

MicroniK 200

R7426A TEMPERATURE CONTROLLER WITHOUT REAL-TIME CLOCK

SPECIFICATION DATA

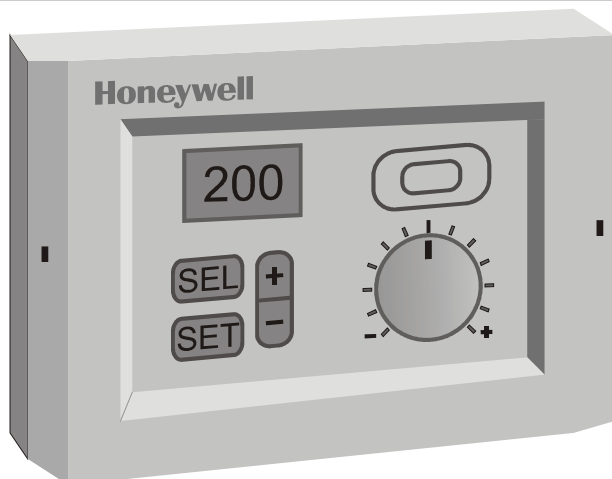


Fig. 1. Temperature controller

GENERAL

The R7426A temperature controller covers all space, air or water flow temperature applications within the selectable control range of 0...50°C (**LOW range**) or 0...130°C (**HI range**) with optional high or low limit control and outside air temperature compensation reset of the main setpoint. The controller can be configured to perform space-discharge air or supply water temperature cascade control.

FEATURES

- Microcontroller design based on modern digital technology
- User interface with LC display, four push buttons, and CPA/SPA-potentiometer
- Control ranges 0...50°C or 0...+130°C
- Selectable proportional plus integral (P+I) or proportional (P) only control
- Three inputs for temperature sensors
- Automatic sensor type identification of Balco 500, Pt 1000 or NTC 20kΩ
- Three digital inputs for plant/system ON/OFF, occupancy (alternatively summer/winter changeover) and freeze protection
- Selectable floating output functions:
 - Floating
 - 2 or 3-stage ON/OFF (TRIAC's)
 - Pulse-width modulation
- Pre-programmed control parameters
- Cascade control with space/supply limit
- Serial communication bus interface for PC-based operator's terminal
- Easy application configuration with parameter up and download possibility

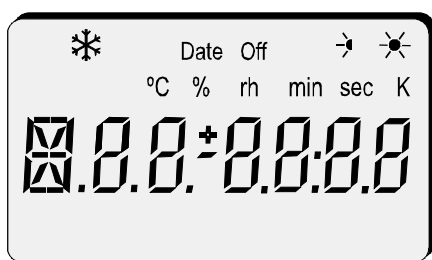


Fig. 2. LC Display

Order Numbers

Order-No.	Controller Description
R7426A2006	Temperature controller, Plant/System ON/OFF input, and one 3-position floating output. The controller offers the choice of selectable output signals to drive solid-state relays or step relays.



