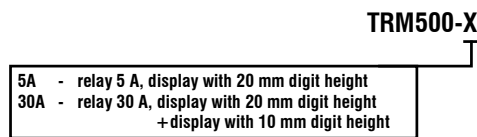# Temperature controller TRM500
User manual

1   Functional description

The TRM500 is a versatile temperature controller with switching current up to 30 A. The device has a universal input for a wide range of resistance thermometers and thermocouples as well as a digital input. It is provided with a relay output, an alarm output, a DC logic output. The outputs can be configured for different tasks (see Annex A). The controller can be quickly configured by using three keys.

Functions:

–   On-Off or PID control (see Fig. 1)
–   Manual control
–   20 mm, 4 digit display, 2nd display optional
–   Digital input filter with an adjustable time constant
–   Custom 2-point linearization
–   Digital input (remote start/stop or setpoint change) (see Annex D)
–   Temperature range alarm
–   Auxiliary alarm output
–   Additional logic output (SSR)
–   Configurable outputs (see Annex A)
–   Autotuning function (see Annex C)
–   Cold junction compensation
–   Input calibration (see Annex E)
–   9 status LEDs

Ordering key:

TRM500-X

5A	relay 5 A, display with 20 mm digit height
30A	relay 30 A, display with 20 mm digit height
	+display with 10 mm digit height

2   Safety precautions

–   *Make sure that the device is fully disconnected from auxiliary power before starting any commissioning or repair work.*
–   *Connect the power supply only after the wiring has been completed.*
–   *Do not use the device where it is subjected to flammable or explosive gas.*

3   Specifications

Table 1. General data

Power supply	230 (96…264) V AC
Power consumption, max.	5 VA
Resistance thermometer	Pt50, Pt100, Pt500, Pt1000, Ni100, Ni500, Ni1000
Accuracy	0,25%
Connection circuit	2-, 3-, 4-wire
Sampling time for 3-wire	0,3 s
Sampling time for 2- / 4-wire	0,2 s
Lead resistance, max.	15 ohm
Reference junction	internal
Thermocouple	B, J, K, L, N, R, S, T
Accuracy	0,50%
Sampling time	0,2 s
Lead resistance, max.	100 ohm
Digital input	potential free contact
ON, resistance max.	70 ohm
OFF, resistance max.	1000 ohm
Relay outputs	
OUT1	5A / 250 VAC, 3A / 30 VDC (resistiv) optional 30A / 250 VAC, 20A / 30 VDC (resistiv)
OUT2	5A / 250 VAC, 3A / 30 VDC (resistiv)
Logic output OUT3	0/5 V, 25-40 mA
Dimensions	96 x 48 x 100 mm
IP Code	front IP54, rear IP20
Operating temperature	-20 … +50 °C
Humidity	up to 80% (non-condensing)
Weight	approx. 160 g

Table 2. Sensor types

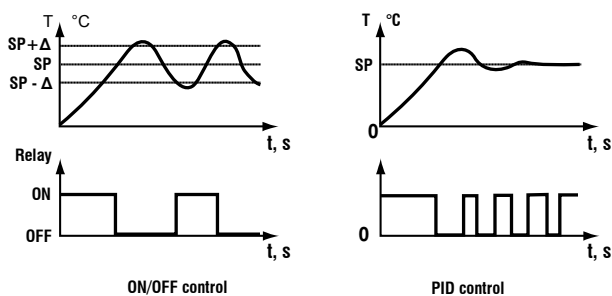| Sensor	Parameter	Measuring range, °C
Pt50	*P50*	−100…+850
Pt100	*P 100*	−100…+850
Pt500	*P500*	−100…+850
Pt1000	*P 1E3*	−100…+300
Ni100	*n 100*	−60…+180
Ni500	*n500*	−60…+180
Ni1000	*n 1E3*	−60…+180
K	*tP.HR*	−100…+1300
J	*tP.J*	−100…+1200
L	*tP.L*	-100…+800
N	*tP.n*	−100…+1300
T	*tP.t*	−100…+400
S	*tP.5*	0…+1750
R	*tP.r*	0…+1750
B	*tP.b*	+200…+1800

