triggered on the negative (falling) edge.
D,V	1 ... 1000	divisor (see info divisor)
(O.K,	0 ... 9999	Upper counting range limit The lower counter-range-limit (downwards counter) is fixed with 0.
DP	"_ _ _ _" " _ _ _ ." " _ . _ _" " _ _ _ _"	Decimal point
D, .K,	-1999 ... 9999	Upper counting range limit
L , (Limit)	OFF	Exceeding of the counter range is tolerable until you reach the maximum measuring range limit.
	ON.ER	The measuring range is exactly bounded by the selected counter-range-limit. When exceeding or short falling of the limit the device will display an error message.
	ON.RG	The measuring range is exactly bounded by the selected counter-range-limit. When exceeding or short falling of the limit the device will display the upper counter-range-limit or 0.
O VTP		Output configuration will be explained in chapter 7. According to your settings different parameters will be shown.

Finish configuration:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

Connection:

For the connection of a frequency-transmitter, please follow the instructions given in chapter 5.3.7. When connecting a switching-contact-transmitter with increased frequency range (= with external circuitry) you have to select TTL as input signal.

Divisor:

The incoming pulses will be divided with the selected pre-scaling factor, after that they will be transmitted to the device for further processing. By this factor you can adapt the device to your transmitter or select a pre-scaling factor for large values.

Example:

Your transmitter emits 1800 pulses per litre and you expect a flow rate of 300 litres. The display should be in litre with a resolution of 0.1 litres.

The pulses to be counted are $1800 \text{ Impulses} \times 300 \text{ litres}$, would result 540000 in Impulses. This overrides the upper counter range. By setting the pre-scaling factor of 100 the pulses are reduced to $540000/100 = 5400$. The upper counting range limit has to be set to 5400.

The display should have a resolution of 0.1 liters. the decimal point position has to be ---.- and a display range limit of 300.0.

6.7. Interface mode

When the device is in the interface mode it won't make any measurements by itself. The value shown in the device's display is sent via serial interface. But the switching and alarm functions of the displayed value are still available.

The EASYBus-Address of the device needed for the communication can be set manually with the device itself or with the help of an EASYBus-software (like Easybus Configurator). Please note, when carrying out an EAYBus-system-initialisation the device's address will be reset automatically.

This chapter describes how to configure the device as an EASYBus-display.

This instruction demands that you selected "**SEri**" as input type like it is explained in chapter 6.1.

In der Anzeige muss **INP** stehen.

Parameter Button 1	Value Button 2 / 3	Notes
ADR	0 ... 239	Address
DP	"_ _ _ _" "- _ _ _ _" "- _ _ _ _" "- _ _ _ _"	Decimal point
O VTP		Output configuration will be explained in chapter 7. According to your settings different parameters will be shown.

Finish configuration:

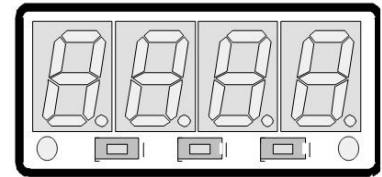
Press **Button 1** as often till the device executes a reset. The values will be stored at it.

7. Configuration of the output function

Calling the Configuration:

The call happened in the chosen Input Signal when the display shows "outP".

The output can be scaled arbitrary with the display range.



Button 1 Button 2 Button 3

General description and notes to the operating of the menu:

With **Button 1** you can go to the next parameter resp. the values will be saved

With **Button 2** or **Button 3** you can adjust the values.



If no key is pressed > 60 sec. the menu will be automatically closed.



A change of the input configuration can possibly influence the switching points and alarm boundaries. (e.g. changing of scaling for standard signals or changing of resolution or unit for temperature). Therefore the output configuration and switching points / alarm boundaries adjustment should be done after the input configuration has been finished. Additionally you may check your output settings after the input configuration has been changed!



ATTENTION

The alarm-outputs are inverted! This means, that the output will be active when there is no alarm!

7.1. Output function

Output Button 1	Function Button 2 / 3	Output 1	Output 2	Description	Go on in chapter
OVTP	NO	off	off	No output, only displaying unit	--
	2P	Switching function 1	off	2-point-controller	7.2
	3P	Switching function 1	Switching function 2	3-point-controller	7.2
	2P.AL	Switching function 1	Min-/Max-Alarm, inverse	2-point-controller with Min-/Max-alarm	7.2
	AL.F1	off	Min-/Max-Alarm, inverse	Min-/Max-alarm, common	7.2
	AL.F2	Max-Alarm, inverse	Min-Alarm, inverse	Min-/Max-alarm, individual	7.2

Further parameter:

Press **Button 1**. Depending on the configuration you have made in the „output“ menu you will get different Display values. Please follow the specific chapter.