EN0B-0300GE51 R0403

TECHNICAL DATA

General	Electronic Power supply Power consumption Control range	8-bit microcontroller, 10-bit A/D converter, EEPROM and LC display 24Vac +10...-15%, 50/60Hz 3VA + Actuator power requirements 0...50°C or 0...+130°C	
Temperature Inputs	T1 T2 T3	Main temperature sensor Limit or cascade temperature sensor Compensation temperature sensor	accuracy ±0.5 K excluding sensor
Sensor type¹⁾	Automatic identification of sensor type	Temperature range	Characteristics²⁾
	Pt 1000 BALCO 500 NTC 20kΩ	-30...+130°C -30...+130°C -30...+85°C / -30...+130°C ¹⁾	1000Ω at 0°C 500Ω at 23.3°C 20kΩ at 25°C
CPA/SPA-Input¹⁾	CPATYP 0 CPATYP 1 (953...1053Ω) CPATYP 2 (100kΩ...0Ω) CPATYP 3 (10...20kΩ) CPATYP 4 (0...10kΩ) CPATYP 5 (0...100kΩ) CPATYP 6 (0...100kΩ)	CPA/SPA range CPA: ±5 K CPA: ±5 K CPA: ±5 K SPA: 15...30°C CPA: ±5 K SPA: 15...30°C SPA: 0...50°C or 0...130°C	Sensor & CPA/SPA types internal T7412B1016 (Pt 1000) T7412B1057 (Pt 1000) T7412C1030 (Pt 1000) T7412B1008 (NTC 20kΩ) T7412C1006 (NTC 20kΩ) 43193982-001 T7412B1024 (BALCO 500) T7412B1040 (Pt 1000) HCW 23 (setpoint wheel printed with +/- 5 K) 43193982-001 43193982-001
Digital inputs	Occupancy or summer/winter changeover input ¹⁾ Freeze protection input ON/OFF input	Mode unoccupied or winter operation occupied or summer operation freeze protection operation normal operation OFF ON	Potential free contact open > 40kΩ closed < 100Ω open > 40kΩ closed < 100Ω open > 40kΩ closed < 100Ω
Outputs	TRIAC output	<ul style="list-style-type: none"> Floating¹⁾ 2 or 3-stage¹⁾ ON (24 Vac) / OFF (0 Vac) Pulse width modulation¹⁾ 0...100% based on run time (P21) 	max. load 450 mA at 24 Vac per output
Ambient limits	Operating temperature Transport and storage temperature Relative humidity	0...50°C (32...122°F) -35...+70°C (-31...+158°F) 5...95%rh non condensing	
Safety	Protection class Protection standard	II as per EN60730-1 IP30 or IP40 (front panel mounting) as per EN60529	
Housing	Dimensions (H x W x D) Weight Mounting	105 x 152 x 37mm 250 g Front door, back panel, wall, or rail	
Connections	Connection terminal	Friction spring screwless terminals max. 1 x 1.5 mm ²	

¹⁾ Selectable²⁾ same sensor type must be used for T1, T2, and T3

CONTROL AND CONFIGURATION PARAMETER

The controller includes two groups of settings (A and B) for control and configuration parameters that are automatically selected during programming. For parameter **Ctrltyp** = Lo setting A is selected and for parameter **Ctrltyp** = Hi setting B is selected.

Control Parameter		Parameter Description	Setting A / Setting B			Reso- lution	Unit
No.	Name		Low	High	Default		
P.01	W1	Main setpoint for input T1	0	50/130	21 / 70	0.5	°C
P.02	Wlim	Limit setpoint (low or high) for input T2	5 / 30	50/130	16 / 90	1	°C
P.03	Wcomp	Compensation changeover point for input T3	-5	40	20	1	°C
P.04	Wi	Winter compensation authority	-350	+350	0	2	%
P.05	Su	Summer compensation authority	-100	+100	0	1	%
P.06	Wcas	Submaster or cascade setpoint	OFF, 0	50/130	20/OFF	0.5	°C
P.07	Rcas	Cascade reset span adjustment	0	40	10	0.5	K
P.08	Xp1	Throttling range (main control loop) T1	0.5	40	2/10	0.5	K
P.09	Xp2	Throttling range (cascade or limit control loop) T2	0.5	40	10	0.5	K
P.12	tr1 ¹⁾	Reset time (main control loop) T1	OFF, 20 s	20min	OFF	10/0.5	sec/min
P.13	tr2 ¹⁾	Reset time (cascade or limit control loop) T2	OFF, 20 s	20min	OFF	10/0.5	sec/min
P.15	Ystart	Start point for mid range shift of output Y1	-20	+20	0	0.5	K
P.16	SOFFS	Offset of main setpoint in Standby mode	0	10	2/5	0.1	K
P.17	T1Cal	Calibration of temperature sensor T1	-20	+20	0	0.1	K
P.18	T2Cal	Calibration of temperature sensor T2	-20	+20	0	0.1	K
P.19	T3Cal	Calibration of temperature sensor T3	-20	+20	0	0.1	K
P.21	RuntimeY1	Actuator run time for Y1	6	180	60	1	sec
Config. Parameter		Values	Default A / B	Unit			
No.	Name						
C.04	Ctrltyp ²⁾	Lo = 0...50°C, Hi1 = 0...130°C	Lo				
C.05	CPATYP	0 = internal (default), 1 = ±5 K (953...1053 Ω), 2 = ±5 K (100 kΩ...0 Ω), 3 = 15 ... 30°C (10...20 kΩ), 4 = ±5 K (0...10 kΩ), 5 = 15 ... 30°C (0...100 kΩ), 6 = 0...50°C or 0...130°C (0...100 kΩ)	0				
C.08	Y1Mode	0= floating, 1= 2 stage ON/OFF, 2= 3 stage ON/OFF, 3 = pwm, 4 = unconfig. <i>(safe state is configured prior to controller's start-up)</i>	4				
C.12	T2ext	0 = T2 installed 1 = T1 signal used for T2	0				
C.13	LimTyp	0 = Low limit 1 = High limit	0 / 1				
C.14	Senstyp	0 = Auto detection 1 = NTC sensor type	0				
C.15	Y1CTRF	Output Y1 used for:	0 = cooling, 1 = heating 2 = summer/winter changeover	0 / 1			
C.22	Adr ²⁾	Serial communication address:	0 = Min. 255 = Max.	254			
C.23	DefProg	0 = No Default programming 1 = Initiates Default programming	0				

