Compact Controller ER2025S and ER2025SA

INSTALLATION & USER MANUAL

NO.: 99.233.01-A
DATE: October 2025
APPROVAL: APPROVED - JMI

Clorius CONTROLS

Table of contents

Table of contents

1. Introduction

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

Warning symbols

WARNING!

This symbol in connection with the signal word indicates that **personal injury** may occur if the respective precautionary measures are not carried out.

CAUTION!

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

CAUTION!

This symbol indicates that **components could be destroyed** by electrostatic discharge

(ESD = Electrostatic Discharge) if the respective cautionary measures are not taken.
Only use the ESD packages intended for this purpose to return device inserts, assembly groups, or assembly components.

READ THE DOCUMENTATION!

This symbol, which is attached to the device, indicates that the associated **documentation for the device** must be **observed**. This is necessary to identify the nature of the potential hazard, and to take measures to prevent it.

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.

FURTHER INFORMATION!

This symbol is used in tables and indicates that **further information** is provided after the table.

DISPOSAL!

At the end of its service life, the device and any batteries present do not belong in the trash! Please ensure that they are **disposed of** properly and in an **environmentally friendly** manner.

1. Introduction

1.2 Intended use

The device is designed for use in an industrial environment as specified in technical data. Other uses beyond those defined are not viewed as intended uses.

The device has been manufactured in compliance with applicable standards and directives as well as the applicable safety regulations. Nevertheless, improper use may lead to personal injury or material damage.

To avoid danger, only use the device:

- For the intended use
- When in good order and condition
- When taking the technical documentation provided into account

Risks resulting from the application may arise, e.g. as the result of missing safety provisions or wrongsettings, even when the device is used properly and as intended.

1.3 Qualification of personnel

This document contains the necessary information for the intended use of the device to which it relates.

It is intended for staff with technical qualifications who have been specially trained and have the appropriate knowledge in the field of automation technology.

The appropriate level of knowledge and the technically fault-free implementation of the safety information and warnings contained in the technical documentation provided are prerequisites for risk-free mounting, installation, and startup as well as for ensuring safety when operating the modules described.Only qualified personnel have the required specialist knowledge to correctly interpret and implement the safety information and warnings contained in this document in specific situations.

1.4 Acceptance of goods, storage, and transport

1.4.1 Check the delivery

- Ensure that the packaging and its contents are undamaged
- Check the delivery for completeness against the packing slip and order details
- Inform the supplier immediately if there is any damage
- Store damaged parts until clarification is received from the supplier

1.4.2 Important information about storage and transport

- Store the device in a dry, clean environment. Observe the admissible ambient conditions (see also technical data section 9 – this manual)
- Protect the device from shock during transport
- The original packaging provides optimum protection for storage and transport

1.4.3 Return of Goods

If repairs are needed, return the complete device in clean condition.

Use the original packaging to return goods.

Accompanying letter for repair

Please include the completed accompanying letter for repair when returning goods.

Do not forget to state the following:

- Description of the application and
- Description of the error that has occurred

Protection against electrostatic discharge (ESD)

(ESD = electrostatic discharge)

To prevent damage due to ESD, electronic modules or components must be handled, packaged, and stored in an ESD-protected environment. Measures that protect against electrostatic discharge and electric fields are described in DIN EN 61340-5-1 and DIN EN 61340-5-2 "Protection of electronic devices from electrostatic phenomena".

When returning electronic modules or components, please note the following:

- Pack sensitive components only in an environment providing protection against ESD. Workspacessuch as this divert electrostatic charges to ground in a controlled manner and prevent static chargesdue to friction.
- Use only packaging intended specifically for ESD-sensitive assemblies/components
- These must consist of conductive plastics.

No liability can be assumed for damage caused by ESD.

CAUTION!

Electrostatic charges occur in non-ESD-protected environments.

Electrostatic discharges can damage modules or components.

▶ For transport purposes, use only the ESD packaging provided.

1.4.4 Disposal Disposing of the device

DISPOSAL!

Devices and/or replaced parts should not be placed in the refuse bin at the end of their service life as they consist of materials that can be recycled by specialist recycling plants. Dispose of the device and the packaging material in a proper and environmentally friendly manner. For this purpose, observe the country-specific laws and regulations for waste treatment and disposal.

Disposing of the packaging material

The entire packaging material (cardboard packaging, inserts, plastic film, and plastic bags) is fully recyclable.

1.5 Identifying the device version

1.5.1 Nameplate

The nameplate is mounted on the housing.

Contents

The nameplate contains important information. This includes:

Description	Designation on the nameplate	Example
Controller type	Type ER 2025S or ER2025SA	-
Part no.	Item no.	1-5144080
Serial number	F-Nr.	0070033801221480006
Voltage supply	20-30 V AC/DC or 110-240 VAC, 48 to 63 Hz	-

Controller (Type)

Compare the specifications on the nameplate with the order.
Identify the supplied device version using the order details (order code).

Part no. (TN)

Item no. uniquely identifies an article in the catalog. It is important for communication between thecustomer and the sales department.

Serial number (F-Nr.)

The serial number indicates, among other things, the date of manufacture (year/week).

Example: F-no. = 0070033801**1748**0006
The characters in question are digits 12, 13, 14, and 15 (from the left).
Thus, the device was produced in calendar week 48 of 2021.

1.5.2 Spare parts

Description	Part no.
Mounting Bracket for ER 2022 & ER 2025S	1-0157263
Terminal Blocks set for ER 2025S	1-0159113

1.6 Brief description

The ER 2025S and ER 2025SA controllers are used for constant temperature control. It is suitable for all heating and cooling control systems.

The controller is primarily intended for marine installations and other industrial applications - such as cooling water and lubricating oil installations, flow temperature control and where it is needed to use remote set point function.

The device is characterized by a simple, clearly structured operation supported with texts.

Process values and parameters are represented by two 18-segment LCD displays.

The ER 2025S and ER 2025SA type are additionally equipped with a pixel matrix LCD display for displaying text. In addition, the device has individual display elements for the switch positions of the outputs as well as for manual mode.

The device operates using a membrane keyboard with four buttons and can be used under harsh environmental influences thanks on the high IP65 protection.

The ER 2025S and ER 2025SA includes, a program controller, manual mode, limit value monitoring functions, digital control signals.

The temperature input comes via a Pt100 sensor with a single sensing element. The measured value of the controlled variable is compared with the set point value and adjusted via a PI or a PID control structure.

The ER 2025S and ER 2025SA can act either as a heating controller, the actuator closes at rising temperature, or as cooling controller, the actuator opens at rising temperature.

The ER 2025S and ER 2025SA permits direct reading of the actual temperature value (PV) and it is secured from failure in the measuring circuit i.e. the controller can be set to give either a closing, an opening or remaining in current position command in case of sensor short circuit or sensor break.

The error message Err appears in the LED display PV.

2. Mounting

2.1 Installation instructions

WARNING!

The device is not designed for use in potentially explosive areas.

Explosion hazard.

▶ Only deploy the device outside of potentially explosive areas.

Mounting site

The device is designed for installation in a panel cut-out within a closed switch cabinet.
The front of thedevice and housing have different protection types (see technical data).

Climatic conditions

The ambient temperature and the relative humidity at the mounting site must correspond to the technicaldata. Aggressive gases and vapors have a negative effect on the operating life of the device. The mounting site must be free from dust, powder, and other suspended solids.

Installation position

The device can be installed in any position.

The maximum admissible ambient temperature only applies for the installation with the display in a vertical position.

2.2 Cleaning

The front of the device (front foil) can be cleaned with standard detergents, rinsing and cleaning agents.

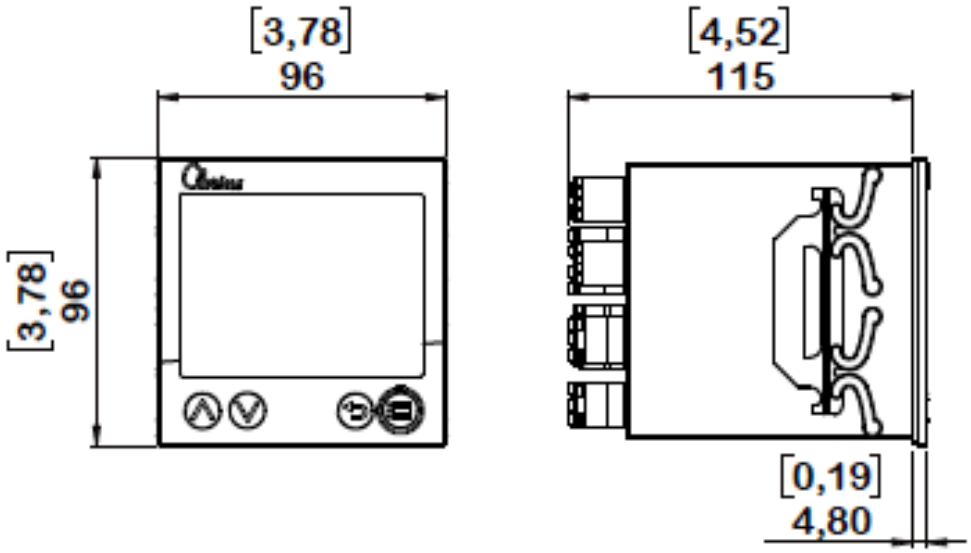
CAUTION!