The settings for the switching and alarm points can be made later in an extra menu.

7.2. Adjust output

This chapter describes how to configure the switching points and the alarm-boundaries. Dependent on your desired output function in chapter 7.1, different parameter will be shown or hidden.

The display must show OVTP.

Parameter Button 1	Value Button 2 / 3	Description	available at output function			
			2P	3P	2P.A	AL.Fx
1.DEL	0.01 ... 2.00	Switching-delay of output 1 (see info switching delay)	x	x	x	
1.OVT	NPN	Low-Side *1	x	x	x	
	PNP	High-Side *2				
	PV.PV	Push-Pull				
1.ERR	OFF	Inactive in case of an error. *4	x	x	x	
	ON	Active in case of an error. *5				
2.DEL	0.01 ... 2.00	Switching-delay of output 2 (see info switching delay)		x		
2.OVT	NPN	Low-Side *1		x		
	PNP	High-Side *2				
	PV.PV	Push-Pull				
2.ERR	OFF	Inactive in case of an error.. *4		x		
	ON	Active in case of an error. *5				
A.OVT	NPN	Low-Side *1			x	x
	PNP	High-Side *2				
	PV.PV	Push-Pull *3				
1.ON	Min. display range ... Max. display range	Turn-on-point of output 1	x	x	x	
1.OFF	Min. display range ... Max. display range	Turn-off-point of output 1	x	x	x	
2.ON	Min. display range ... Max. display range	Turn-on-point of output 2		x		
2.OFF	Min. display range ... Max. display range	Turn-off-point of output 2		x		
AL. K,	AL.L O ... Max. display range	Max. alarm-value			x	x
AL.L O	Min. display range ... AL. K,	Min. alarm-value			x	x
A.DEL	0 ... 9999	Alarm delay. Time [in sec] before the alarm gets active.			x	x

*1: NPN, open collector, switching GND
Switching output is closed (connected to GND) as long there is no alarm-condition, and is opened if there is an alarm-condition.

*2: PNP, open collector, switching +Uv
Switching output is closed (is under voltage) as long there is no alarm-condition, and is opened if there is an alarm-condition.

*3: Switching output is high with no alarm and changes to low if there is an alarm

*4 : Low-/High-side-switch: opened in case of an error. Push-Pull-output: low in case of an error.

*5 : Low-/High-side-switch: closed in case of an error. Push-Pull-output: high in case of an error

Finish configuration:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

Switching delay:

The value for the switching-delay is the time [in sec] the device waits at least to switch on the output again after the output was switched off.

8. Offset- and slope-adjustment

The offset and slope-adjustment function can be used for compensating the tolerance of the used sensor, and for venire adjustment of the used transducer or transmitter.



The settings of the offset- / slope-adjustment will be cancelled, when no button was pressed for more than 60 sec. Changes you may have made already won't be saved and will be lost!

The settings of the offset- / slope-adjustment and alarm-boundaries will automatically be reset to factory default when any changes for the settings "InP", "SEnS" or "Unit" had been made!

Calling the Menu:

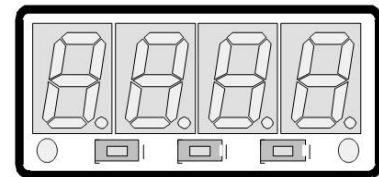
Press **Button 3** >2 Seconds.

General description and notes to the operating of the menu:

The Display has to show OFFS ('Offset').

With **Button1** you can go to the next parameter resp. after the last parameter values will be **saved**.

With **Button 2** or **Button 3** you can adjust the value.



Button 1 Button 2 Button 3



If no key is pressed > 60 sec. the menu will be automatically closed.

8.1. Adjustment

The display has to show OFFS.