¹⁾ for tr > 2 min resolution = 0.5 min , for tr < 2 min resolution = 10 sec

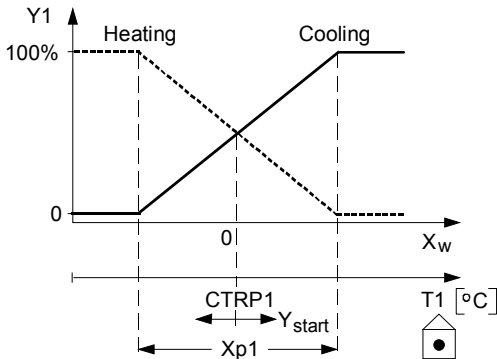
²⁾ actual value will not be changed during reset to default parameter

APPLICATION

NOTE: All diagrams show proportional control action, only. If P+I control is in operation, the slopes for heating and cooling are not defined.

Main Temperature Control

The controller compares the actual temperature value measured by the main sensor (T1) with the calculated setpoint (CTRP1) and generates an internal deviation signal (X_w). CTRP1 is the sum of the OAT compensation effect, the CPA, and the mode-dependent offset.



Depending on the deviation signal, the control output ($Y1$) value is calculated and converted to a floating signal. Cooling or heating action is selected by the configuration parameter **Y1CTRF**. The "Throttling range" setting ($Xp1$) controls the output span.

The startpoint Y_{start} determines (in Kelvin) the midrange shift of the output ($Y1$) from the calculated setpoint (CTRP1).

Limit Control (W_{lim} , $Xp2$ and $tr2$)

The R7426A controller offers limit control (W_{lim}) which is performed by comparing the deviation signals of the main and limit control loops. The lowest (low limit control) or highest (high limit control) deviation signal is selected and fed into the output stage.

High limit control is performed if control parameter **LimTyp** = 1 and low limit control is performed if control parameter **LimTyp** = 0. During limit control the throttling range ($Xp2$) and reset time ($tr2$) are active.

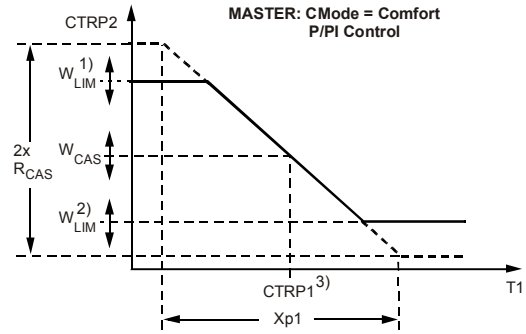
Limit control will be active only if the T2 temperature sensor (control parameter **T2ext** = 0) is connected or alternatively the sensor T1 value (control parameter **T2ext** = 1) is used also for the limit control loop.

Cascade Control (W_{cas} , R_{cas} and $tr2$)

The R7426A controller provides cascade control which uses two control loops (master and submaster) to maintain the master setpoint (CTRP1).

At zero room temperature deviation ($X_{wMaster}$), the discharge temperature (T2) is controlled by the programmed setpoint (W_{cas} = CTRP2). If the room temperature deviates, the submaster setpoint (CTRP2) is altered.

The reset span adjustment (R_{cas}) determines the degree of reset effect.



- 1) If **LimTyp** = 1.
- 2) If **LimTyp** = 0.
- 3) $CTRP1 = w - SOFFS$ (Heating); $CTRP1 = W + SOFFS$ (Cooling).

The integral reset time and the throttling range of the P+I control for the submaster can be adjusted by the control parameters **Xp2** and **tr2**.