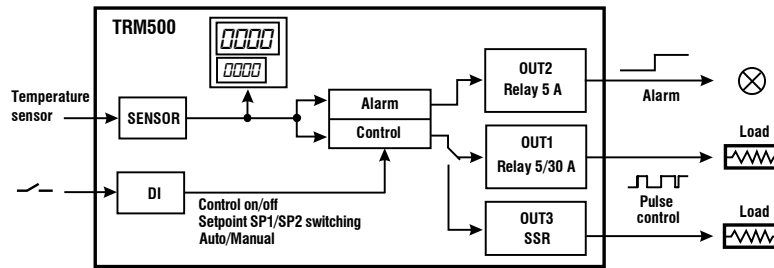*Fig. 1.   Control*

Fig. 2.   Block diagram

4   Installation and electrical wiring
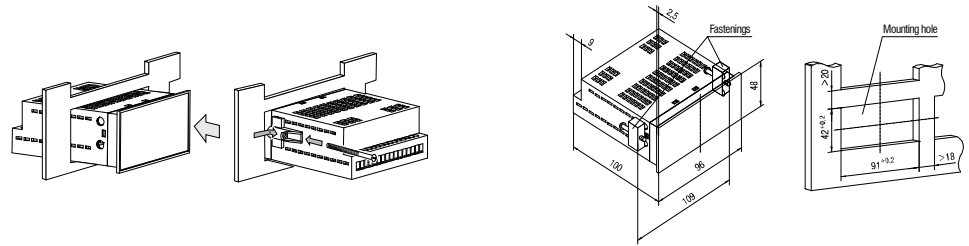
Fig. 3.   Mounting and dimensions
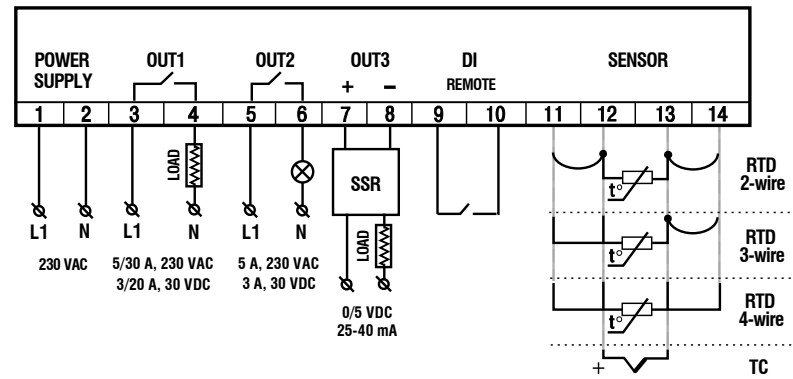
Fig. 4.   Electrical wiring

The maximum wire size is 0,75 mm².

5   Maintenance

Technical maintenance should be performed on the device at least every six months by maintenance personnel and comprising the following tasks:

–   Removing dust, dirt and foreign matter from the housing.
–   Checking mounting of device
–   Checking connections

The safety guidelines in Section 2 must be observed when performing maintenance.

6   Transportation and storage

The device must be transported in closed transport boxes.
Protective measures against shocks, vibrations and humidity must be observed.
Storage temperature range -30 to +60 °C.
There may be no chemically active substances in the air.

7   Package content

–   Temperature controller TRM500   1
–   User manual   1

Annex A.   Output configuration

Annex B.   Displays and control elements

Annex C.   Configuration

Note: The values in the square brackets are factory settings

Operation `284.9` `285.0`

> 3 s (PROG)

Quick setup `FASt`

Full setup `FuLL`

Exit `oUt`

Setpoint SP1 adjustment

`285.0` `SP1`

new Setpoint SP1 `150.0` `SP1`

`0.0` `SP2`
displayed if inP.F = Set2 or inP.F = Add2

new Setpoint SP2 `100.0` `SP2`

Quick setup branch:

`S.tYP` Sensor type [P100] (see Table 2)
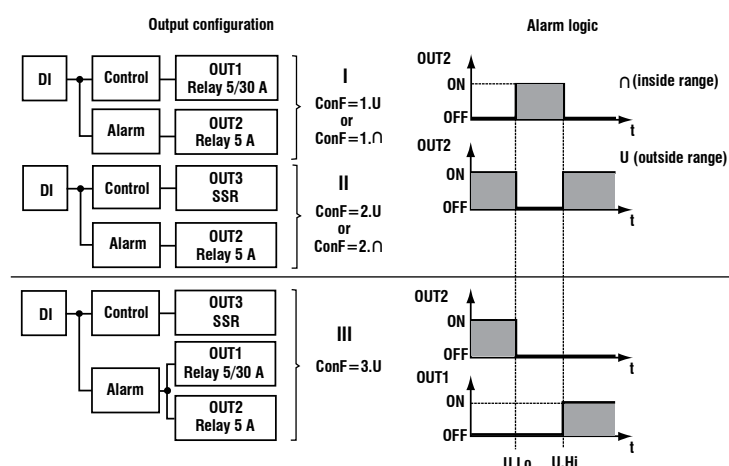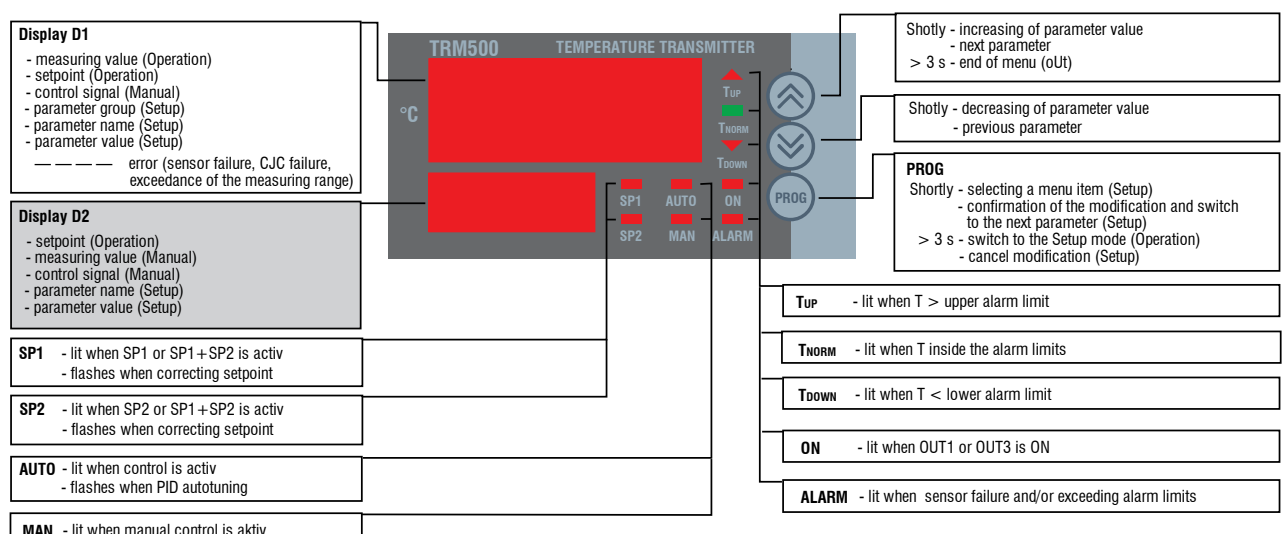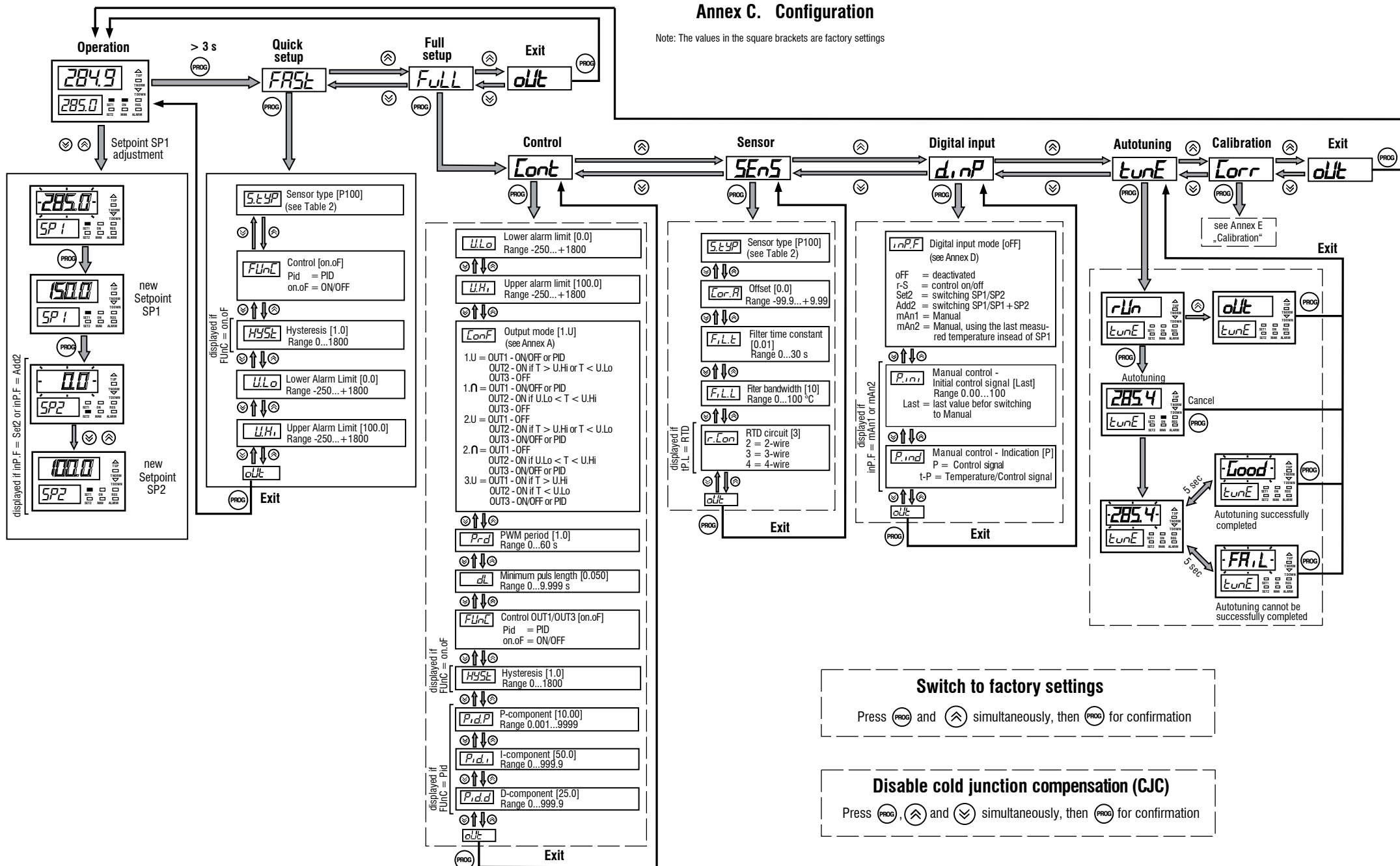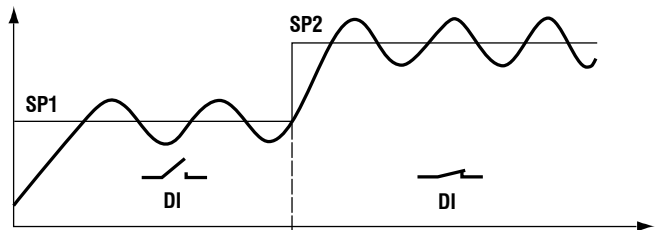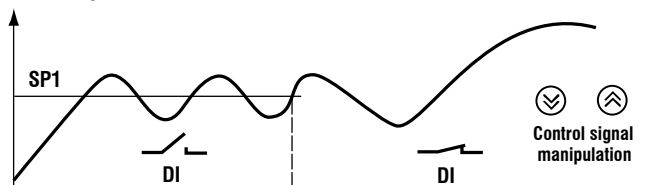
`FUnC` Control [on.oF] Pid = PID on.oF = ON/OFF

