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Operating Manual TR440

updated: 2015-07-17 Sc/Fu

- Transformer protection temperature relay

Table of contents

1 Use and brief description

Temperature relay to protect transformers against excess temperature and to control a fan.
The temperatures in the windings are monitored with three Pt 100 sensors. The core temperature can be monitored with a fourth sensor.
The 4 alarms/output relays are used to control the fan, to signal an advance warning and to switch-off the transformer. Various programs facilitate using the alarm ideally for each application. Depending on the program, e.g. an extra relay is available for the fault message or for triggering due to exceeding the maximum core temperature.

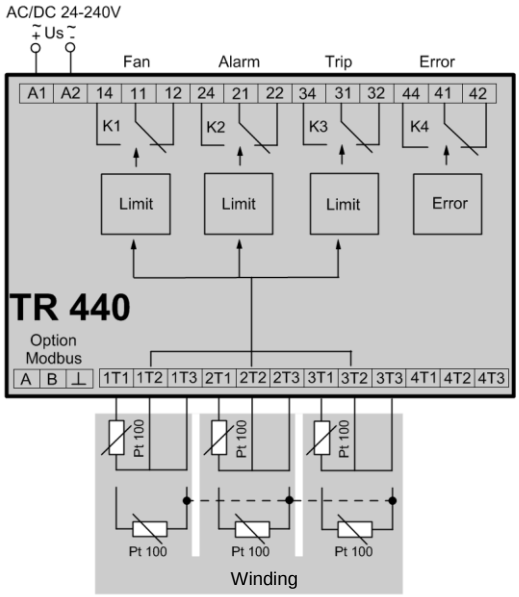
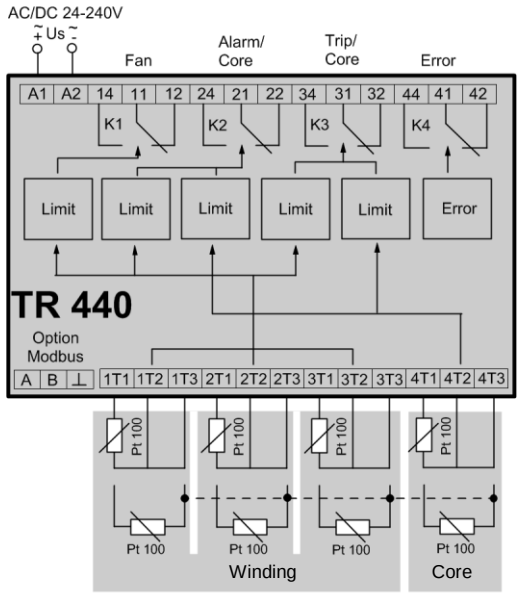
Other uses: Alternatively, with the fourth sensor the temperature of the room the transformer is located in can be monitored and, with the alarm, the room ventilation can be controlled. The device can also be used for other tasks for temperature monitoring
e.g., for motors.

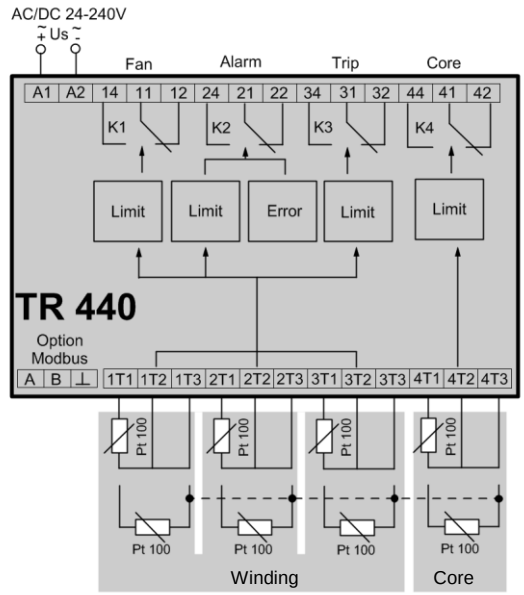
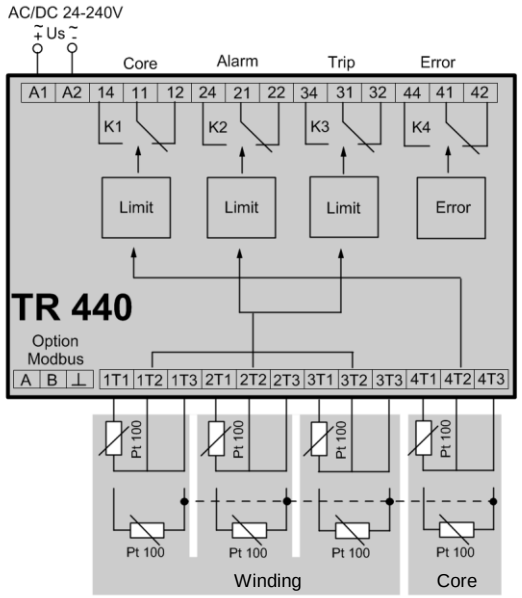
2 Overview of the functions

- 4 Sensor inputs Pt 100 (RTD), 2 or 3-wire connection
- Large monitoring range -199…+850°C / -199...+999°F
- 4 Alarms / Relays
- 3-digit digital display (resolution 1°C / 1°F)
- 4 LEDs sensor
- 4 LEDs relay
- 4 LEDs alarm
- 1 LED error
- Control voltage AC/DC 24-240 V
- Clear displays and simple programming
- Min and max sensor values can be saved
- Code block against unintended / unauthorised changes to the settings
- Optional RS 485 interface with Modbus RTU protocol
- EasySimulation for simple sensor value simulation

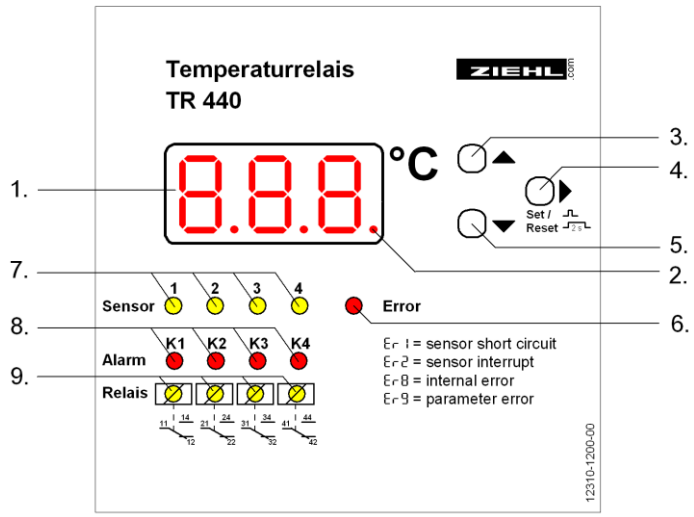
3 Connection diagram

There are various connection possibilities depending on the four adjustable programs.