The front of the device is not resistant to aggressive acids and lye's, scouring agents, and cleaning with a pressure cleaner.

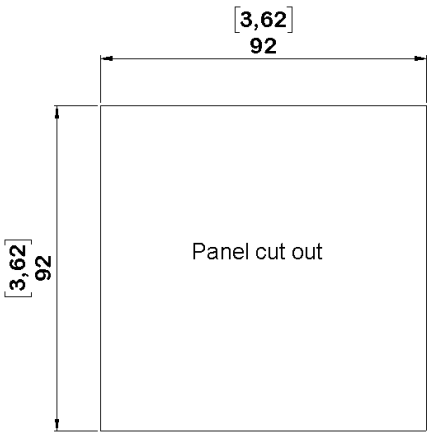
Use of these media can cause damage.

▶ Only clean the front of the device with suitable agents.

2.3 Dimensions mm – [inch]



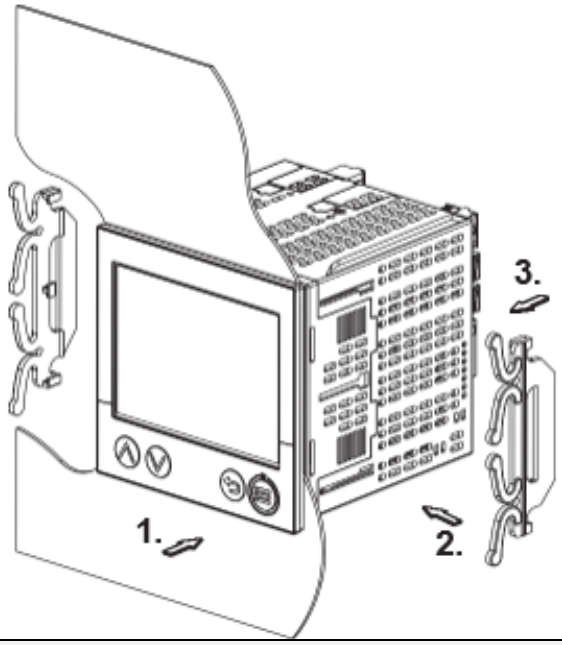
Panel cut-out according to DIN IEC 61554 [inch]



Controller	Panel cut-out (width x height)	Minimum spacing of panel cut- outs (for tightly packed installations)	
		Horizontal	Vertical
ER 2025S ER2025SA	$92^{+0.8}$ × $92^{+0.8}$ mm [3,62 x3,62 inch]	20 mm [0,79 inch]	30 mm [1,18 inch]

2.4 Panel mounting

ER 2025S / ER2025SA



1. Insert the device from the front into the panel cut-out and ensure that the seal is correctly positioned.

2. From behind the panel, insert both mountingelements at the side into the three recesses of the device case using the guide lugs.

3. Press both mounting elements evenly withthe springs against the panel rear until thedetent lugs engage in their slots and the frame is sufficiently fastened.

CAUTION!

The front of the device and housing have different protection types!

The protection type IP65 (front-side) is only guaranteed if the seal is flush and even.

▶ Use the mounting frame or both mounting elements as shown in the figure and ensure an even attachment

3. Electric connection

3.1 Installation notes

Requirements for personnel

- Work on the device must only be carried out to the extent described and, like the electrical connection only by qualified personnel.
- Before plugging and unplugging connecting cables, it must be ensured that the acting person is electrostatically discharged (by touching grounded metallic parts, for example).

Cables, shielding, and grounding

- When selecting the electrical wiring material as well as when installing and connecting the device electrically, comply with the requirements of DIN VDE 0100 "Low-voltage electrical installations" and the applicable country-specific regulations (for example, based on IEC 60364).
- It may be necessary to adhere to special notes relating to the heat resistance of cables (see also the connection diagram).
- Route input, output, and supply lines separately and not parallel to one another.
- Only use shielded and twisted probe and interface cables.

  Do not route the lines close to current-carrying components or cables.
- For temperature probes, ground the shielding on one side in the control cabinet.
- Do not perform loop throughs on the grounding cables but instead route the cables individually to ashared grounding point in the control cabinet; in doing so, ensure that the cables are as short as possible. Ensure that the potential equalization is correct.

Electrical safety

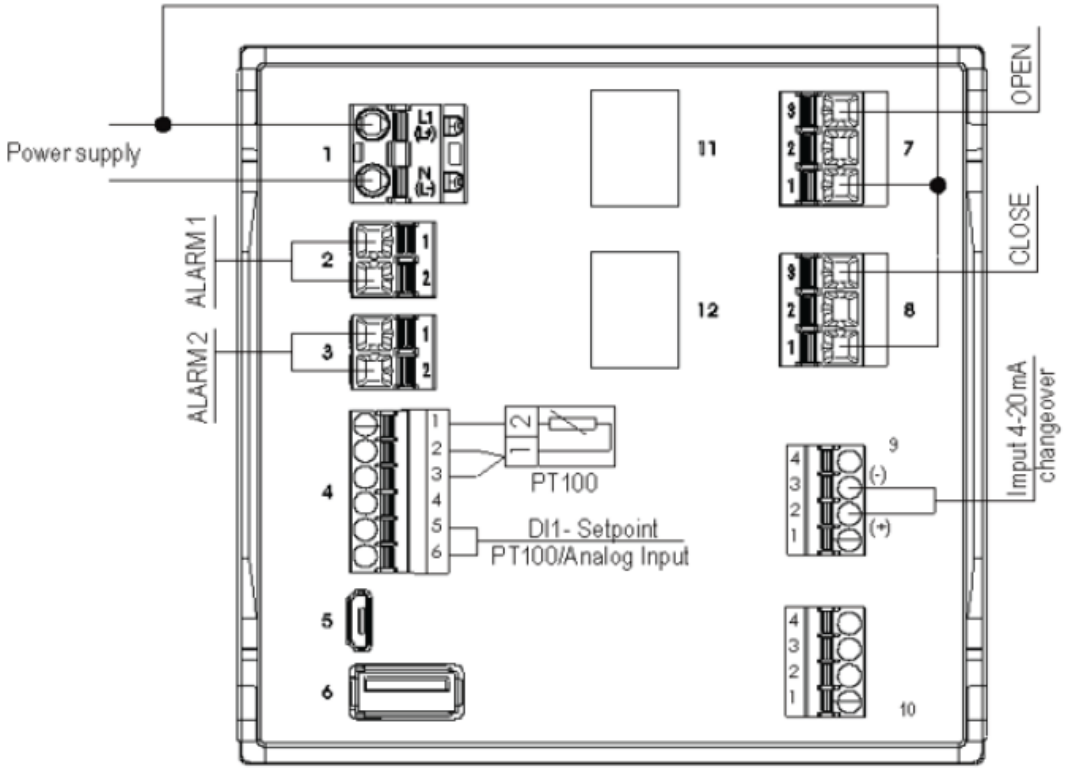
- The device is intended to be installed in control cabinets or plants. Ensure that the customer's fuse protection does not exceed 20 A. Disconnect the device from the mains voltage on all poles prior to starting service or repair work.
  The relay's load circuit can be operated with a hazardous electrical voltage (e.g. 230 V).
  De-energizethe load circuit during mounting/dismounting and electrical connection.
- To prevent the relay contacts being destroyed in the case of an external short-circuit in the load circuit, the latter must be fuse-protected as per the maximum admissible relay current
- The device is not suitable for installation in potentially explosive areas.
- In addition to a faulty installation, incorrectly set values on the device can also impair the correct function of the downstream process. Therefore, ensure that safety devices independent of the device, e.g., overpressure valves or temperature limiters/monitors, are present and that it is only possible for qualified personnel to define settings. Please observe the corresponding safety regulations in this context.

References for other information

- Electromagnetic compatibility conforms to the standards and regulations cited in this manual.
- In general, please observe the specifications regarding electrical isolation.