displayed if FUnC = on.oF:
`HYSt` Hysteresis [1.0] Range 0...1800
`U.Lo` Lower Alarm Limit [0.0] Range -250...+1800
`U.Hi` Upper Alarm Limit [100.0] Range -250...+1800
`oUt` **Exit**

Control `Cont`

`U.Lo` Lower alarm limit [0.0] Range -250...+1800
`U.Hi` Upper alarm limit [100.0] Range -250...+1800

`ConF` Output mode [1.U] (see Annex A)
1.U = OUT1 - ON/OFF or PID
   OUT2 - ON if T > U.Hi or T < U.Lo
   OUT3 - OFF
1.∩ = OUT1 - ON/OFF or PID
   OUT2 - ON if U.Lo < T < U.Hi
   OUT3 - OFF
2.U = OUT1 - OFF
   OUT2 - ON if T > U.Hi or T < U.Lo
   OUT3 - ON/OFF or PID
2.∩ = OUT1 - OFF
   OUT2 - ON if U.Lo < T < U.Hi
   OUT3 - ON/OFF or PID
3.U = OUT1 - ON if T > U.Hi
   OUT3 - ON/OFF or PID
3.∩ = OUT1 - ON if T < U.Lo
   OUT3 - ON/OFF or PID

`Prd` PWM period [1.0] Range 0...60 s
`dL` Minimum puls length [0.050] Range 0...9.999 s

displayed if FUnC = on.oF:
`FUnC` Control OUT1/OUT3 [on.oF] Pid = PID on.oF = ON/OFF
`HYSt` Hysteresis [1.0] Range 0...1800

displayed if FUnC = Pid:
`P.d.P` P-component [10.00] Range 0.001...9999
`P.d.i` I-component [50.0] Range 0...999.9
`P.d.d` D-component [25.0] Range 0...999.9
`oUt` **Exit**

Sensor `SenS`

`S.tYP` Sensor type [P100] (see Table 2)
`Cor.A` Offset [0.0] Range -99.9...+9.99
`F.i.t` Filter time constant [0.01] Range 0...30 s
`F.i.L` Fiter bandwidth [10] Range 0...100 °C

displayed if tP.L = RTD:
`r.Con` RTD circuit [3] 2 = 2-wire 3 = 3-wire 4 = 4-wire
`oUt` **Exit**

Digital input `dinP`

`inP.F` Digital input mode [oFF] (see Annex D)
oFF = deactivated
r-S = control on/off
Set2 = switching SP1/SP2
Add2 = switching SP1/SP1+SP2
mAn1 = Manual
mAn2 = Manual, using the last measured temperature insead of SP1

displayed if inP.F = mAn1 or mAn2:
`P.ini` Manual control - Initial control signal [Last] Range 0.00...100 Last = last value befor switching to Manual
`P.ind` Manual control - Indication [P] P = Control signal t-P = Temperature/Control signal
`oUt` **Exit**

Autotuning `tunE`

`rUn` `tunE`
Autotuning
`285.4` `tunE` Cancel
`285.4` `tunE`
`oUt` `tunE`

`Good` `tunE` — Autotuning successfully completed (5 sec.)
`FAiL` `tunE` — Autotuning cannot be successfully completed (5 sec.)

Calibration `Corr`
see Annex E „Calibration"

Exit `oUt`

Switch to factory settings
Press (PROG) and (∧) simultaneously, then (PROG) for confirmation

Disable cold junction compensation (CJC)
Press (PROG), (∧) and (∨) simultaneously, then (PROG) for confirmation

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Annex D.   Digital input configuration (Parameter InP.F)

1. Setpoint switching

SP2
SP1
DI

InP.F = Set2 - switching SP1/SP2 or
InP.F = Add2 - switching SP1/SP1+SP2

2. Switching to Manual

SP1
DI
Control signal manipulation

InP.F = mAn1 - switching to Manual, when switched back - control with the last setpoint
InP.F = mAn2 - switching to Manual, when switched back - control with the last measured temperature instead of setpoint
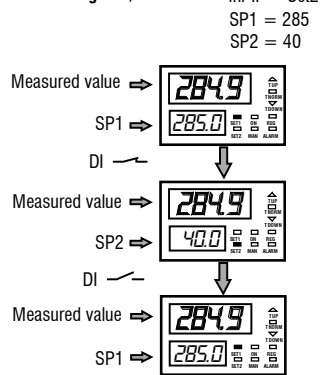
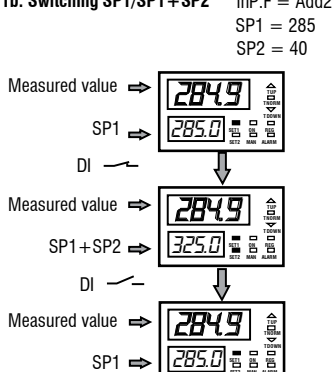**3. Control on/off**