Program 1:	Program 2:
3 sensors in the windings: • Fan/FAN (with cyclic test) • Advance warning ALr • Shutdown trP • Malfunction (sensor error)	3 sensors in the windings and 1 sensor in the transformer core: • Fan/FAN (with cyclic test) • Advance warning (winding + core) ALr • Shutdown (winding + core) trP • Malfunction (sensor error) For the sensors in the windings and for the sensor in the core, various limits can be set for each.
	

Program 3:	Program 4:
3 sensors in the windings and 1 sensor in the transformer core: • Fan/FAN (with cyclic test) • Advance warning (winding) / malfunction combined ALr • Shutdown (winding) trP • Shutdown (core) Cor Alarm 2 simultaneously to reach the advance warning temperature and the fault message.	3 sensors in the windings and 1 sensor in the transformer core: • Shutdown (core) Cor • Advance warning (winding) ALr • Shutdown (winding) trP • Malfunction (sensor error)
	

4 Display and controls



1 **Digital display (3 digits)**
- Display of sensor value
- Display of error codes
- Display of menu and configuration mode

2 **Right-hand decimal point**
- Off: The device is in the display mode
- Illuminated: The device is in the menu mode
- Flashes: The device is in the configuration mode

3, 5 **Up key / Down key** (in display mode, normal state)
- Change into the menu mode (see Operating instructions Point 8.3)
- Press for 2 s: Displays min/max measurement of the selected sensor
  ⇒ Additionally pressing key set ≥ 2s deletes all min/max values
- Press Up and Down ≥ 2s: EasySimulation, jumps into simulation mode for the sensors 1T .. 3T (display S1-3)

4 **Set/Reset key** (in display mode, normal state)
- Press briefly: Displays the next sensor (sensor LED illuminates)
- Press for 2 s: Reset function, deletes a locked alarm (=> [Delay time Alarm off] must have expired)
- Press for 5 s: Displays the program number (e.g. Pr3)
- Press for 8 s: Displays the measurand (e.g. °C)
- Press for 10 s: Displays the software version (e.g. -00)

6 **LED (red) error**
- Illuminated: Sensor error in one sensor circuit or an internal device fault has occurred

7 **LEDs (yellow) sensors**
- Illuminated: Displays the sensor value belonging to the LED in the digital display
- Flashes: Sensor error in the corresponding sensor circuit

8 **LEDs (red) alarm**
- Illuminated: Alarm (1-4) has occurred
- Flashes quickly (1:4): [Delay time Alarm on] running
- Flashes long (4:1): [Delay time Alarm off] running
- Flashes uniformly (1:1): Ready for reset, reset with key Press "SET/RESET" ≥ 2s

9 **LEDs (yellow) relay state**
- Illuminated: The relay belonging to the LED is operating
- Off: The relay belonging to the LED is released

5 Important information

WARNING
Hazardous electrical voltage!
Can lead to electric shock and burns.
Before starting work, switch plant and device voltage-free.

The flawless and safe operation of a device requires that it is shipped and stored appropriately, professionally installed and put into operation and operated according to its intended use.
Only people who are familiar with the installation, commissioning and operation and who have qualifications corresponding to their job are permitted to work on the device. They must comply with the contents of the operating instructions, the notices attached to the device and the relevant safety regulations for erecting and operating electrical plants.
The devices are built and certified in accordance with (DIN / VDE / EN / IEC) and leave the factory in a safe and technically flawless condition. To maintain this state you must comply with the safety regulations indicated with "Caution" in the operating instructions. Non-compliance with the safety regulations can lead to death, bodily injury or property damage on the device itself and on other devices and equipment.
If the information in the operating instructions is insufficient in any case whatsoever, please contact us directly or contact the representation responsible for you.
Instead of the industrial norms and stipulations stated in the operating instructions and applicable in Europe, you must comply with the valid and applicable instructions in the land of utilisation if the device is used outside of the area of application.

Caution!
Devices with reclosing interlock (Reset) do not comply with the conditions for safety circuits according to EN 60204. They must not be used alone for functions in which an independent restart must be prevented.

Caution!
If the operating current version is programmed for all relays, a failure of the control voltage or the device will not be detected. When using as a monitoring device, the operator must ensure that this error is detected through periodic function tests.
We recommend programming at least one relay in closed-circuit current version and to correspondingly evaluate.

Attention! (Only devices with RS 485 interface)
Sensor-Inputs and Interface RS 485 are the same potential. Please regard.
RS 485 interface:
Large cable lengths may shift the potential ground and the transmission can be disturbed.
Corrective measures can be galvanic separation or an additional ground wire.

6 Programs

4 programs (Pr) can be selected in the factory version. Starting from these programs, it is especially simple to adapt the device to the application.
First select the program that fits your application and then change the individual parameters! All parameters are reset with when switching the program to "factory settings" (see "Connection Diagram" and see "Factor Settings").
Selecting the program:

- ⇒ Switch off control voltage supply
- ⇒ Keep the Set key pressed
- ⇒ Switch on control voltage supply
- ⇒ Wait at least 10s until Pr appears in the display
- ⇒ Release the Set key
- ⇒ Select program (Pr 1... Pr 4) with the Up/Down keys
- ⇒ Press the Set key
- ⇒ Select the measurand (°C / °F) with the Up/Down keys
- ⇒ Press the Set key
- ⇒ Display --- appears, settings will be copied, device starts

Querying the program number

- ⇒ See
  Point 11.1 Display of program number, measurand and software version

7 Installation

Comply with the maximum permissible temperature when installing. Ensure sufficient clearance to other devices or heat sources. If cooling is inhibited, e.g., through close proximity to devices with increased surface temperature or interference with the cooling air current, the permissible ambient temperature is decreased.