Parameter Button 1	Value Button 2 / 3	Description
OFFS	± 50	Offset The input of the offset will be in digit or °C/°F. The value that had been set will be subtracted from the measured value
S(AL)	$\pm 2.00 \%$	Slope

Finish adjustment:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

Calculate correction:

Temperature:

Displayed value = (measured value – zero point offset) * (1 + slope adjustment [% / 100])

Standard signal:

Displayed value = (measured value – zero point offset - di.Lo) * (1 + slope adjustment [% / 100]) + di.Lo

Examples for offset- and slope-adjustment:

Example 1: Connecting a Pt1000-sensor (with an offset error depending on the cable-length of the sensor)

The device displays the following values (without offset- or slope-adjustment): 2°C at 0°C and 102°C at 100°C

Therefore you calculated: zero point: 2

slope: $102 - 2 = 100$ (deviation = 0)

You have to set: offset = 2 (= zero point-deviation)
scale = 0.00

Example 2: Connecting of a 4-20mA-pressure-transducer

The device displays the following values (without offset- or slope-adjustment): 0.08 at 0.00 bar and 20.02 at 20.00 bar

Therefore you calculated: zero point: 0.08

slope: $20.02 - 0.08 = 19.94$

deviation: 0.06 (= target-slope – actual-slope = 20.00 - 19.94)

You have to set: offset = 0.08 (= zero point-deviation)
scale = 0.30 (= deviation / actual-slope = 0.06 / 19.94 = 0.0030 = 0.30%)

Example 3: Connecting of a flow-rate-transducer

The device displays the following values (without offset- or slope-adjustment): 0.00 at 0.00 l/min and 16.17 at 16.00 l/min

Therefore you calculated: zero point: 0.00

slope: $16.17 - 0.00 = 16.17$

deviation: - 0.17 (=target-slope – actual slope = 16.00 - 16.17)

You have to set: offset = 0.00
scale = - 1.05 (= deviation / actual-slope = - 0.17 / 16.17 = - 0.0105 = - 1.05%)

9. Switching points and alarm-boundaries

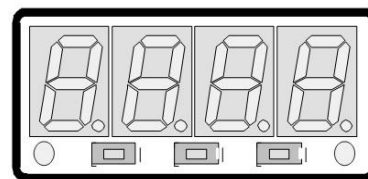


The difference between this menu and the output configuration menu is that it is not possible to select switching delay and the preferred state of switching functions.

Calling the Menu:

Press **Button 1** >2 seconds.

Depending on the configuration you have made in the output configuration menu you will get different display values. Please follow the specific chapter for further information.



Button 1 Button 2 Button 3

General description and notes to the operating of the menu:

With **Button1** you can go to the next parameter resp. after the last parameter values will be **saved**.

With **Button 2** or **Button 3** you can adjust the value.



If no key is pressed > 60 sec. the menu will be automatically closed.



The settings of the switch points and alarm-boundaries will automatically be reset to factory default when any changes for the settings "InP", "SEnS" or "Unit" had been made!.

9.1. Menu

Function OVTP	Description	Go on in chapter
NO	No output, device is only display Function call not possible	--
2P	2-point-controller	9.2
3P	3-point-controller	9.2
2P.AL	2-point-controller with alarm	9.3
AL.F1	min-/max-alarm, common	9.4
AL.F2	min-/max-alarm, individual	9.4

9.2. 2-point-controller, 3-point-controller

This chapter describes how to configure the device as a 2-point-controller or 3-point-controller. This instruction demands that you selected “**2P**” or “**3P**” as your desired output function like it is explained in chapter 7.1.

The display has to show 1.ON.

Parameter Button 1	Value Button 2 / 3	Description
1.ON	Min. display range ... Max. display range	Turn-on-point of output 1
1.OFF	Min. display range ... Max. display range	Turn-off-point of output 1
2.ON only with 3P	Min. display range ... Max. display range	Turn-on-point of output 2
2.OFF only with 3P	Min. display range ... Max. display range	Turn-off-point of output 2

Finish adjustment:

Press **Button 1** as often till the device executes a reset. The values will be stored at it

***Example:** You want to control the temperature of a heating coil, with a hysteresis of +2°C, to 120°C. Therefore you will have to select the turn-on-point “1.on” to 120°C and the turn-off-point to “122°C”. When your heating coil temperature falls below 120°C it will be turned on. When the temperature rises above 122°C the heating coil will be turned off.*

Note: Depending on the inertia of your heating coil an overshooting of the temperature may be possible

9.3. 2-point-controller with alarm function

This chapter describes how to configure the device as a 2-point-controller with alarm function. This instruction demands that you selected “**2P.AL**” as your desired output function like it is explained in chapter 7.1.

The display has to show 1.ON.

Parameter Button 1	Value Button 2 / 3	Description
1.ON	Min. display range ... Max. display range	Turn-on-point of output 1
1.OFF	Min. display range ... Max. display range	Turn-off-point of output 1
AL. K,	AL.L O ... Max. display range	Maximum alarm-value
AL.L O	Min. display range ... AL. K,	Minimum alarm-value
A.DEL	0 ... 9999	Alarm delay. Time [in sec] before the alarm gets active.