3.2 Connection elements

Controller ER2025S – 3-point output

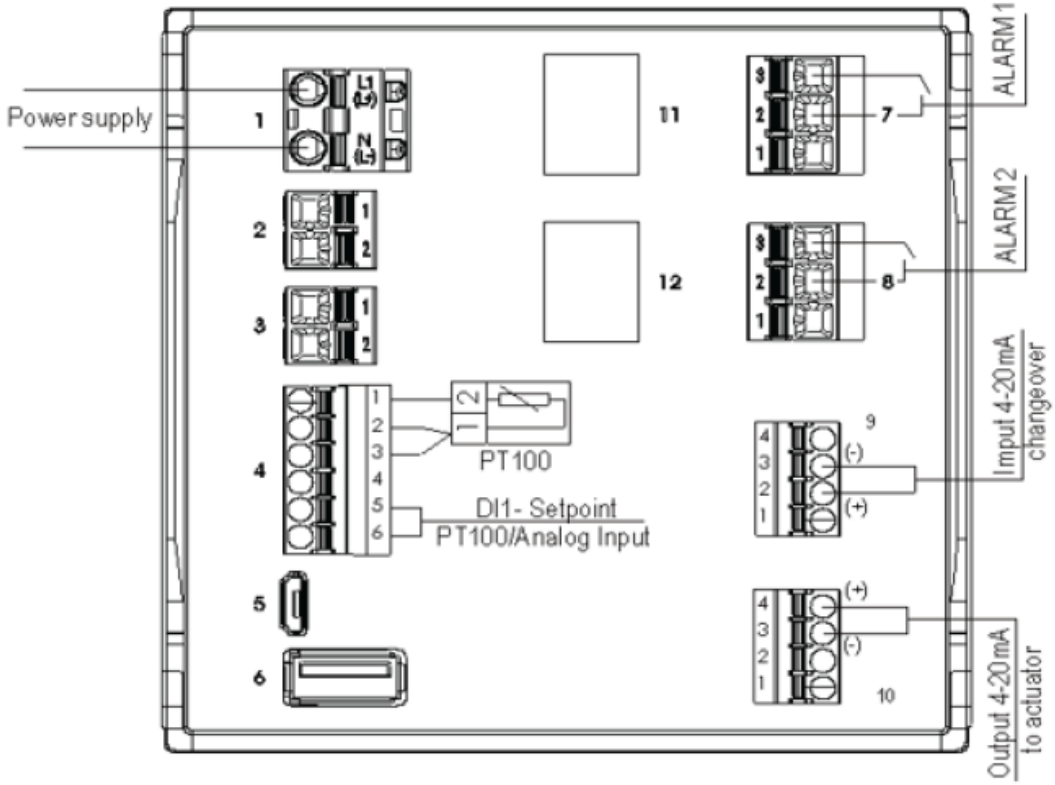


TERMINAL	CONNECTION	DESCRIPTION
Block 1		
L1(+) and N(-)	Voltage supply 110-240VAC 24ACDC-Option	
Block 2		
1	ALARM	
2		
Block 3		
1	ALARM	
2		
Block 4		
1	INPUT/Pt100 - three -wire/white	
2	INPUT/Pt100 - two -wire/red	
3	INPUT/Pt100 - two-wire/red	
5	DI-1 - Digital setpoint setings	Pt100/analog 4-20mA
6		

TERMINAL	CONNECTION	DESCRIPTION
Block 7		
1	Relays 230V/8A - OUTPUT	
3		3 to actuator OPEN
Block 8		
1	Relays 230V/8A - OUTPUT	
3		3 to actuator CLOSE
Block 9		
2	Input signal 4-20mA(+)	Set point controller signal 4mA - 65°C/20 mA - 95°C
3	Input signal 4-20mA(-)	

3.2 Connection elements

Controller ER2025A – Analog



TERMINAL	CONNECTION	DESCRIPTION
Block 1		
L1(+) and N(-)	Voltage supply 110-240VAC 24ACDC-Option	
Block 7		
3	ALARM	
2		
Block 8		
3	ALARM	
2		

TERMINAL	CONNECTION	DESCRIPTION
Block 4		
1	INPUT/Pt100 - three -wire/white	
2	INPUT/Pt100 two -wire/red	
3	INPUT/Pt100 two -wire/red	
5	DI-1 - Display set point settings	Pt100/analog 4-20mA
6		
Block 9		
2	Input signal 4-20mA(+)	Set point controller signal 4mA - 65°C/20 mA - 95°C
3	Input signal 4-20mA(-)	
Block 10		
3	Input signal 4-20mA(+)	To actuator
4	Input signal 4-20mA(-)	

3.3 Connection diagram

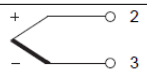
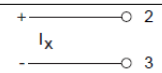
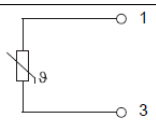
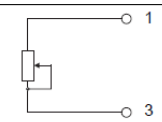
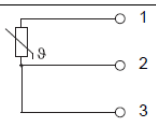
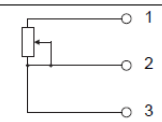
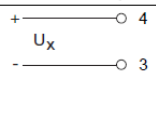
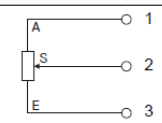
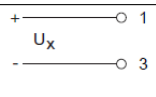
CAUTION!

In unfavorable conditions, the temperature may exceed 60 °C/140°F at the terminals.

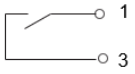
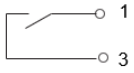
As a result, the insulation of the cables connected at the terminals may be damaged.

- ▶ The affected cables must be heat-resistant up to at least 80 °C/176°F
- ▶ Relay (changeover contact, 8 A): The affected cables must be heat-resistant up to at least 90 °C.
- ▶ Only copper conductors are allowed to be connected to the terminals

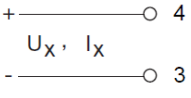
3.3.1 Analog input

Measuring probe/ standard signal	Symbol and terminal designation	Measuring probe/ standard signal	Symbol and terminal designation
Thermocouple		Current DC 0(4) to 20 mA Heater current AC 0 to 50 mA (only for option)	
RTD temperature probe two-wire circuit		Resistance/potentiometer two-wire circuit	
RTD temperature probe three-wire circuit		Resistance/potentiometer three-wire circuit	
Voltage DC 0 to 10 V (for analog input 1: only usable if digital input 2 is not used)		Resistance transmitter A = Start E = End S = Slider	
Voltage DC 0 to 1 V			

3.3.2 Output 3- point signal

ER2025S	Symbol and terminal designation
1 -Relay 8A	
2 -Relay 8A	

Output analog signal

ER2022SA	Symbol and terminal designation
Analog output	

3.3.3 Voltage supply

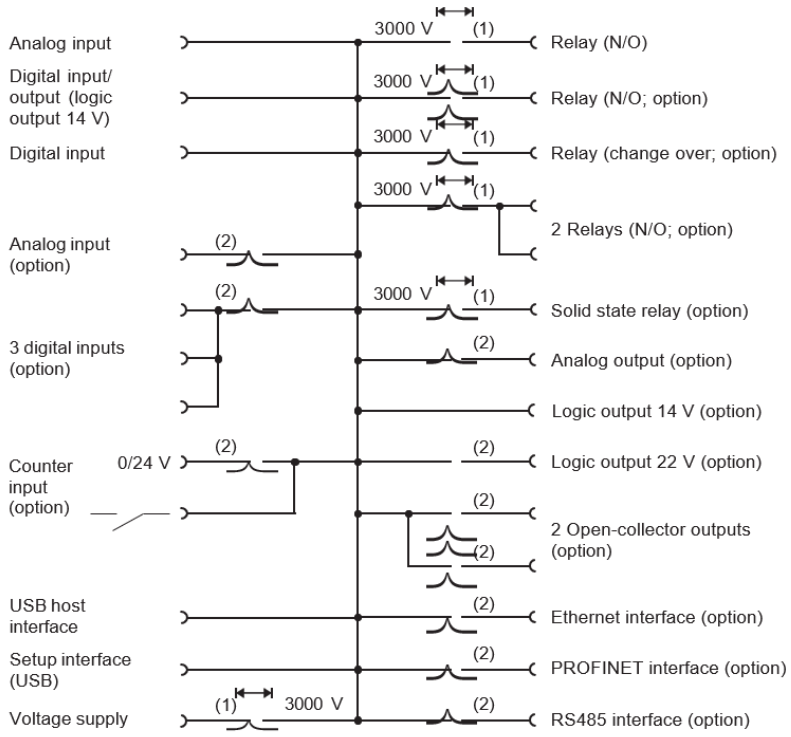
Version (see nameplate)	Symbol and terminal designation
AC 110 to 240 V	L1 — L1/L+ N — N/L-

Version (see nameplate)	Symbol and terminal designation
AC/DC 20 to 30 V	L+ — L1/L+ L- — N/L-

3.3.4 Analog output

Output	Version	Symbol and terminal designation
1 2 3 4	DC 0 to 10 V or DC 0/4 to 20 mA (configurable)	+ — 4 U_X, I_X - — 3

3.4 Galvanic isolation



1 The voltage specifications correspond to the test voltages (alternating voltage, rms values) according to DIN EN 61010-1 (VDE 0411-1):2020-03 for type testing.

2 Functional galvanic isolation for connection of SELV or PELV electrical circuits.

CAUTION!

The standard analog input and the setup interface (USB) are not galvanically isolated.

▶ Do not connect the USB with a ground sensor if the ground of the PC is also grounded (e.g. a desktop PC).

4. Operation

4.1 Display and control elements

1 18-segment LCD display (e.g. actual value), four-digit, white.
It is also for displaying menu items, parameters, and text.