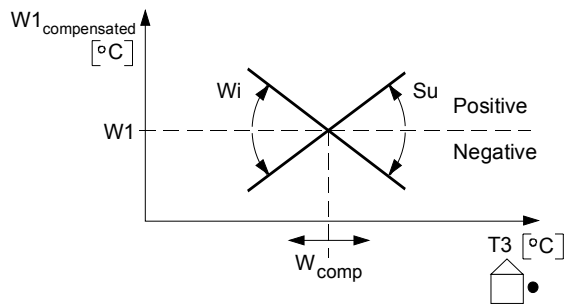
High limit of CTRP2 is performed if control parameter **LimTyp** = 1 and low limit of CTRP2 is performed if control parameter **LimTyp** = 0.

CONTROLLER FUNCTIONS

Outside Air Temperature Compensation

Outside air temperature compensation is performed when T3 is connected. The control parameter W_{comp} defines the compensation changeover point for summer and winter compensation. The degree of summer and winter compensation is defined by control parameters **Wi** and **Su**.

Winter compensation is performed if temperature $T3 < W_{comp}$. Summer compensation is performed if temperature $T3 > W_{comp}$.



Smoothing Filter for Outside Air Temperature Input

A smoothing filter for the outside air temperature input T3 is incorporated to eliminate sudden temperature variations. This provides more stable operation of the control system. **This function will work only if the controller parameters have never been changed by means of the PC tool.**

Summer/Winter Changeover Function

The occupancy input can alternatively be used for summer/winter changeover. The summer/winter changeover function is activated by setting the control parameter **Y1CTRF** to 2.

A potential-free contact can be used between terminals 1 and 4 to switch the controller mode to heating (contact open) or cooling (contact closed).

Occupied/Unoccupied Function (SOFFS)

A potential-free contact can be used between terminals 1 and 4 to switch the controller between comfort (contact closed) or standby (contact open) mode. The input is active during Comfort and Standby mode.

In comfort mode the temperature set point **W1** is used for the control point calculation. In standby mode the **SOFFS** parameter value is added (cooling) to or subtracted (heating) from the calculated control point for cooling or heating.

Freeze Protection

If the contact connected to the freeze protection input is open the following actions will be executed:

Control Parameter Y1CTRF	Output Function	Freeze Protection Action Output Y1
0 (Cooling)	Cooling	0%
1 (Heating)	Heating	100%
2 (Cho)	Cooling	0%
2 (Cho)	Heating	100%

A closed contact performs a frost recovery:

Conditions of Outdoor Temp. T3	Frost Recovery
> 6°C or T3 not connected	Main temperature control
< 6°C	Setpoint W1 is temporarily raised by Xp1 and linearly decreased to its normal value over approx. 10 min.

Freeze protection operation has the highest priority over all other control operations.

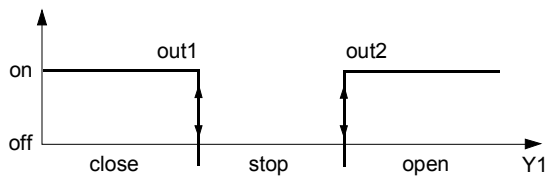
OUTPUT FUNCTIONS

The R7426A controller provides a choice of output signals suitable for operating a range of final control devices according to the parameter setting of **Y1Mode** control parameter.

3-position Output for Valve or Damper Actuators (floating mode)

The controller converts the deviation signal to a proportional output pulse which drives the actuators depending on the **RuntimeY1** parameter value.

Parameter setting for Heating / Cooling Control Outputs: **Y1Mode = 0**.



An automatic synchronization function ensures correct positioning of the actuator. This is performed by running the actuator to the closed position periodically. The run time for synchronization is derived by control parameter **RuntimeY1** multiplied by 1.25.

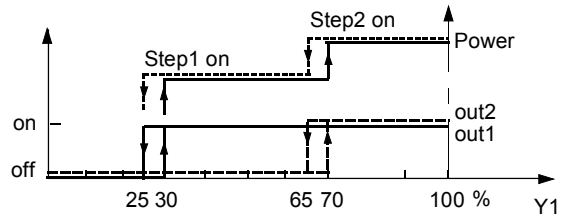
Synchronization by the controller is initiated:

- after power up reset (initial start)
- after 250 control steps as soon as control output is below 5%
- if plant/system ON/OFF input is switched to OFF

2-stage ON/OFF Sequence Control

The R7426A controller converts the output signal into a two-stage ON/OFF sequence output signal suitable for operating relays. Two relays can be connected to provide sequence control of e.g. two electric heater stages.