Finish Adjustment:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.



ATTENTION

Alarm-outputs are inverted! This means, that the output will be active when there is no alarm!

***Example:** You want to control the temperature of a cooling chamber between –20°C and –22°C. Therefore you will have to select –20°C for the turn-on-point 1 “1.on” and –22°C for the turn-off-point 1 “1.off”. When the temperature rises above –20°C the device turns its output 1 on, when falling below –22°C the device will turn its output 1 off .*

Note: Depending on the inertia of your cooling circuit an overshooting of the temperature may be possible.

Example: You want to have an alarm monitoring for the cooling chamber mentioned above. The alarms should start when the temperature will be rising above -15°C or falling below -30°C . Therefore you have to select -15°C for the maximum alarm-value "AL.Hi" and -30°C for the minimum alarm-value "AL.Lo".
The alarm will be starting after the temperature rises above -15°C and stays above -15°C for the entered delay time or after it had been falling below -30°C and stays below -30°C for the entered delay time.

Please note that the alarm-outputs are inverted! This means, that the output will be active when there is no alarm.

9.4. Minimum/maximum-alarm (individual or common)

This chapter describes how to configure the device's alarm boundaries for min-/max-alarm-monitoring. This instruction demands that you selected "**AL.F1**" or "**AL.F2**" as your desired output function like it is explained in chapter 7.1.



ATTENTION

The alarm-outputs are inverted.
That the output will be active when there is no alarm

The display has to show AL. K,.

Parameter Button 1	Wert Button 2 / 3	Description
AL. K,	AL.L O ... Max. display range	Maximum alarm-value
AL.L O	Min. display range ... AL. K,	Minimum alarm-value
A.DEL	0 ... 9999	Alarm delay. Time [in sec] before the alarm gets active.

Finish Adjustment:

Press **Button 1** as often till the device executes a reset. The values will be stored at it.

Example: You want to have a temperature alarm-monitoring of a greenhouse. The alarm should start when the temperature rises above 50°C or falls below 15°C .
Therefore your settings will be 50°C for the maximum alarm-value "AL.Hi" and 15°C for the minimum alarm-value "AL.Lo". The alarm will be starting after the temperature rises above 50°C and stays above 50°C for the entered delay time or after it had been falling below 15°C and stays below 15°C for the entered delay time..

10. Min-/max-value storage

The device features a minimum/maximum-value storage. In this storage the highest and lowest measured value are saved.

Button			Description
	Min.-Value	Press short	The device will display "Lo" briefly, after that the min-value is displayed for about 2 sec.
	Max.-Value	Press short	The device will display "Hi" briefly, after that the max-value is displayed for about 2 sec.
	Erase	Press together >2 seconds	the device will display "CLr" briefly, after that the min/max-values are set to the current displayed value.

11. Serial interface

The device features one EASYBus-Interface. You can use the device as a full function EASYBus-device.

The serial interface allows the device to communicate with a host computer. Data polling and data transfer is done in master/slave mode, so the device will only send data on demand. Every device has a unique ID-number that makes exact identification of each device possible. With the help of a software (like EASYBus-Configurator – freeware version available via internet) you are able to re-assign an address to the device.

Additional accessories needed for the interface mode:

- Interface converter EASYBus ↔ PC: e.g. EBW1, EBW3, EBW64
- Software for communication with the device
 - EBS20M / 60M: 20-/60-channel-software for displaying a measured value.
 - EASYControl net: universal multi-channel software for real-time-recording and displaying measure-values of a device in ACCESS®-database-format.
 - EASYBUS-DLL: EASYBUS-developer-package for developing own software. This package features a universal WINDOWS®-Library with documentation and program-examples. The DLL can be used in any usual programming language.

12. Error codes

When detecting an operating state which is not permissible, the device will display an error code.

The following error codes are defined:

Err.1: Exceeding of the measuring range

Indicates that the valid measuring range of the device has been exceeded.

- Possible causes:
- Input signal too high.
 - Sensor broken (Pt100 and Pt1000).
 - Sensor shorted (0(4)-20mA).
 - Counter overflow.

- Remedies:
- The error-message will be reset if the input signal is within the limits.
 - check sensor, transducer or transmitter.
 - check device configuration (e.g. input signal)
 - reset the counter.

Err.2: Values below the measuring range

Indicates that the values are below the valid measuring range of the device.