2 8-segment LCD display (e.g. setpoint value), four-digit eight-digit), green; it is also for displaying menu items, parameters, and text.
"OK" will display upon leaving editing mode (if changes were made)

3 Basic display (basic status) 1 or 2, ramp function/program, timer, manual mode

4 Pixel matrix LCD display for displaying menu items, parameters, values, and customer-specific texts.

5 Switch position of the digital outputs (yellow = active)

6 Up (in the menu: increase value, select previous menu items or parameter; in basic display: increase setpoint value)

7 Down (in menu: reduce value, select next menu item or parameter; in basic display: reduce setpoint value)

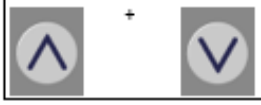
8 Back (in menu: back to previous menu level, exit editing mode without change; in basic display: configurable function)

9 Menu/OK (long press: switch between basic displays 1 and 2; short press: call up main menu, switch to submenu/level, switch to editing mode, exit editing mode with change)

Symbols (activity displays)

Symbol	Off	Lights up	Flashes
Basic display (basic status) 1 	Device is in basic display 2.	Device is in basic display 1 or in another operating level. Also illuminates during set-up transfer and signalizes that the symbols displayed refer to basic display 1 with controller 1 and timer 1.	---
Basic display (basic status) 2 	Device is not in basic display 2.	Device is in basic display 2. The symbols refer to controller 2 and timer 2.	---
The following displays refer to the controller and timer of the active basic display (controller 1 and timer 1, or controller 2 and timer 2).			
Ramp function/program 	Ramp function or program controller is not configured.	Ramp function or program controller is configured but not active.	Ramp function or program controller is active.
Timer 	Timer is not configured.	Timer is configured but not active.	Timer is active (running).
Manual mode 	Manual mode is not active (= automatic mode).	Manual mode is active. The outputs can be manually controlled using the "Up" and "Down" keys: Increase/decrease output level (or for three-step controller: Open/close actuator).	---

Button function

Button or button combination (permanent)	Function		
	In basic status	When navigating	When editing
Up 	Increase setpoint value In manual mode: Increase output level (or open actuator in the case of the three-step controller)	Select previous menu item or parameter	Increase value or go up in picklist
Down 	Decrease setpoint value In manual mode: Decrease output level (or close actuator in the case of the three-step controller)	Select next menu item or parameter	Decrease value or go down in picklist
Back short (< 2 s) 	Function configurable (default setting: without function)	Move to menu level above	Leave editing mode without changes
Back long (> 2 s) 	Function configurable (default setting: switch to manual mode / end manual mode)	---	---
Menu/OK short (< 2 s) 	Call up main menu	Call up sub-menu or switch to editing mode	Leave editing mode with changes
Down + Menu/OK very long (> 5 s) 	Call up menu for level inhibit	---	---

4.2 Language selection

After switching on the device for the first time, the user can either confirm the flashing displayed language with "OK" or select another language using the "Up"/"Down" buttons and then confirm this with "OK".

If, at a later point, another user is to also have the option of selecting a language, the configuration parameter "Language selection active" must be set to "Yes" (Configuration > System data). After applyingthe language, this parameter is automatically set to "No", so that language selection is not necessary the next time the device is switched on.

The language of the device texts can be changed at any time in the configuration settings (regardless oflanguage selection after switch-on).

4.3 Manual mode

After changing over to manual mode – for all controller types except the three-step controller – either the current output level or a specific, adjustable output level is displayed and output (configurable). The "Up" and "Down" buttons can be used to change the output level.

For the three-step controller, the actuator gradually opens each time the "Up" button is pressed (display "Open") and gradually closes each time the "Down" button is pressed (display "Close").

It is also possible to switch to manual mode through a digital signal.

Manual mode can be generally inhibited in the configuration. It is also possible to inhibit manual mode through a digital signal.

The controller automatically changes to manual mode in the event of overrange or underrange (even if manual mode is disabled or locked

4.4 Operating level

Main menu

The "Menu/OK" key must be pressed to switch from the basic display (basic status) to the main menu (menu).

The user must individually configure the operating levels available on the device beforehand using the setup program. A basic configuration is available per default which can be customized and supplemented.

The content of the "Device info" level is fixed (display of device information and counter statuses).

Navigating through the menus

The individual sub-menus (levels) in the main menu can be selected by pressing the "Up" and "Down" keys. The user can access the selected level by pressing the "Menu/OK" key. The same applies when selecting a sub-level or a parameter (editing mode). The "Back" key returns the user to the superordinate level or takes them out of editing mode without changes.

To change a parameter, the desired value or setting must be selected in editing mode using the "Up" and "Down" buttons. The change is taken over by pressing the "Menu/OK" key, and the user exits editing mode. If the function "Save parameter automatically" is active, the user will exit editing mode automatically after approx. 5 seconds, and the change is taken over.

If no further keys are pressed, the device automatically switches to the basic display 1 after 180 seconds (default setting, configurable).

Example of changing a configuration parameter

The following example applies to the default configuration of the operating levels.

Changing offset value of analog input 1

1. Press the "Menu/OK" key to change from the basic display (basic status) to the main menu (menu).
2. Press the "Down" (or "Up") key repeatedly until the "Configuration level" level appears.
3. Press the "Menu/OK" key to switch to the level.
4. Press the "Down" (or "Up") key repeatedly until the "Analog input 1" sub-level appears.
5. Press the "Menu/OK" key to switch to the sub-level.
6. Press the "Down" (or "Up") key repeatedly until the "Offset" parameter appears.
7. Press the "Menu/OK" button to switch to editing mode.
   The current value "0.0" flashes (default setting).
8. Change the current value using the "Down" (or "Up" key until the new value is shown.
9. Press the "Menu/OK" key to apply the new value and to exit editing mode.
   Successful application of the new value is confirmed by "OK" being displayed. The new value is shows (not flashing).
10. Press the "Back" key several times to return to the basic display (basic status).
    The device always returns to basic display (basic status) 1.

4.5 Inhibited level

Access to the individual levels can be inhibited to prevent unintentional or unauthorized operation.

Button or button combination (permanent)	**Function**		
	In the basic display (basic status)	**When navigating**	**When editing**
Down + Menu/OK very long (> 5 s)  + 	Call up menu for level inhibit	---	---

The degree of inhibition can be selected using the "Up" and "Down" buttons and confirmed using the "Menu/OK" button.

4.6 Error messages

Display	Possible cause	Measures
<<<<	Measuring range underflow Short-circuit (probe/line) Break (probe/line) Polarity	Check sensor and line (break, short-circuit, polarity). Check connection terminals. Check configuration (signal type, linearization, resistance measuring range, scaling).
>>>>	Measuring range overflow	
----	Break (probe/line) Polarity	
----	No valid input value (internal error)	For optional modules: Check that the module is fitted correctly. Switch-off the device and switch it on again.
----	Division by zero Incorrect math value or ST code value	Check math function. Check ST code.
****	Display capacity exceeded	Display the value in another display that has more digits.
++++	When the cold junction temperature is displayed: - Temperature outside the permissible range - Analog input not configured for thermocouple	Check configuration of the analog input.

In the event of an error, the controller switches to manual mode.

5. Parameterization

5.1 Parameter blocks & Controller types

2 parameter blocks can be defined for each control channel (controller 1, controller 2).

The following table shows the parameters in a parameter block. The same parameters are also available for the second parameter block.

The transmission behavior is specified by the selection of the controller structure and determined by the configuration of the parameters for the proportional band (P component), derivative time (D component), and reset time (I component).

Parameters that appear in pairs such as Proportional band 1 and Proportional band 2 refer to the first and second controller outputs. Depending on the controller type configured, certain parameters may be omitted or ineffective.

Parameter	Selection/text/value	Description
Control structure 1		These settings determine the control structure (transmission behavior) and relate to the first controller output.
	P	P controller
	I	I controller
	PI	PI controller
	PD	PD controller
	PID	PID controller
Control structure 2	(see: Control structure 1)	These settings apply to the second controller out-put for a three-state controller.
Xp1 proportional band	0 to 9999	Value for the proportional band The controller structure has no effect if Xp = 0 (behavior identical to limit value monitoring)! For a continuous controller, Xp must be □ 0.
Xp2 proportional band	0 to 9999	
Tv1 derivative time	0 to 9999 (80)	The derivative time (in seconds) influences the differential component (D component) of the controller output signal. The effect of the D-term increases as the derivation time increases.
Tv2 derivative time	0 to 9999 (80)	
Tn1 reset time	0 to 9999 (350)	The reset time (in seconds) influences the integralcomponent (I component) of the controller outputsignal. The greater the reset time, the less effect the component has.

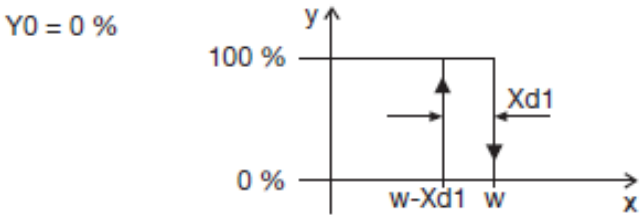
Tn2 reset time	0 to 9999 (350)	
Cy1 cycle time	0 to 9999 (20)	The cycle time (in seconds) should be chosen so that the energy supply to the process is as continuous as possible without overloading the switchingelements.
Cy2 cycle time	0 to 9999 (20)	
Xsh contact spacing DEAD BAND	0 to 999	Spacing between the two control contacts of a three-state controller and three-step controller
Xd1 switching differential	0 to 999 (1)	Hysteresis for a switching controller with proportional band Xp = 0
Xd2 switching differential	0 to 999 (1)	
TT actuator time	5 to 3000 (60)	Control valve running time range (in seconds) used for a three-step controller
Y0 working point	-100 to +100 (0)	Working point correction (in percent) for a P or PDcontroller (correction value for the output level) If the actual value has reached the setpoint value,the output level corresponds to the working point Y0.