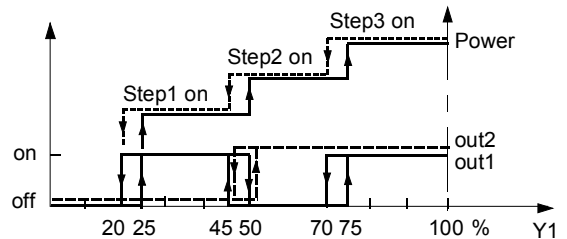
Parameter setting for Output Switching Position: **Y1Mode = 1**



3-stage Binary ON/OFF Sequence Control

The R7426A controller converts the heating signal into a three-stage binary ON/OFF sequence as shown in the following diagram.

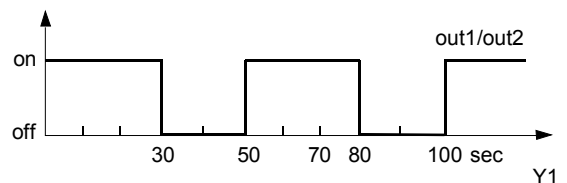
Parameter setting for Output Switching Position: **Y1Mode = 2**



Electric Heat Current Valve (pwm output)

The pulse width modulated output is suitable for driving electric heat current valves and is controlled from the heating signal. The interval or total cycle time is set by the control parameter **RuntimeY1**.

The diagram below shows as example, 60% Output Signal with Motor **RuntimeY1** set to 50 sec: **Y1Mode = 3**.



ADJUSTMENTS

Control Point / Setpoint Adjustment (CPATYP)

The control or setpoint can be adjusted via the internal or an external potentiometer connected to the CPA/SPA input. The CPA/SPA type is selected by the control parameter **CPATYP** (see page 2, *Technical Data*).

Calibration of Temperature Sensors (T1CAL, T2CAL, and T3CAL)

In case of an offset as a result of long wiring lengths the temperature sensor inputs (T1, T2 and T3) can be adjusted separately by the control parameters **T1CAL**, **T2CAL** and **T3CAL**.

WIRING

Wiring run	Type of wires	Length max.	
		1.0mm ²	1.5mm ²
From controller to all input and output devices	local standard	100 m	150 m

Offset for temperature sensors due to wire resistance per 10 m distance from sensor to controller:

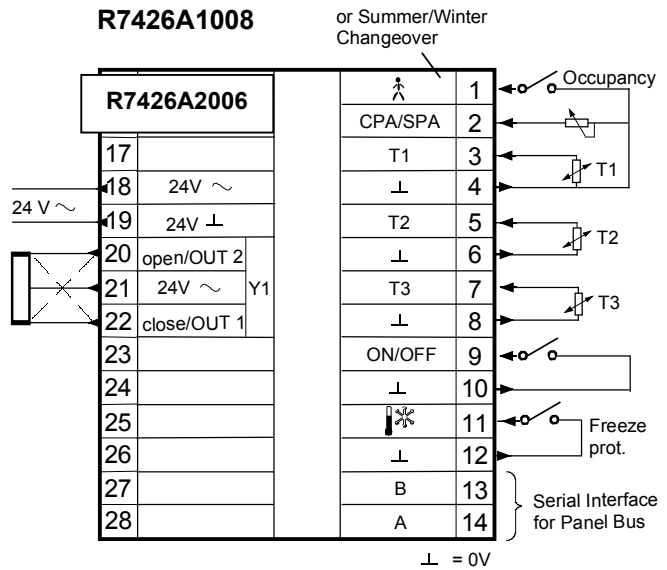
Type of wire	Temperature offset		
	Pt 1000	BALCO 500	NTC
0.5mm ² (AWG20)	0.18°C (0.324°F)	0.3°C (0.54°F)	negligible
1.0mm ² (AWG17)	0.09°C (0.162°F)	0.15°C (0.27°F)	
1.5mm ² (AWG15)	0.06°C (0.108°F)	0.1°C (0.18°F)	

Serial Communication Address (Adr)

The configuration parameter **Adr** sets the serial communication address.