- Possible causes:
- Input signal is too low or negative.
 - Current below 4mA.
 - Sensor shorted (Pt100 and Pt1000).
 - Sensor broken (4-20mA).
 - Counter underflow.

- Remedies:
- The error-message will be reset if the input signal is within the limits.
 - Check sensor, transducer or transmitter.
 - check device configuration (e.g. input signal)
 - Reset the counter.

Err.3: Display range has been exceeded

Indicates that the valid display range (9999 digit) of the device has been exceeded.

- Possible causes:
- Incorrect scale.
 - Counter overflow.

- Remedies:
- The error-message will be reset if the display value is below 9999.
 - Reset the counter.
 - When happening frequently, check the scale-setting, maybe it was set too high and should be reduced.

Err.4: Values below display range

Indicates that display value is below the valid display range of the device (-1999 digit).

Possible causes:

- Incorrect scale.
- Counter underflow.

Remedies:

- The error-message will be reset if the display value is above -1999.
- Reset the counter
- When happening frequently, check the scale-setting, maybe it was set too low and should be increased.

Err.7: System-error

The device features an integrated self-diagnostic-function which checks essential parts of the device permanently. When detecting a failure, error-message Err.7 will be displayed.

Possible causes:

- Valid operating temperature range has been exceeded or is below the valid temperature range.
- Device defective.

Remedies:

- Stay within valid temperature range.
- Exchange the defective device.

Err.9: Sensor defective

The device features an integrated diagnostic-function for the connected sensor or transmitter. When detecting a failure, error-message Err.9 will be displayed.

Possible causes:

- Sensor broken or sensor shorted (Pt100 or Pt1000).
- Sensor broken (thermo-elements).

Remedies:

- Check sensor or exchange defective sensor.

Er.11: Value could not be calculated

Indicates a measuring value, needed for calculation of the display value, is faulty or out of range.

Possible causes:

- Incorrect scale.

Remedies:

- Check settings and input signal

13. Decommissioning, reshipment and disposal**13.1. Decommissioning**

Always disconnect the device before from its supply before decommission (e.g. at fuse). Valid general safety requirements shall be observed.

Please also make sure that connected Loads are disconnected also and are in a safe state.

13.2. Reshipment and disposal

All devices returned to the manufacturer have to be free of any residual of measuring media and other hazardous substances.

Measuring residuals at housing or sensor may be a risk for persons or environment



Use an adequate transport package for reshipment, especially for fully functional devices. Please make sure that the device is protected in the package by enough packing materials.

Add the completed reshipment form of the Senseca website.



The device must not be disposed in the unsorted municipal waste! Send the device directly to us (sufficiently stamped), considering the above if it should be disposed. We will dispose the device appropriate and environmentally sound.

14. Specification

Absolute maximum ratings: see chapter 5.2 (connection data)

Measuring input: Standard inputs for

Input type	Signal	Range	Resolution	Note
Standard-voltage-signal	0 – 10 V	0 ... 10 V		$R_i \geq 300 \text{ k}\Omega$
	0 – 2 V	0 ... 2 V		$R_i \geq 10 \text{ k}\Omega$
	0 – 1 V	0 ... 1 V		$R_i \geq 10 \text{ k}\Omega$
	0 – 50 mV	0 ... 50 mV		$R_i \geq 10 \text{ k}\Omega$
Standard-current-signal	4 – 20 mA	4 ... 20 mA		$R_i = \sim 125 \text{ }\Omega$
	0 – 20 mA	0 ... 20 mA		$R_i = \sim 125 \text{ }\Omega$
RTD probes	Pt100	-50.0 ... +200.0 °C (-58.0 ... +392.0 °F)	0.1 °C / °F	3-wire-connection max. perm. line resistance: 20 Ω
		-200 ... +850 °C (-328 ... +1562 °F)	1 °C / °F	
	Pt1000	-200 ... +850 °C (-328 ... +1562 °F)	1 °C / °F	2-wire-connection
Thermocouple probes	NiCr-Ni (type K)	-270 ... +1350 °C (-454 ... +2462 °F)	1 °C / °F	
	Pt10Rh-Pt (type S)	-50 ... +1750 °C (-58 ... +3182 °F)	1 °C / °F	
	NiCrSi-NiSi (type N)	-270 ... +1300 °C (-454 ... +2372 °F)	1 °C / °F	
	Fe-CuNi (type J)	-170 ... +950 °C (-274 ... +1742 °F)	1 °C / °F	
	Cu-CuNi (type T)	-270 ... +400 °C (-454 ... +752 °F)	1 °C / °F	
Frequency	TTL-Signal	0 Hz ... 10 kHz	0.1 mHz	Signal low: 0.0 – 0.5 V Signal high: 2.7 – 24 V
	Switching contact NPN	0 Hz ... 3 kHz	0.1 mHz	<i>i</i> An internal pull-up-resistor ($\sim 11 \text{ k}\Omega$ to +3.3V) is connected automatically.
	Switching contact PNP	0 Hz ... 1 kHz	0.1 mHz	An internal pull-down-resistor ($\sim 11 \text{ k}\Omega$ to GND) is connected automatically.
	Rotation	TTL-Signal, Switching contact NPN, PNP	0 ... 9999 U/min	Pre-scaling-factor (1-1000), Pulse-frequency: max. 600000 p./min. *
	Up/Down-Counter	TTL-Signal, Switching contact NPN, PNP	0 ... 9999 with pre-scaling factor: 9 999 000	Pre-scaling-factor (1-1000) Pulse-frequency: max. 10000 p./sec. *
		Reset input	--	Reset: $R < 1 \text{ k}\Omega$ Release: $R > 100 \text{ k}\Omega$