Parameter	Selection/text/value	Description
Y1 max. output level limit	0 to 100	Admissible maximum output level (in percent; onlyeffective if Xp □ 0)
Y2 min. output level limit	-100 to +100	Admissible minimum output level (in percent; onlyeffective if Xp □ 0) Three-state controller: For the second con-troller output to be active, a negative value must be set.
Tk1 min. relay-on time	0 to 9999	Minimum ON period (in seconds) to limit the switching frequency for switched outputs (digital outputs) Recommended setting when using a relay as con-troller output: ≥ 0.15 s
Tk2 min. relay-on time	0 to 9999	

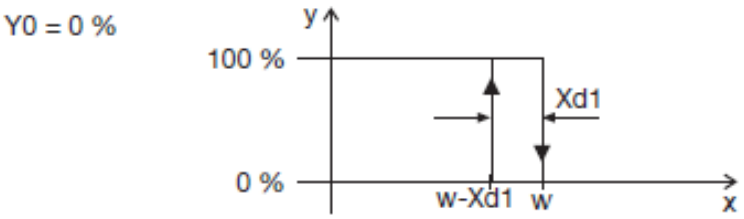
Two-state controller

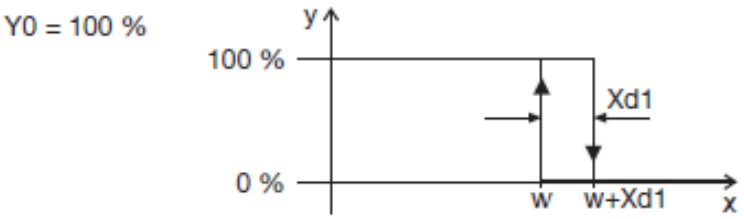
This controller has a switched output and can be parameterized with P, PI, PD, or PID transmission behavior. The proportional band Xp must be greater than 0 for the controller structure to take effect.

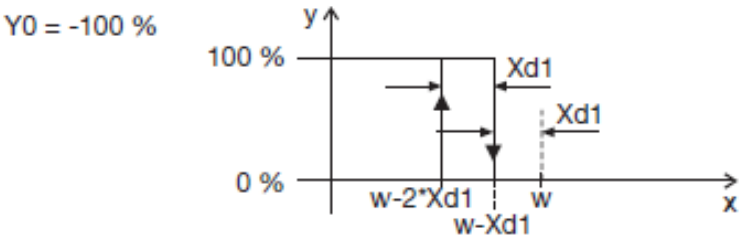
If Xp = 0, the behavior corresponds to the function of limit value monitoring with switching differential Xd1 (working point Y0 = 0 %):



Influence of working point Y0 on the switching behavior:



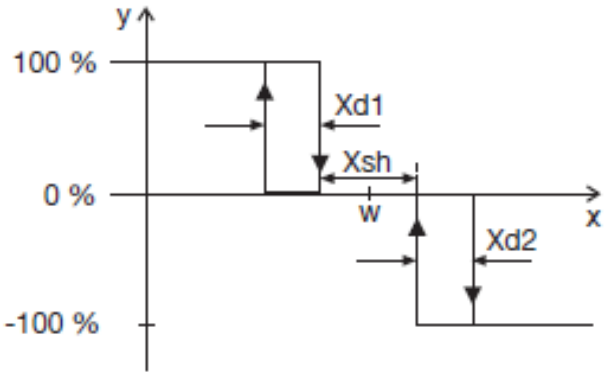




Three-state controller

This controller has two outputs, which can be configured as continuous (analog output) or switched (digital output). In both cases, the controller can be parameterized with P, PI, PD, or PID transmission behavior. The proportional bands Xp1 and Xp2 must be greater than 0 for the controller structure to take effect.

If Xp1 = 0 and Xp2 = 0, the behavior corresponds to the function of limit value monitoring with switching differential Xd1 and Xd2, and contact spacing Xsh (working point Y0 = 0 %):



Three-step controller

This controller has two switched outputs and can be parameterized with PI or PID transmission behavior.The proportional band Xp must be greater than 0 for the controller structure to take effect.

The three-step controller is used for actuator drives with three switching statuses (actuator open, closed,hold).

Continuous controller

This controller has a continuous output (analog output) and can be parameterized with P, PI, PD, or PID transmission behavior. The proportional band Xp must be greater than 0 for the controller structure to take effect (the setting Xp = 0 is not normally used in practice).

Position controller

This controller is a continuous controller with integrated position controller and two switched outputs (digital outputs) with PI or PID transmission behavior.

The position controller is used for actuator drives with three switching statuses (actuator open, closed, hold). Output level feedback is required.

If the output level feedback is "out of range", the current position of the actuator can no longer be determined. In this case, the actuator can be operated on with the keys "Up" (open) and "Down" (close) as for the three-step controller.

6. Configuration

6.1 Selectors

The selectors contain signals that are available for configuration on the device
These are device signals (e.g., analog and digital inputs or internal signals).

Analog selector

Category	Signal	Description
No selection		No signal selected
Analog input	Analog input	Analog input signal
Controller	Actual value	Actual value on the controller input
	Setpoint value	Active setpoint value on the controller input
	Sampling rate	Sampling rate (fixed value: 150 ms)
	Controller output 1 (ana-log)	Switched controller output 1 (0 to +100 %; e.g., forheating)
	Controller output 2 (ana-log)	Switched controller output 2 (-100 to 0 %; e.g., forcooling)
	Controller differential	Difference between setpoint value and actual value of the controller
	Output level display	Controller output level (-100 % to +100 %)
Setpoint values	Setpoint 1 to setpoint 4	Setpoint values that can be selected through thesetpoint changeover.
	Current setpoint value	Setpoint value selected through the setpoint changeover

Digital Selector

Category	Signal	Description
No selection		No signal selected
Digital inputs	Digital input 1 digital input 2	Signals of digital inputs 1 and 2
Controller	Controller off	The signal corresponds to the controller-off signal(switch off controller).
	Autotuning	The signal is active during autotuning.
	Manual mode active	The signal is active during manual mode.
	Controller cycle alarm	Control loop monitoring alarm signal
	Output level alarm	Output level monitoring alarm signal
	Controller output 1 (digital)	Signal on controller output 1 (e.g., for heating withinverse control direction)
	Controller output 2 (digital)	Signal on controller output 2 (e.g., for cooling with inverse control direction)
Limit value monitoringfunctions	Limit value monitoring function 1 to limit value monitoring function 4	Alarm signals of limit value monitoring functions 1 to 4

6.2 System data

The general system data is configured in this menu.

Parameter	Selection/text/value	Description
Device name (setup only)	Name (editable)	Device designation (in the "Device information" menu)
National language	German English French Spanish	National language of display texts
Language selection active	No Yes	Language selection after switching on the next time If "Yes", the user can select the national languagefor the device after the next time the device is switched on - following the change to the configuration After applying the national language, this parameter is automatically set to "No", so that language selection is not necessary the next time the device is switched on.
Temperature unit	°C °F	Temperature unit for the display on the device andin the setup program (automatic conversion from °C to °F)

6.3 Display/operation

Settings are implemented in this menu that affect the function of the displays and the device buttons.

Parameter	Selection/text/value	Description
Display 1	Analog selector Analog input	Analog signal that is shown in the first 18-segment display (top, white).
Display 2	Analog selector Current setpoint value	Analog signal that is shown in the second 18-segment display (bottom, green).
Display 3	Analog selector No selection	Analog signal that is shown in the top line of the pixel matrix display (only for formats 108H, 108Q,and 104).
Display 4	Analog selector No selection	Analog signal that is shown in the bottom line ofthe pixel matrix display (only for formats 108H, 108Q, and 104).
Timer start display change		Display change when starting the timer:
	Without function	No display change
	Timer remaining running time	Display of the remaining running time
	Timer runtime	Display of the runtime
Time-out operation	30 to 180 0 = Switched off	Time period (in seconds), after which the device automatically returns to the basic status if no key ispressed.
Contrast	1 to 10 (8)	Contrast of the displays
Running speed	1 to 3 (2)	Running speed of the display text
Short-press back button(< 2 s)	Without functionManual mode Start autotuning Display timer value	Function of the "Back" button when short pressing the button (less than two seconds) Additional functions of the button can be selectedin the configuration of the individual device functions (digital selector).
Long-press back button(> 2 s)	Manual mode (See above for other functions)	Function of the "Back" button when long-pressing the button (more than two seconds)
Start delay time	0 to 300 s	Start delay time (in seconds) after Power ON All functions of the device are only active after thistime has elapsed.
Parameter	**Selection/text/value**	**Description**
Key lock	Digital selector No selection	Digital signal (high active) for inhibiting the buttons
Display off	Digital selector No selection	Digital signal (high active) for switching off all displays
Additional functions (setup only)	Expansion 1 to Expansion 5	Reserved functions for service purposes. Only activate when instructed to do so by service personnel! Click checkbox to activate the function.

6.4 Analog input

The device has a universal analog input for connecting various measuring probes (sensors).

Parameter	Selection/text/value	Description
Signal type	No sensor	No sensor selected
	2L RTD temperatureprobe	RTD temperature probe in two-wire circuit
	3L RTD temperatureprobe	RTD temperature probe in three-wire circuit
	0...10 V	Voltage signal
	2...10 V	Voltage signal
	0...20 mA	Current signal
	4...20 mA	Current signal
Linearization	**Pt 100**	Only with RTD temperature probe
Decimal places		Number of pre-decimal and decimal places for thenumerical display of the measured value
	Auto	Automatic
	XXXX.	No decimal place
	XXX.X	One decimal place
	XX.XX	Two decimal places
	X.XXX	Three decimal places

6.4.1 Analog output

The device can optionally be equipped with an analog output.

Parameter	Selection/text/value	Description
	0...10 V	Voltage signal
	2...10 V	Voltage signal
	0...20 mA	Current signal
	4...20 mA	Current signal

6.5 Digital output

Parameter	Selection/text/value	Description
Source	Digital selector No selection	Signal that is issued at the digital output. Default setting for digital output 1: controller output 1 (digital) In the event of "No selection" the output signal does not correspond to the active status.
Inversion	No	Output signal not inverted.
	Yes	Output signal inverted.