The serial communication bus allows connecting the PC-based Operator's Terminal to one or several controllers. It provides access to all application configuration and control parameters, input and output values of the connected controllers and easy setting of these via the bus by mouse click or keyboard.

CONNECTIONS



⚠ CAUTION

- **Outputs are not isolated from power supply**
- **Observe correct phasing with 24Vac power supply**

Fig. 3. Connections

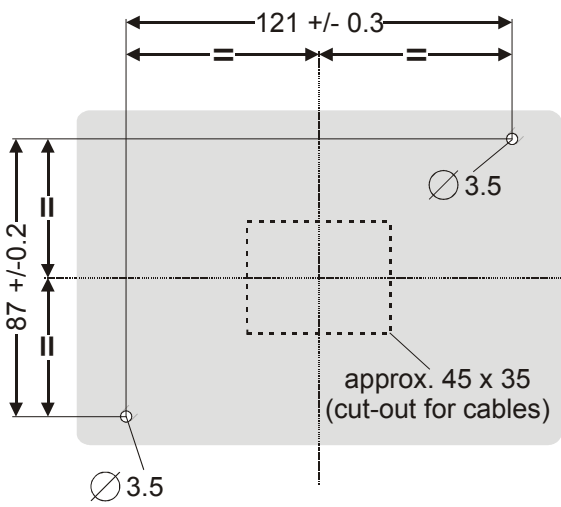
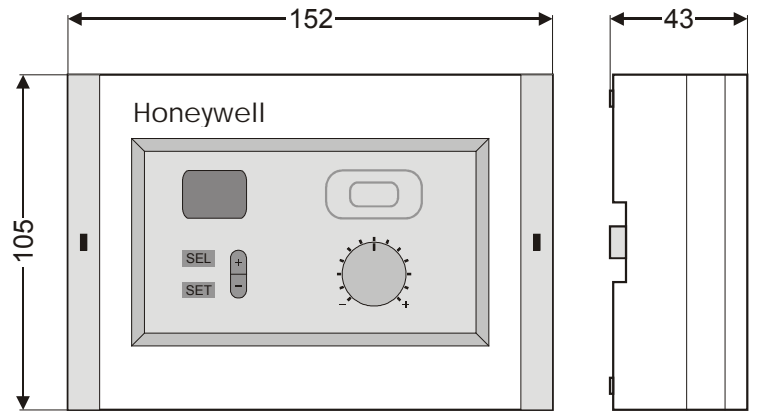
Jumper Coding:

Jumper ¹⁾	State	Description
W303 ²⁾	closed	T3 supplied by this controller
	open	T3 supplied from another controller

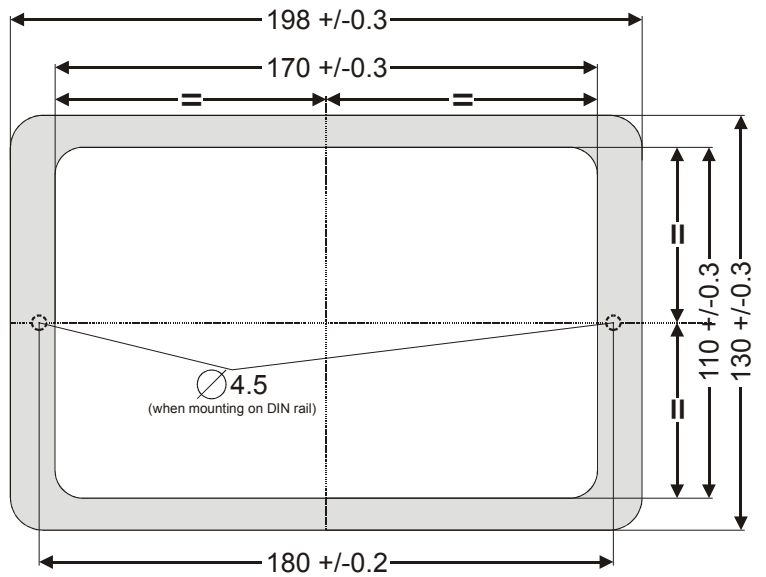
1) Default jumper position = closed
2) Cut (open) jumper W303 only if the T3 input is fed from another controller (parallel connection, max. 6 devices). This disconnects the T3 input from the internal power supply.

MOUNTING AND DIMENSIONS

All dimensions in mm.



wall mounting



front panel mounting

Fig. 4. Mounting and dimensions

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