* = with switching contact accordingly to frequency input lower values may occur

Display range: (voltage-, current and frequency-measurement)
-1999 ... 9999 Digit, initial value, terminal value and decimal point position arbitrary. Recommended range: < 2000 Digit

Accuracy:: (at nominal temperature)

Standard-signals: < 0.2% FS ± 1 Digit (from 0 – 50mV: < 0.3% FS ± 1 Digit)

RTD: < 0.5% FS ± 1 Digit

Thermocouples: < 0.3% FS ± 1 Digit (from Type S: < 0.5% FS ± 1 Digit)

Frequency:	< 0.2% FS ± 1 Digit
Point of comparison:	$\pm 1^{\circ}\text{C}$ ± 1 Digit
Temperature drift:	< 0.01% FS / K (bei Pt100 – 0.1°C: < 0.015% FS / K)
Measuring freq:	approx. 100 measures / sec. (standard-signal) or approx. 4 measures / sec. (temperature-measurement) or approx. 4 measures / sec (frequency, rpm at $f \geq 4$ Hz) or accordingly f (at $f < 4$ Hz)
Display:	approx. 10 mm height, 4-digit red LED-display
Handling:	3 push-buttons, accessible after dismounting of the front panel or via interface.
Interface:	EASYBus-interface, electrically isolated. Bus load: 1 EASYBus- standard load
Output:	2 switching outputs, not electrically isolated
Output type:	selectable: low-side, high-side or push-pull
Breaking capacity:	low-side: 28V/1A; high-side: ~9V/25mA
Response time:	≤ 20 ms for standard signals ≤ 0.3 s for temperature, frequency ($f > 4$ Hz)
Function:	2-point, 3-point, 2-point with alarm, min-/max-alarm common or individual.
Switching points:	arbitrary
Power supply:	11 to 14 V DC (when using the 12 V DC device construction) 22 to 27 V DC (when using the 24 V DC device construction)
Current drain:	max. 50 mA (without switching output)
Nominal temp:	25 °C
Ambient conditions:	
Operating ambient:	-20 to +50 °C
Relative humidity:	0 to 80 % rel. LF. (non condensing)
Storage temp.:	-30 to +70 °C
Max elevation:	5000 m above sea level
Housing:	fibre-glass-reinforced noryl, front view-panel: polycarbonate for panel mounting via spring-clip
Dimensions:	48 x 24 mm (front dimensions W x H).
Installation depth:	approx. 65 mm (incl. Screw-in/plug-in clamps)
Mounting:	via VA-spring-clip
Panel cut-out:	45 ^{+0.5} x 21.7 ^{+0.5} mm (W x H)
Panel thickness:	available from 1 to approx. 10 mm.
Connection:	screw-in/plug-in clamps
Cross-sections:	0.14 to 1.5 mm ² single-wire, fine-wire with sleeve (sleeves with insulating enclosures max. 1 mm ²)
Protection data:	
Prot. class front:	IP 54 acc. EN 60529
Prot. class housing and connections:	IP 20 acc. EN 60529

Directives and standards: The instruments confirm to following European Directives:

2014/30/EU EMC Directive

2011/65/EU RoHS

Applied harmonized standards:

EN 61326-1 : 2013 emissions level: class B

emi immunity according to table 2

Additional fault: <1 %