Behavior after power on

The outputs are not active during the device's initialization phase (depending on the configuration). Oncethe initialization is complete, the output signal corresponds to the signal of the source (inverted if necessary).

6.6 Controller

6.6.1 Controller configuration

The general features of the controller are defined in this menu.

Parameter	Selection/text/value	Description
Controller type	Off	Controller disabled
	2-P controller	Two-state controller Controller with a switched output
	3-P controller	Three-state controller Controller with two switched outputs (for example, for heating/cooling) The combination of a continuous (e.g., for heating) and a switched output (e.g., for cooling) is also possible.
	3-P step controller	Three-step controller Controller with two switched outputs (for motor actuator)
	Continuous controller	Continuous controller Controller with a continuous output (analog signal)
Control direction	Direct	The controller output level is positive if the actual value is greater than the setpoint value (cooling).
	Inverse	The controller output level is positive if the actual value is smaller than the setpoint value (heating).
Y in manual mode	**Current value**	Current output level before changeover
	Y manual mode	Configurable value (see "Y manual mode" parameter)
Y with error	Current value	Current output level before fault occurs
	Y replacement value	Configurable value (see "Y replacement value" parameter)
Y replacement value	-100 to +100 (0)	Output level (in percent) in the event of a fault

6.6.1 Controller configuration

Parameter	Selection/text/value	Description
Control direction	Direct	The controller output level is positive if the actual value is greater than the setpoint value (cooling).
	Inverse	The controller's output level is positive if the actual value is smaller than the setpoint value (heating).
Y in manual mode		Output level after changeover to manual mode
	Current value	Current output level before changeover
	Y manual mode	Configurable value (see "Y manual mode" parameter)
Y manual mode	-100 to +100 (0)	Output level (in percent) in manual mode
Y with error		Output level in the event of a fault (outside of the measuring range)
	Current value	Current output level before fault occurs
	Y replacement value	Configurable value (see "Y replacement value" parameter)
Y replacement value	-100 to +100 (0)	Output level (in percent) in the event of a fault

Behavior after power on

The controller outputs are inactive during the initialization phase (output level 0 %, relay in standby mode).

6.6.2 Controller input

The controller input signals are assigned in this menu.

Parameter	Selection/text/value	Description
Controller actual value	Analog selector **Analog input**	Analog signal as actual value of the controller
Controller setpoint value	Analog selector **Current setpoint value**	Analog signal as controller setpoint value
Signal 1 setpoint changeover	Digital selector **No selection**	Signal (bit 0) for controlling setpoint changeover
Signal 2 setpoint changeover	Digital selector **No selection**	Signal (bit 1) for controlling setpoint changeover
Manual/auto change-over signal	Digital selector **No selection**	Signal (high-active) for changeover to manualmode
Manual mode signal inhibition	Digital selector **No selection**	Signal (high active) for inhibiting manual mode

6.6.2 Setpoint changeover

Signal 2 (bit 1)	Signal 1 (bit 0)	Active setpoint value
0	0	Setpoint value 1
0	1	Setpoint value 2
1	0	Setpoint value 3
1	1	Setpoint value 4

Controller input

Parameter	Selection/text/value	Description
Parameter block changeover signal	Digital selector No selection	Signal (high-active) for changeover from parameter block 1 to parameter block 2
Controller signal on	Digital selector No selection	Signal (high-active) for switching on the controller
Controllers signal off	Digital selector No selection	Signal (high-active) for switching off the controller

Setpoint changeover

Signal 2 (bit 1)	Signal 1 (bit 0)	Active setpoint value
0	0	Setpoint value 1
0	1	Setpoint value 2
1	0	Setpoint value 3
1	1	Setpoint value 4

6.6.3 Setpoint values

One of four (switchable) setpoint values is used as a controller setpoint value. For each of these setpoints,certain specifications can be made here that are of importance, for example, when entering the setpointvalue. The setpoint itself can also be set here.

Parameter	Selection/text/value	Description
Min. limit	**-1999** to 9999	Minimum admissible setpoint value (lower input limit)
Max. limit	-1999 to **9999**	Maximum admissible setpoint value (upper input limit)
Setpoint value	-1999 to 9999 (**0**)	Fixed setpoint value (input limits dependent onmin. limit and max. limit)

6.7 Limit value monitoring functions

The device is equipped with four limit value monitoring functions that can be individually configured. Thefollowing configuration parameters are available for each of the four limit value monitoring functions.

Parameter	Selection/text/value	Description
Function	Without function	
	AF1	Limit value above and below the setpoint value
	AF2	As for AF1, output signal inverted
	AF3	Limit value below the setpoint value
	AF4	As for AF3, output signal inverted
	AF5	Limit value above the setpoint value
	AF6	As for AF5, output signal inverted
	AF7	Fixed limit value (independent of the setpoint value)
	AF8	As for AF7, output signal inverted
Actual value input	Analog selector No selection	Analog signal as actual value (signal to be monitored)
Setpoint value input	Analog selector No selection	Analog signal as setpoint value (reference signal for AF1 to AF6)
Limit value	-1999 to 9999 (0)	Admissible deviation (AL) of the actual value
Limit value 2	-1999 to 9999 (0)	For non-standard limit value function: second limitvalue (AL2) to implement an asymmetrical monitoring band; only for AF1 and AF2 The limit value (AL) is below the setpoint value; thesecond limit value (AL2) is above the setpoint value.
Switching differential	0 to 9999 (1)	Switching thresholds of the output signal (difference from limit value)
Startup alarm suppression		Alarm suppression during start-up phase
	Off	Limit value monitoring always operates accordingto its alarm function.
	On	Alarm suppression after power on or if limit value or setpoint value is changed
Response in case of a fault		Output signal in the event of a fault (e.g., in the event of over range or under range)
	Off	Output signal inactive
	On	Output signal active

Function

For the AF1 to AF6 alarm functions, the final limit value depends on the setpoint value – the entered limit value is added to or subtracted from the setpoint value. The AF7 and AF8 alarm functions work with a fixed limit value which corresponds to the limit value entered.

See also *chapter 6.7.1 "Alarm functions and switching behavior",*

Startup alarm suppression

Function of the startup alarm suppression:

- After power on, the alarm signals for the limit value monitoring function remain inactive, even if the actual value is in the alarm range.
- If the limit value or setpoint value is changed so that the actual value is within the alarm range, while the actual value is outside of the alarm range, the alarm signal remains inactive.
- The limit value monitoring only starts to operate according to its alarm function again once the actual value has left the alarm range. This means that the alarm signal remains inactive until the actual value returns to the alarm range.

Behavior after power on

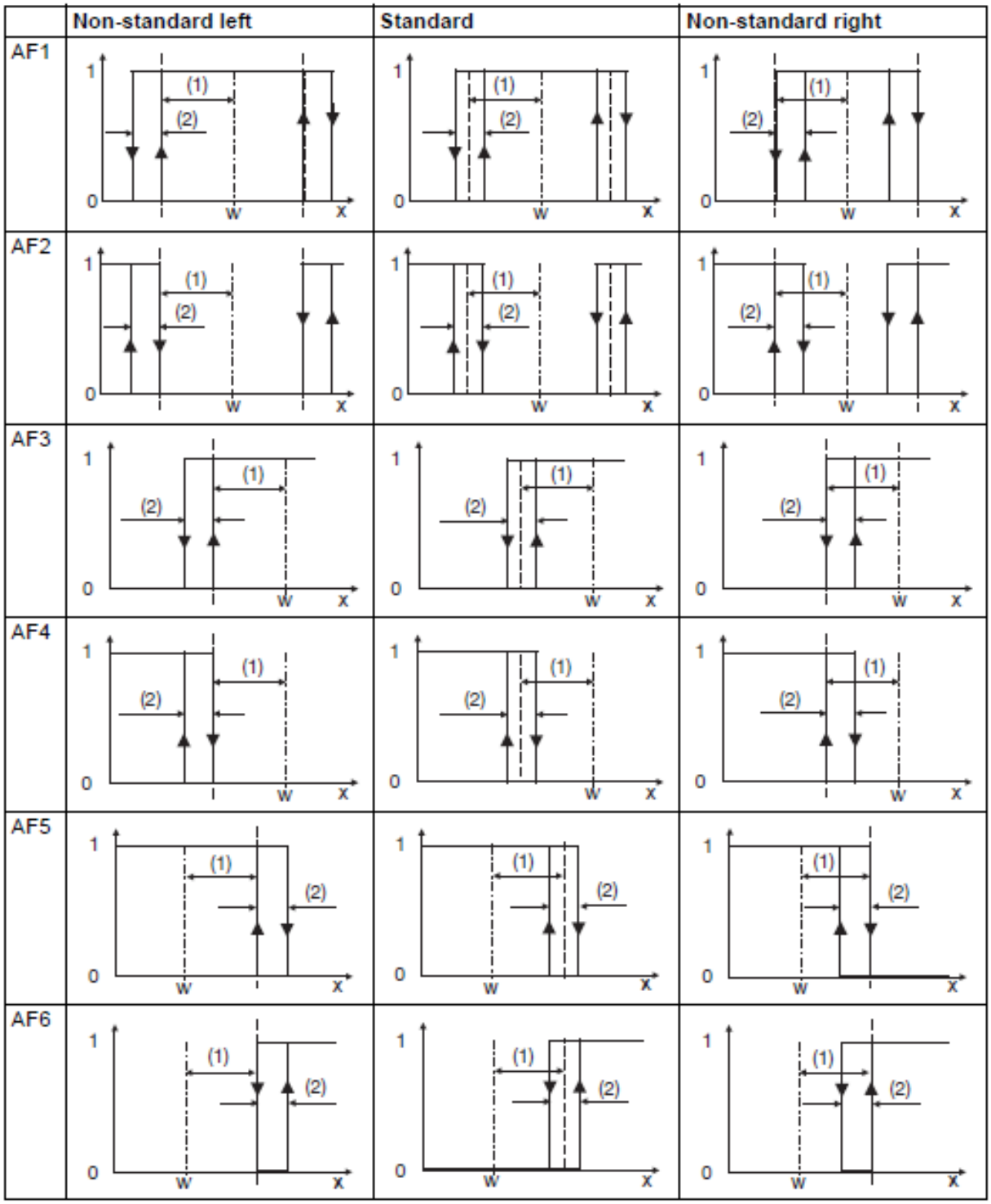
The output signal status is not saved via power off. Limit value monitoring starts after completion of initialization according to its configuration.