Caution! Wide area power supply
The device has a wide area power supply that is suitable for DC and AC voltages. Before you apply mains voltage to the device, make sure that the permissible voltage range of the control voltage Us on the rear of the device matches the mains voltage connected to the device!

Push the TR440 into the prepared 91 x 91 mm cut-out according to DIN 43700 from the control side.
To achieve the IP 54 degree of protection, install the supplied seal between the housing and the front panel.
Push the fastening clasp onto both sides of the guide rails.
Screw the fastening clasps tight with a screwdriver.
Tighten both clasps uniformly.

Connect in accordance with the connection diagram or the rating plate.

8 Start-up operation (commissioning)

8.1 General instructions on operating

On the decimal point behind the last 7-segment display one can recognise the device operating mode.

8.2 Display mode

Decimal point off (normal state for measurement display)

LED yellow (sensor) • one is illuminated	Display of the current sensor value (corresponds to the illuminated LED)
• all illuminated	Display of the hottest measured temperature of all connected sensors
• alternating illumination	All sensor values are displayed for 2s each consecutively
	Briefly press the Set key: ⇒ Displays the next sensor value ⇒ Displays the hottest sensor value ⇒ Displays all sensor values consecutively
	Displays errors on the TR440 with the error code (Er1 , Er2 Er8 , Er9 , -EE , EEE)
	Displays alarms (ALr , trP ,or Cor)
LED yellow Relay K1 .. K4	ON = Relay operating OFF = Relay is released
LED red Alarm 1 .. 4	Flashes 1:4 = [Alarm delay on] active Flashes 4:1 = [Alarm delay off] active Flashes 1:1 = Ready for reset, reset with key Press "SET/RESET" ≥ 2s ON = Alarm on OFF = Alarm off
LED red Error	ON = Fault in a sensor circuit (yellow LED for the defective sensor flashes) = internal device error (error code in display)
Function key Set/Reset	Press briefly: Displays the next sensor (sensor LED illuminates) Press for 2 s: Resets a locked alarm Press for 5 s: Displays the program number Press for 8 s: Displays the measurand Press for 10 s: Displays the software version
Function keys Up and Down	Press briefly: Change into the menus mode Press for 2 s: Displays min/max measurement of the selected sensor ⇒ Additionally pressing the Set key ≥ 2s deletes all min/max values Press Up and Down ≥ 2s: EasySimulation, jumps into simulation mode for the sensors 1T .. 3T (display S1-3)

8.3 Menu mode

Decimal point on

	Select the menu items for viewing the parameters
Function keys Up and Down	Press briefly: Select menu item; change into the display mode
Function key Set/Reset	Press briefly: Change into the configuration mode

8.4 Configuration mode

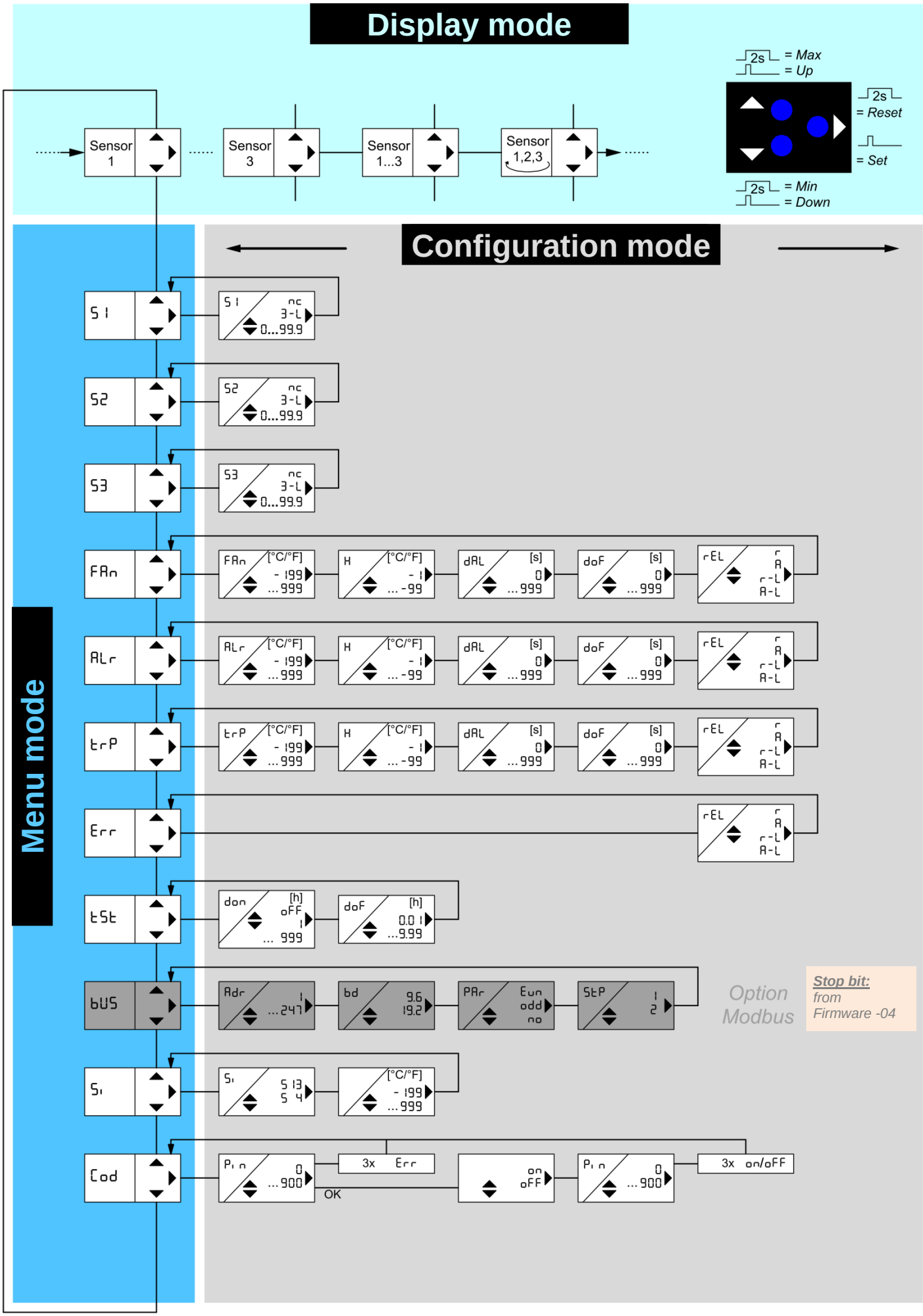
Decimal point flashes

Function keys Up and Down	Press briefly/long: Value change of the parameter (slow/fast)
Function key Set/Reset	Press briefly: Copy the settings and select the next parameter after the last parameter change in the menu mode