SP1
DI

InP.F = r-S - control on/off
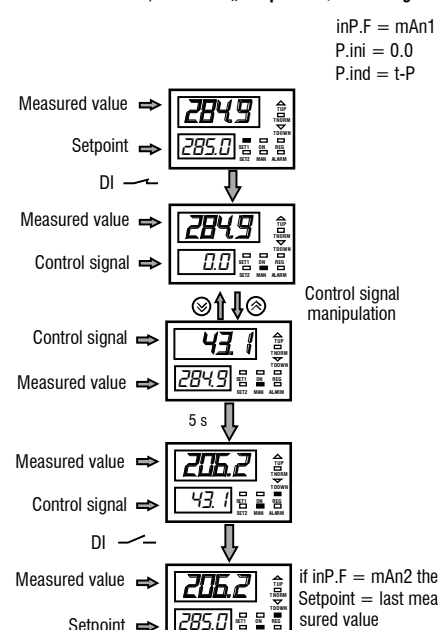
1a. Switching SP1/SP2
inP.F = Set2
SP1 = 285
SP2 = 40

Measured value ⇒ `284.9` `285.0`
DI
Measured value ⇒ `284.9` `40.0`
DI
Measured value ⇒ `284.9` `285.0`

1b. Switching SP1/SP1+SP2
inP.F = Add2
SP1 = 285
SP2 = 40

Measured value ⇒ `284.9` `285.0`
SP1
DI
Measured value ⇒ `284.9` `325.0`
SP1+SP2
DI
Measured value ⇒ `284.9` `285.0`
SP1

2a. Manual control, indication „Temperature/Control signal"
inP.F = mAn1
P.ini = 0.0
P.ind = t-P

Measured value ⇒ `284.9`
Setpoint ⇒ `285.0`
DI
Measured value ⇒ `284.9`
Control signal ⇒ `0.0`
Control signal manipulation
Control signal ⇒ `43.1`
Measured value ⇒ `284.9`
5 s
Measured value ⇒ `206.2`
Control signal ⇒ `43.1`
DI
Measured value ⇒ `206.2`
Setpoint ⇒ `285.0`
if inP.F = mAn2 then Setpoint = last measured value

2b. Manual control, indication „Control signal"
inP.F = mAn1
P.ini = 0.0
P.ind = P

Measured value ⇒ `284.9`
Setpoint ⇒ `285.0`
DI
Control signal ⇒ `0.0`
Measured value ⇒ `284.9`
Control signal manipulation
Control signal ⇒ `100.0`
Measured value ⇒ `284.9`
DI
Measured value ⇒ `350.9`
Setpoint ⇒ `285.0`
if inP.F = mAn2 then Setpoint = last measured value

Annex E.   Calibration

back to menu „Calibration"

Password 17

`PASS` `Corr` → `17` `Corr` → flashing Y1 `Y1` `Corr` → `nULL` `Corr` → `oUt` `Corr` (PROG) Calibration factor Y1 = 0

To calibrate the first point:
connect a resistance decade (for RTD) or mV-signal (for TC) as a reference signal to the input „Sensor"

Measured value according to the reference signal ⇒ `5.3` `Y1` → `5.0` `Y1` flashing value
Adjust temperature according to the reference table

`Y2` `Corr` → `APLY` `Corr` → `oUt` `Corr`
save calibration factor Y1
don't save calibration factor Y1

2nd point calibration when required
`Y3` `Corr` → `APLY` `Corr` → `oUt` `Corr`
save calibration factor Y2
don't save calibration factor Y2

3rd point calibration when required
`APLY` `Corr` → `oUt` `Corr`
don't save calibration factor Y3
save calibration factor Y3