6.7.1 Functions and switching behavior

This section describes the alarm function AF1 to AF8 and the switching behavior (non-standard left,standard, non-standard right)

Factory setting AF6 alarm type.

Limit value in relation to the setpoint value

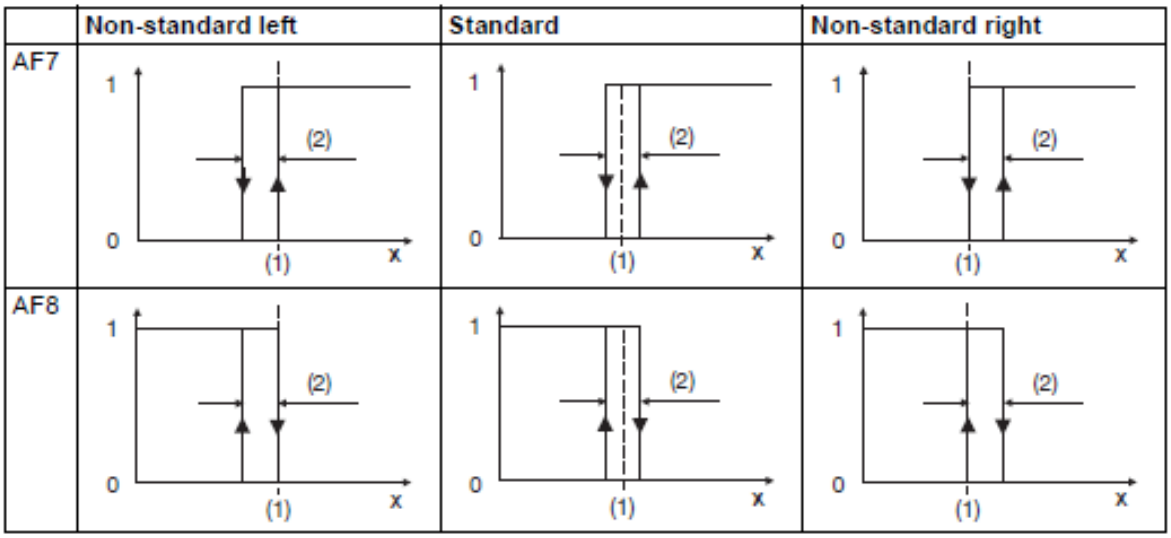


0 = output signal not active
1 = output signal active

x = actual value
w = setpoint value

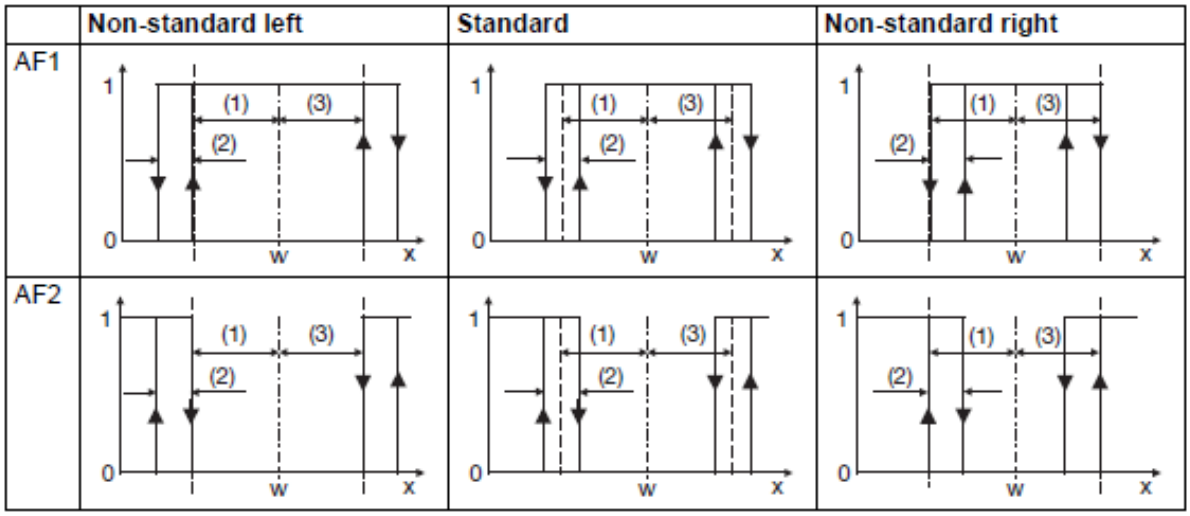
(1) Limit value (AL)
(2) Switching differential

Fixed limit value



0 = output signal not active
1 = output signal active
x = actual value
(1) Limit value (AL)
(2) Switching differential

Limit value in relation to the setpoint – non-standard monitoring brand



0 = output signal not active
1 = output signal active
x = actual value
w = setpoint value
(1) Limit value (AL)
(2) Switching differential
(3) Limit value 2 (AL2)

6.7.2 Serial interface

The device can be optionally equipped with a RS485 interface that is provided for connecting to a Modbus master and is operated as a Modbus slave (Modbus RTU protocol).

RS485	
Baud rate Data	9600, 19200, 38400, 115200
format	8-1-no parity, 8-1-even parity, 8-1-odd parity, 8-2-
Protocol	no parity Modbus RTU (master/slave)
Ethernet Connector	
type Transfer rate	RJ45 (socket)
Protocol Connecting	10 Mbit/s, 100 Mbit/s
cable	TCP/IP, DHCP, DNS; Modbus
Line length	TCP (master/slave) Network
	cable, at least CAT5 (S/FTP)
	Max. 100 m
PROFINET IO Device	
Connector type	2 x RJ45 (socket),
Transfer rate	integrated switch 100
Conformity class	Mbit/s
Netload class Protocol	C (CC-C)
Connecting cable	III (Netload Class III)
Line length	DCP, LLDP, VLAN Priority, PTCP, MRP
	Network cable, at least
	CAT5 (S/FTP) Max.
	100 m

NOTE!

There is a separate interface description available with further information. Amongst other things, this includes the Modbus addresses of all device data, process value, and configuration parameters available via Modbus

Behavior after power on

The inputs are set to 0 (binary) or "NOINPUT" (analog) during the device's initialization phase. Once the initialization is complete, the values transferred via Modbus are applied.

7. Technical data

7.1 Analog input

RTD temperature probe

Designation	Standard	ITS	Connection type	Measuring range	Accuracy[a]	Measuring current
Pt100	DIN EN 60751:2009 IEC 60751:2008	ITS-90	Two/three-wire	-50 to +260 °C -58 to +500 °F	≤ 0.1 %	500 µA

a) The accuracy value refers to the measuring range.

Ambient temperature influence	≤ 50 ppm/K
Sensor line resistance	Max. 30 Ω per line
Sampling rate	150 ms
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

Voltage, current (standard signals)

Designation	Measuring range	Accuracy[a]	Input resistance or burden voltage
Voltage	0 to 10 V	≤ 0.1 %	> 500 kΩ
	2 to 10 V	≤ 0.1 %	> 500 kΩ
Current	4 to 20 mA	≤ 0.1 %	< 2.5 V
	0 to 20 mA	≤ 0.1 %	< 2.5 V

a) The accuracy value refers to the maximum measuring range. Small measuring spans lead to reduced linearization accuracy.

Ambient temperature influence	≤ 100 ppm/K
Deviation below/above the measuring range	According to NAMUR recommendation NE 43 (only current input 4 to 20 mA)
Sampling rate	150 ms
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100.0 s

Measuring circuit monitoring

The device's behavior in the event of a fault is configurable.