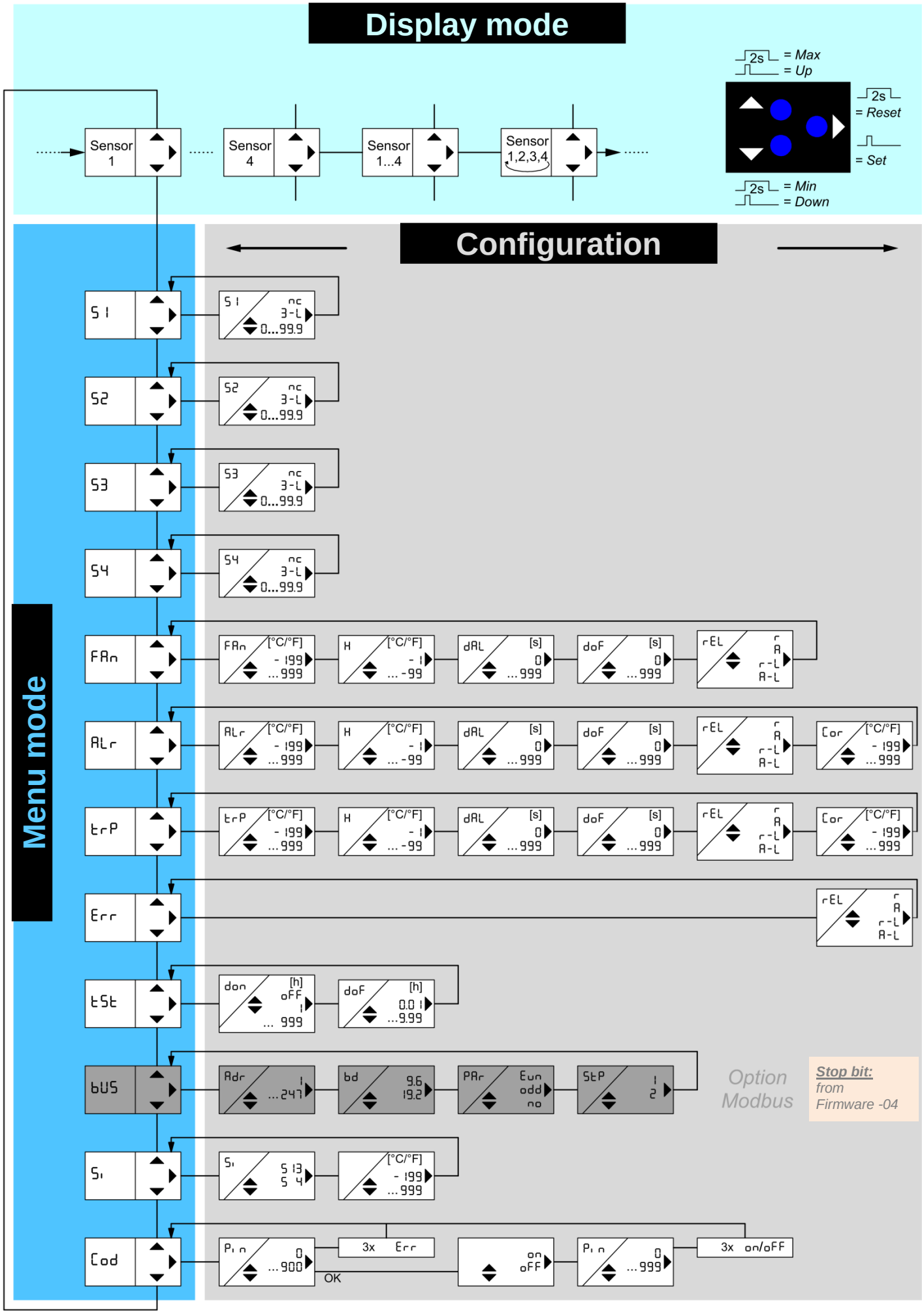
Hint:
If the Set/Reset key is pressed for 2s, one leaves the menu mode / configuration mode and returns to the display mode. The same happens if no key is pressed for 30s.
Exception in simulation mode:

- If a locked alarm is present, it is reset by pressing the Set/Reset key for ≥ 2s.
- If no locked alarm is present, returns to the display mode.
- Return to the display mode after 15 minutes without any key activation.

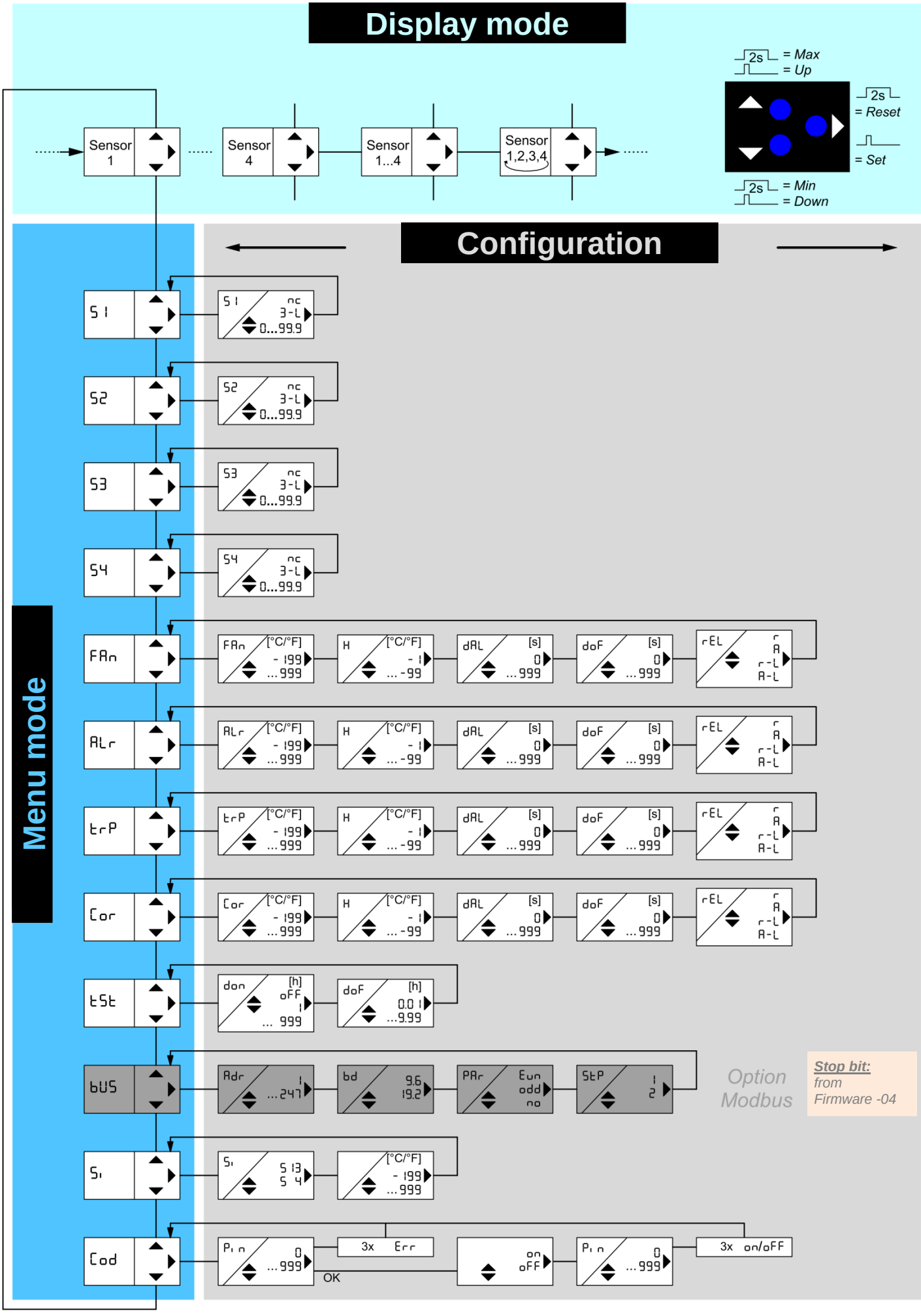
8.5 Short operating diagram [Program 1]



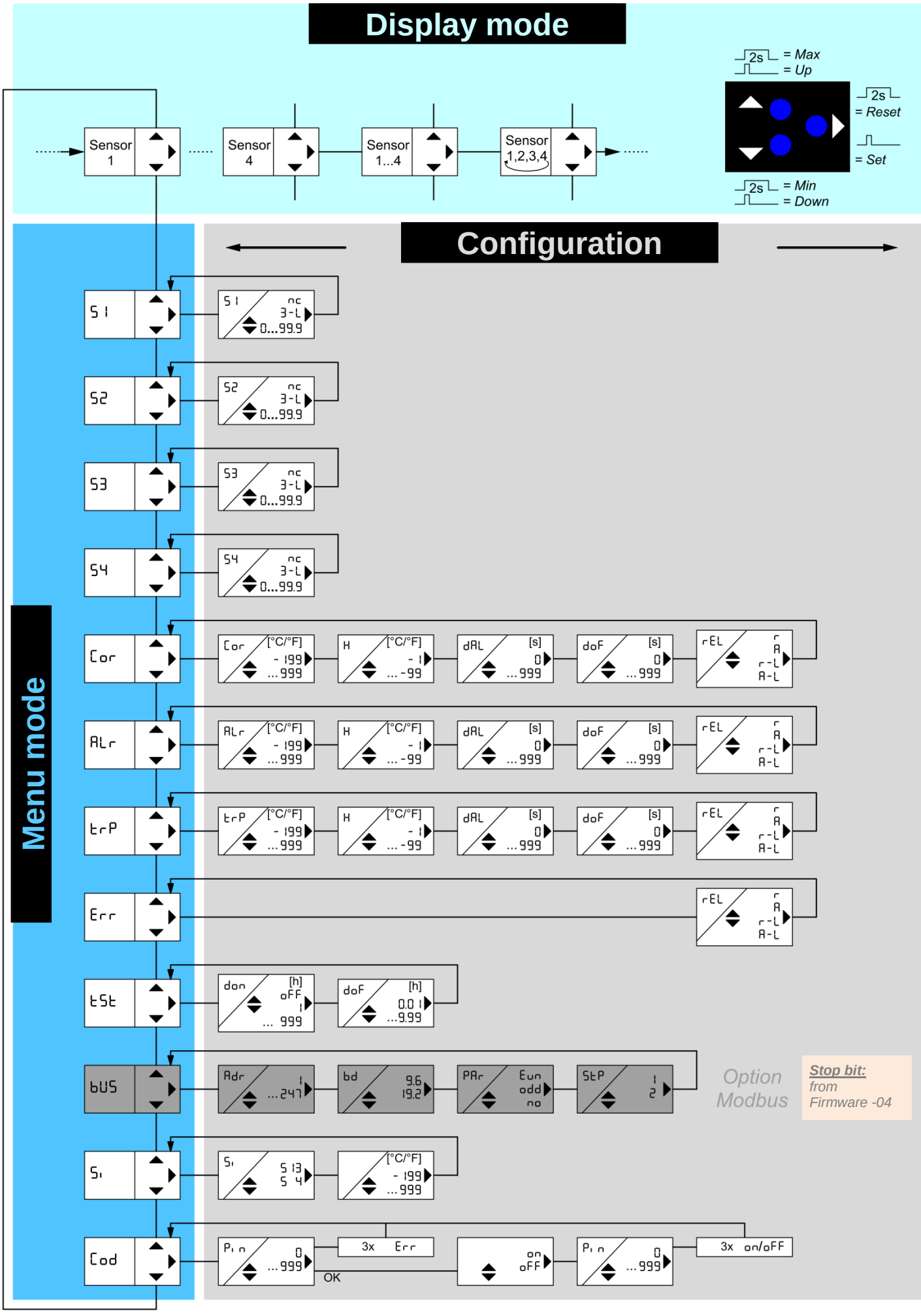
8.6 Short operating diagram [Program 2]



8.7 Short operating diagram [Program 3]



8.8 Short operating diagram [Program 4]



8.9 Overview of commissioning

Must	Can	Overview
X		8.10 Selection of program number
X		8.11 Switch on device
X		8.12 Configure the sensors
X		8.13 Configure the alarms
X		8.14 Configure the relay test on K1
	X	8.15 Configure the Modbus RS 485 interface (option)
	X	8.16 Sensor simulation
	X	8.17 Code block
		8.18 Tips on operating
		8.19 Possible indications in display

8.10 Selection of program number

Set the program number as described in Point [6. Programs].