Measuring probe	Measuring range underflow	Measuring range overflow	Short-circuit (probe/line)	Break (probe/line)	Polarity
RTD temperature probe	++	++	++	++	---

++ = is detected --- = is not detected (+) = is detected in certain conditions

7. 2 Analog input

Voltage	
Output signal	DC 0(2) to 10 V
Load resistance	> 500 Ω
Current	
Output signal	DC 0(4) to 20 mA
Load resistance	< 450 Ω
Accuracy	≤ 0.5 %
Ambient temperature influence	≤ 150 ppm/K

7.2 Digital outputs

Relay (N/O contact)	Max. 3 A at AC 230 V or DC 30
Switching capacity	V, resistive load150,000
Contact life	operations at rated load 350,000 operations at 1 A
Relay (N/O contact) with longer contact life	Max. 3 A at AC 230 V, resistive load 300,000
Switching capacity	operations at rated load 1,500,000
Contact life	operations at 1 A
Logic output	DC 0/14 V ±15 %
Output signal	Max. 20 mA per output (at nominal
Current	voltage 14 V)Min. 10 ms
Switching time when used as a controller output	
PhotoMOS® relay[a]	
Switching capacity	Max. 200 mA at AC 30 V or DC 45 V; not short-circuit proof

7.2 Interface – on request

RS485	
Baud rate	9600, 19200, 38400, 115200
Data format	8/1n, 8/1e, 8/1o, 8/2n
Protocol	Modbus-RTU as slave

7.3 Display

18-segment LCD displays		
Digit height ER2022 and ER2022A	Upper display: 24.8 mm / 0,976 inch	Lower display: 12 mm / 0,472 inch
Color	Upper display: white; lower display: green	
Places, including decimal places	Upper display: 4; lower display:	
Decimal places	0, 1, 2, 3 or automatic (configurable)	
	Pixel matrix LCD display	
Pixel fields		
ER2022 and ER2022A	2 rows each with 11-pixel fields	
Number of pixels per field	8 x 5	
Color	White	

7.4 Electric data

Voltage supply	AC 110 to 240 V +10/-15 %, 48 to 63 Hz AC/DC 20 to 30V, 48 to 63Hz	
Electrical safety	According to EN 61010, part 1; overvoltage category II to 300 V mains voltage,pollution degree 2	
Protection rating	With internal isolation from SELV	
Power consumption	For AC 110 to 240 V: Max. 6.8 W	For AC/DC 20 to 30 V: Max. 8.9 W
Electrical connection	On the back via spring-cage terminals (Push-In technology)	
Conductor cross section Wire or stranded wire without ferrule Stranded wire with ferrule Stripping length	Min. 0.2 mm^2, max. 1.5 mm^2 Without plastic collar: min. 0.2 mm^2, max. 1.5 mm^2 with plastic collar: min. 0.2 mm^2, max. .75mm^2 8 mm / 0,314 inch	

7.5 Environmental influence

Ambient temperature range Storage Operation	-30 /-22 to +70 °C / 158 °F -10/14 to +55 °C/ 131 °F
Site altitude	Max. 2000 m above sea level
Climatic environmental influences	According to DIN EN 60721-3 with extended temperature range
Resistance to climatic	≤ 90 % rel. humidity without condensation
conditions	
Storage	According to class 1K2
Operation	According to class 3K3
Electromagnetic compatibility	According to DIN EN 61326-1
(EMC)	
Interference emission	Class A – only for industrial use –
Interference immunity	Industrial requirements

7.6 Case

Case type	Plastic housing for panel mounting according to DIN IEC 61554 (indoor use)
Case front	Made of plastic with membrane keyboard
Panel thickness	1 to 10 mm / 0,039 to 0,393 inch
Case fastening	In panel using the supplied mounting frame or both mounting elements
Operating position	Any[a]
Protection type	According to DIN EN 60529, IP65 on the front, IP20 on the back
Weight	Max. 220 g 7,760 oz

[a] The maximum admissible ambient temperature only applies for the installation with the display in a vertical position.

7.7 Approvals and approvals marks

Approval mark	Test facility	Certificate/certification numbers	Inspection basis	Valid for
c UL us	Underwriters Laboratories	E201387	UL 61010-1 (3. Ed.), CAN/CSA-22.2 No. 61010-1 (3. Ed.)	
DNV GL	DNV GL		Class Guideline DNVGL-CG-0339	On request

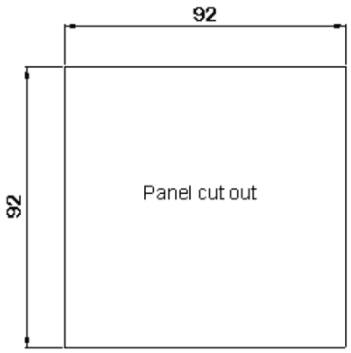
The device is approved if the relevant approval mark is shown on the device.

8. Replacing the ER2022S&SA by new type ER 2025S&SA

Before starting the replacement of ER2022S by ER2025A check dimension of controller hole made on front of the panel /or cabinet cover.

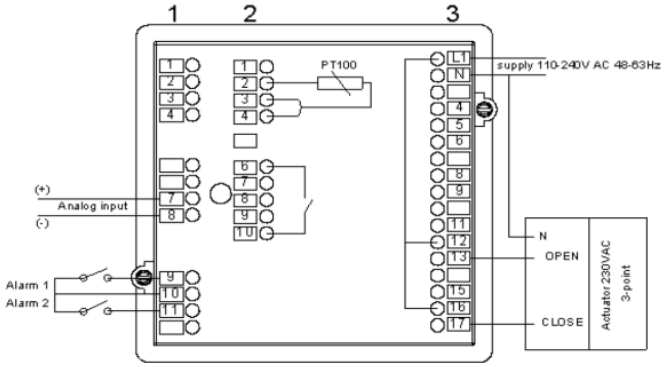
If dimension of panel hole is too small rework the hole manually for bigger one as such below sketch.

Panel cut up 92+0.5 + 0.5 mm [3,62 x3,62 inch]

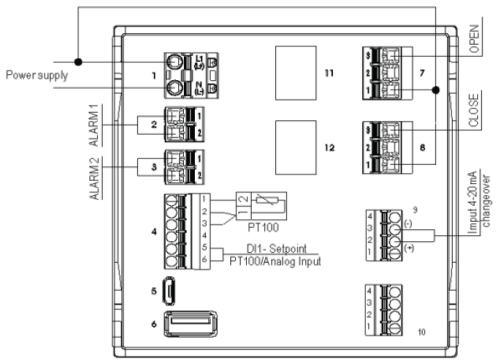


Wring diagram of ER Controllers /3-point/ 110-240VAC old and new type

ER 2022S



ER2025S



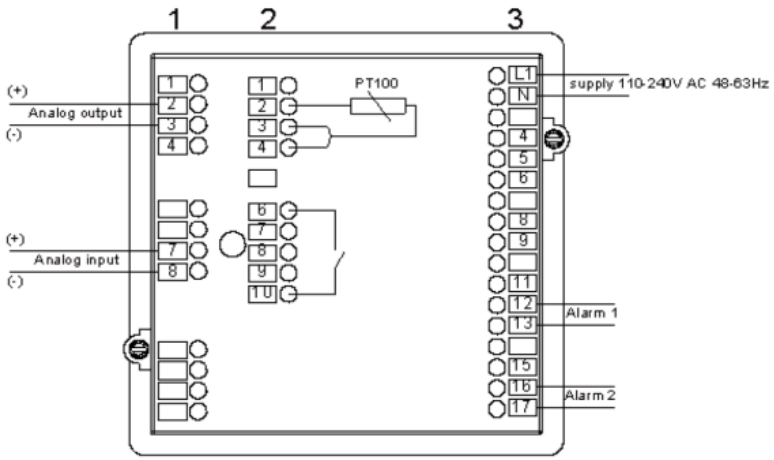
Description	ER 2022S Terminals	ER 2025S Terminals
Voltage supply	L 1	L
	N	N
Output 1 - open	3-13	7-3
Output 2 - close	3-17	8-3
Analog Input (+)	1-7	9-2
Analog Input (-)	1-8	9-3
ALARM	1-9,10	2-1,2
ALARM	1-9,11	3-1,2
DI-setpoint	2-6,10	4-5-6
Pt 100 - 3 wire	2-2	4-1
	2-3	4-2
	2-4	4-3

Shielded cables should been used.
It is recommended to use the cable end clamps when installing the wire.

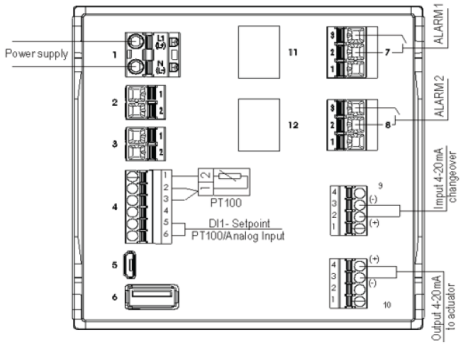
9. Replacing the ER2022SA with new type ER 2025SA

Wring diagram of ER Controllers /analog / 110-240VAC old and new type

ER 2022SA



ER 2025SA



Description	ER 2022SA Terminals	ER 2025SA Terminals
Voltage supply	L 1	L
	N	N
Analog output (+) - open	1-2	10-4
Analog output (-) - close	1-3	10-3
Analog Input (+)	1-7	9-2
Analog Input (-)	1-8	9-3
ALARM	3-12,13	7-2,3
ALARM	3-16,17	8-2,3
DI-setpoint	2-6,10	4-5-6
Pt 100 - 3 wire	2-2	4-1
	2-3	4-2
	2-4	4-3

Shielded cables should been used.
It is recommended to use the cable end clamps when installing the wire.

CONTACT INFORMATION

Clorius Controls**: mail@cloriuscontrols.com**

See also **www.cloriuscontrols.com** for further information