8.11 Switch on device

Switch on supply voltage,

⇒ All LEDs and displays are illuminated
⇒ Displays the set measurand
⇒ Displays the set program number
⇒ After ca. 2s, the TR440 is operable

8.12 Configure the sensors

Starting from the display mode:
Return into the display mode by pressing Set key ≥ 2s
If no entry is made for 30 s, the device also returns to the display mode.

	Press Down key
	Display S 1.
→	Press the Set key
	Set sensor type using the Up / Down key nc. => not connected, no sensor connected 3-L. => 3-wire Pt 100 sensor 00.0. … 99.9. => 2-wire Pt 100 sensor, specification of the entire line resistance from the sensor outgoing and return line 2-wire, compensation of line-resistance: To compensate the line resistance short-circuit the wires nearby the sensor and measure the line resistance. With 2-wire connection and a common line for all signals, all sensor measuring currents will be added on the common line. Thus the value of the compensation line resistance RK must be calculated as follows: RK=(n+1) x RL/2 (RL = line resistance of two wires, n = number of sensors) We recommend using 2 or bettering 3 wires for each sensor.
	Press the Set key
	Select the next sensor with the Down key (with Up key to the previous sensor or to exit the menu modus in sensor S 1.)
—	Configure the next sensor
	After Sensor 4 (in program 1 after Sensor 3), change to the next menu item with the Down key (alarms configuration)

8.13 Configure the alarms

The following parameters are significant:

Alarm value	FAn. ALr. trP. Cor.	Limits for the alarms. Dependent on the selected program, various alarm settings are possible(see short operating diagrams)
Hysteresis	H .	Reset value is calculated from the alarm value + hysteresis, e.g.: 90°C (limit) + -5°C (hysteresis) = 85°C (reset value)
Alarm delay on	dAL.	An alarm is suppressed for the set time (seconds)
Alarm delay off	doF.	An alarm is only switched off after the limit is fallen below (alarm value + hysteresis) and this time (seconds) has expired.
Relay	rEL.	**Closed-circuit current** r. **:** Relay is operating (attracted) in GOOD state (= alarm value has not been reached) and releases when the alarm value is reached. Advantage: Errors and malfunctions generally lead to an alarm Disadvantage: Alarm also when the control voltage is switched off. Unfavourable, e.g., in transformers, especially when the TR440 control voltage comes from the monitored transformer
		Operating current A. **:** Relay has released in GOOD state and operates (attracts) when the alarm value has been reached. No alarm when the control voltage is switched off and during faults.
		Closed-circuit current locked Lr. **:** Behaves as with zero signal current, but an alarm remains active until it is reset with the Set/Reset key (press ≥ 2s).
		Operating current locked LA. **:** Behaves as with operating current, but an alarm remains active until it is reset with the Set/Reset key (press ≥ 2s).
Error / Malfunction	Err.	rEL. - r. - A. - Lr. - LA. Behaviour of the device during faults (sensor fault / device fault) Involves Relay K4 (not in program 3)

Note: A locked alarm is not saved in the device zero-voltage maintained time.
That means that if the supply voltage is interrupted, a locked alarm can be reset.

Adjustment procedure (procedure as an example based on Alarm FAn.]):
Select the menu item with the Up/Down key until …

Display FAn.
Press the Set key
Display FAn. / 100. flashes alternately (actual limit, value can be different)
Set the desired limit using the Up and Down keys
Press the Set key
Display H . / -20. (hysteresis / value) flash alternately
Set the desired hysteresis using the Up and Down keys
Press the Set key
Display dAL. / 0. (delay alarm / value) flash alternately
Set the desired value with the Up and Down keys
Press the Set key
Display doF. / 999. (delay alarm off / value) flash alternately

Set the desired value with the Up and Down keys
Press the Set key
Display rEL. / r. (relay / parameter) flash alternately
Set the desired value with the Up and Down keys
Press the Set key
Display FAn.
Select the next alarm with the Down key (with the Up key to previous alarm or menu item)
Configure the next alarm
After the last alarm setting, change to the next menu item (relay test) with the Down key

8.14 Configure the relay test on K1

Here, you can program so that Relay K1 switches into the alarm state after a certain time don, e.g. 1 week (= 168 hours) for the time doF, e.g. 0.2h. This is required, e.g., to let a fan or a pump run so that it is moved and the bearing does not suffer any damage through long standstill times.

The following parameters are significant:

Relay test	tSt.	Relay test menu
Test time	don.	Specify after how much time the relay test starts (in h), or how often the test repeats (oFF. = relay test off)
Test duration	doF.	State how long the relay test runs (in h)

Adjustment process:
Select the menu item with the Up/Down key until …

Display tSt.
Press the Set key
Use the Up and Down keys to set the desired time during which the relay test is to be repeated, oFF. – 1. – 999. h
Press the Set key
Set the desired relay test duration using the Up and Down keys, 0.01. – 9.99. h
Press the Set key

The expired test time don is saved in the device zero-voltage maintained.
If the TR440 is performing a relay test, tSt. flashes in the display.
The relay test should not be activated for program 4.

8.15 Configure the Modbus RS 485 interface (option)

The following parameters are significant:

Modbus	bUS.	Modbus menu
Device address	Adr.	Device address, can be set from 1 to 247
Baud rate	bd .	Baud rate, 9600 9.6. or 19200 19.2.
Parity	PAr.	Parity bit: Evn. , odd. , no. (even, odd, none)
Stop	StP.	Stop bit: 1. / 2. (1 / 2) *(-> from Firmware -04)*

Adjustment process:
Select the menu item with the Up/Down key until …

	Display bUS.
	Press the Set key
	Display Adr. / 1. (address / value) flash alternately
	Set the desired address using the Up and Down keys
	Press the Set key
	Display bd . / 9.6. (baudrate / value) flash alternately
	Set the desired baudrate using the Up and Down keys
	Press the Set key
	Display PAr. / Evn. (parity / value) flash alternately
	Set the desired value with the Up and Down keys
	Press the Set key *(-> from Firmware -04)*
	Display StP. / 1. (stop bit / value) flash alternately
	Set the desired value with the Up and Down keys
	Press the Set key
	Exit the menu item (display bUS.) Move to the next menu item with the Up and Down keys

For more information on the modbus configuration and programming please go to www.ziehl.com.

8.16 Sensor simulation

A temperature can be simulated here. All device functions operate as if this temperature is actually being measured. After 15 minutes without pressing a key, the device automatically switches back to the display mode.
The flashing display indicates that the device is currently in the simulation mode (digital display 0.9s on and 0.1s off)
Select the menu item with the Up/Down key until …
(Alternative: EasySimulation, press Up and Down keys simultaneously ≥ 2s)

	Display Si .
	Press the Set key
	Use the Up and Down keys to select the desired sensor(s), S 1-3. Sensors 1 to 3 or S 4. for Sensor 4
	Press the Set key
	Set the desired temperature using the Up and Down keys
	Press the Set key
	Exit the simulation (display Si .) Move to the next menu item with the Up and Down keys

8.17 Code block

Here, the set parameters can be protected by activating a code block. The device acknowledges an incorrect entry with Err (flashes three times). Select the menu item with the Up/Down key until …

	⇒ Display Cod.
	• Press the Set key
	⇒ Display Pin. / 0. (pin / pin code) flash alternately
	• Use the Up and Down keys to set the **saved** pin code (**factory setting is** 504.)
	• Press the Set key
	• Set the desired code block using the Up and Down keys: ○ oFF. off, all parameters can be changed ○ on . on, no parameter can be changed
	• Press the Set key
	⇒ Display Pin. / 504. (pin / pin code) flash alternately
	• Set the desired new pin code with the Up and Down keys (caution: write down the pin code)
	• Press the Set key
	⇒ Code block on, Display on flashes three times ⇒ Code block off, Display oFF flashes three times
	⇒ Exit the menu item (display Cod.) ⇒ Use the Up key to go to the previous menu item ⇒ Exit the menu mode with the Down key and return to the display mode (normal state).

8.18 Tips on operating

- When the right-hand decimal point in the 7-segment display is illuminated, one has exited the display mode and can use Up/Down to select the individual menu points (menu mode).
- When the right-hand decimal point is flashing, one is in the configuration mode and can change the settings with Up/Down.
- In the configuration mode:
  - Pressing Up/Down for a long time accelerates the changes in the display.
  - Pressing the Up and Down keys simultaneously changes the set values to zero.
- With reset (press Set/Reset for 2 s), one returns from any position in the configuration mode or menu mode (exception: in the simulation mode there is a locked alarm -> Alarm is reset) back into the display mode (most recently set values are taken on during this).
- Activate simulation mode (in display mode):
  - EasySimulation, press Up and Down keys simultaneously ≥ 2s

8.19 Possible indications in display

In display mode (normal state)	
ALr / trP / Cor	Alarms, dependent on the set program number, Alarm = Advance warning Trip = Switch off Core = Core temperature
Er1	Short-circuit in temperature sensor Pt 100
Er2	Interruption in temperature sensor Pt 100
Er8	Internal device fault in TR440
Er9	Parameter error (illogical TR440 configuration)
EEE	Overrange, measurement too large
-EE	Underrange, measurement too small

Sensors, menu mode/configuration mode	
S 1 .. S 4.	Sensors 1 to 4
nc. / 3-L.	Sensors off / 3-wire Pt 100
0.0. .. 99.9.	2-wire Pt 100, specify the total line resistance

Alarm value, menu mode/configuration mode	
FAn. / ALr. / trP. / Cor.	Alarm values, Fan = fan Alarm = Advance warning Trip = Switch off Core = Core temperature
H .	Hysteresis
dAL.	Time delay until alarm
doF.	Time delay until alarm is reset
rEL.	Relay function
r. / A. / rL. / AL.	Relay function Zero signal current, operating current Zero signal current locked, operating current locked

Relay test, menu mode/configuration mode	
tSt.	Relay test
don.	Specify after how much time the relay test starts (in h), or the relay test is repeated
doF.	State how long the relay test runs (in h)

RS 485 interface Modbus, menu mode/configuration mode **(Option)**	
bUS.	Modbus (RS 485 interface)
Adr.	Modbus - device address
bd .	Modbus - baudrate
9.6. / 19.2.	Modbus – baudrate, 9600 or 19200
PAr.	Modbus - parity
Evn. / odd. / no.	Modbus – parity bit – even / odd / no

Simulation, menu mode/configuration mode	
SI .	Simulation
S1-3. / S 4.	Sensor to be simulated, ⇒ Sensors S1...S3 ⇒ Sensor S4

Code block, menu mode/configuration mode	
Cod.	Code block
Pin.	Pin code
on . / oFF.	Code block on / off

9 Factory settings

When changing programs (operating instructions point Programs), all parameters are reset to the factory settings.

Menu item	Parameters	Values				My data
		Pr 1	Pr2	Pr3	Pr4	
Sensor 1 .. 4	S 1 Sensor 1	3-L	3-L	3-L	3-L	
	S 2 Sensor 2	3-L	3-L	3-L	3-L	
	S 3 Sensor 3	3-L	3-L	3-L	3-L	
	S 4 Sensor 4	---	3-L	3-L	3-L	
Alarm Relay K1	Alarm name	FAn	FAn	FAn	Cor	---
	Limit	100	100	100	170	
	H (Hysteresis)	-20	-20	-20	-5	
	dAL (Delay Alarm)	0	0	0	0	
	doF (Delay Alarm off)	999	999	999	0	
	rEL (Relay function)	A	A	A	A	
Alarm Relay K2	Alarm name	ALr	ALr	ALr	ALr	---
	Limit	130	130	130	130	
	H (Hysteresis)	-5	-5	-5	-5	
	dAL (Delay Alarm)	0	0	0	0	
	doF (Delay Alarm off)	0	0	0	0	
	rEL (Relay function)	A	A	r	A	
	Cor (Core temperature)	---	250	---	---	
Alarm Relay K3	Alarm name	trP	trP	trP	trP	---
	Limit	150	150	150	150	
	H (Hysteresis)	-5	-5	-5	-5	
	dAL (Delay Alarm)	0	0	0	0	
	doF (Delay Alarm off)	0	0	0	0	
	rEL (Relay function)	A	A	A	A	
	Cor (Core temperature)	---	170	---	---	

Alarm Relay K4	Alarm name	Err	Err	Cor	Err	- - -
	Limit	- - -	- - -	170	- - -	
	H (Hysteresis)	- - -	- - -	-5	- - -	
	dAL (Delay Alarm)	- - -	- - -	0	- - -	
	doF (Delay Alarm off)	- - -	- - -	0	- - -	
	rEL (Relay function)	r	r	A	r	
Relay test	don	168	168	168	oFF	
	doF	0.20	0.20	0.20	0.0	
Modbus (Option)	Adr	1	1	1	1	
	bd	9.6	9.6	9.6	9.6	
	PAr	Eun	Eun	Eun	Eun	
	StP *(-> from Firmware -04)*	1	1	1	1	
Code	on / off	oFF	oFF	oFF	oFF	
	Pin	504	504	504	504	

10 Maintenance and repair

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11 Trouble shooting

Er1 or Er2 appears in the display	
Cause	Sensor short-circuit or sensor interruption in the Pt 100 temperature sensor
Remedy	Check Pt 100 temperature sensor to see if electrically okay and correctly connected.

Er8 appears in the display	
Cause	Internal device fault in TR440
Remedy	Switch device off and then back on. If the error continues to appear, send the device to the factory for inspection.

Er9 appears in the display	
Cause	Parameter error (illogical TR440 configuration)
Remedy	Check the alarm configuration

The device cannot be programmed (configured)	
Cause	Code block
Remedy	The code block provides protection against unauthorised manipulation on the device. When the code block is active, the parameters cannot be change. The pin can be set by the user. Pin code unknown? -> perform a code reset: ▪ While switching on the control voltage, keep the "Set" key pressed for **2 s** ⇒ The display changes 888 – Cod – oFF – 888 ⇒ Release the Set key ⇒ Code block is switched off, Pin code is 504

Displayed temperature does not match the sensor temperature	
Cause	• PT 100 sensor is incorrectly connected • False sensor settings • False measurand (°C / °F)
Remedy	• Check the Pt 100 sensor connection (see connection diagram) • Check the sensor settings (3-wire or 2-wire with specification of the line resistance –> Resistance of outgoing and return line) • Set the correct measurand (see Programs point)

Temperature repeatedly darkens briefly	
Cause	The device is in the simulation mode
Remedy	Exit the simulation mode, see Point [8.16 Sensor Simulation]

11.1 Display of program number, measurand and software version

Keep the Set key pressed:
- ⇒ After 5s: Displays the program number
- ⇒ After 8s: Displays the measurand
- ⇒ After 10s: Displays the software version

12 Technical data

Control voltage Us	AC/DC 24 – 240 V 0/50/60 Hz <2 W < 4 VA	
Limits	DC 20.4 - 297 V AC 20 - 264 V	
Sensor connection	Pt 100 according to EN 60751 (2/3-wire version)	
Measuring range	-199°C. 850°C / -199°F .. 999°F	
Sensor resistance + line res.	max. 500 Ohm	
Sensor current	≤ 0.7 mA	
Measurement cycle/measurement time	< 2.5 s	
Tolerance	± 1°C, ± 1 Digit	
Temperature drift	<0.04°C/K	
Relay data K2, K3 and K4	3 x 1 change-over contact	
Switching voltage	max. AC 415 V	
Switching current	max. 6 A	
Switching capacity	max. 2000 VA (Ohmic load) max. 120 W at DC 24 V	
Nominal operating current for reversing switch	3 A AC15 250 V; 2 A DC13 24 V	
Recommended series fuse	3.15 A slow-to-blow (gL)	
Contact service life, mechanical	3 x 10^7 operating cycles	
Contact service life, electrical	1 x 10^5 operating cycles at 240 V / 6 A	
Reduction factor at cos φ 0,3	0,5	
Relay data K1	1 reversing switch	
Switching voltage	max. AC 400 V	
Conventional thermal current Ith	max. 10 A	
Inrush current (at 10 % ED)	30 A max. 4 s	
Nominal operating current Ie (AC 15)	6 A AC 250 V	
Recommended series fuse	gG/gL 10 A	
Contact service life, mechanical	30 x 10^6 operating cycles	
Contact service life, electrical	1 x 10^6 operating cycles at AC 250 V / 6 A 2 x 10^5 operating cycles at AC 250 V / 10 A cos φ 0.6	
Test conditions	EN 50178 / EN 61010-1	
Rated impulse withstand voltage	4000 V	
Pollution level	3	
Rated insulation voltage Ui	250 V	
Operating time	100 %	
Permissible ambient temperature	-40 °C ... +65 °C EN 60068-2-2 dry heat	
EMC compatibility	EN 61000-6-2	
EMC electrical interference	EN 61000-6-3	
Vibration resistance EN 60068-2-6	2…25 Hz ±1.6 mm 25 ... 150 Hz5 g	
Galvanic insulation	Us – relays, sensors, (RS 485) DC 3820 V relays – sensors, (RS 485) DC 3820 V	
No Galvanic insulation (Only devices with RS 485 interface)	RS 485 – sensors	

Housing	Panel monitoring housing SE 2
Dimensions (W x H x D)	96 x 96 x 80 mm
Line connection single strand	per 1 x 2.5 mm^2
Finely stranded with wire end sleeve	per 1 x 2.5 mm^2
Housing internal protection	Front panel IP 54 (with seal), rear IP 20
Terminal strip protection type	IP 20
Mounting	Panel mounting, Cut-out $91^{+0.7}$ x $91^{+0.7}$ mm
Weight	approx. 310 g

The right to make technical changes is reserved.

13 Mounting type SE 2

Dimensions in mm
Panel opening $91^{+0.7}$ x $91^{+0.7}$ mm