DATA SHEET

T 7036 EN

Type 3430 Pneumatic Indicating Controllers for Temperature with Pt 100 Resistance Thermometer · Type 3432 Controller Station · Type 3438 Transmitter Module

Series 430

Application

Temperature controllers for process engineering and industrial applications for liquids, gases and vapors · Measuring range from **–30 to 400 °C**

The controller directly measures the temperature of the process medium, compares the measured value to the set point and produces a pneumatic control signal of 0.2 to 1.0 bar (3 to 15 psi). The required supply pressure of 1.4 bar (20 psi) or an operating air pressure from 2.0 to 12 bar (30 to 180 psi).

The controllers consist of a controller station, a controller module with the required control mode and a transmitter module corresponding to the temperature set point for four-wire connection to a Pt 100 resistance thermometer.

Special features

- Controller and control valve form a unit to directly measure the temperature to be controlled which is easy to service and low in price
- Set point, controlled variable, set point deviation and output pressure are visible at a glance; all required adjusters and switches can be operated on the front panel
- Can be equipped with modules for P, PI, PID or PD control modes and additional modules for special control tasks
- Housing suitable for wall, pipe and panel mounting (front frame 192x228 mm), optionally with lockable door of transparent plastic (IP 65) with conductive coating

Versions

Type 3430 Indicating Controller for Temperature consisting of a Type 3432 Controller Station, a control-specific Type 3433 or Type 3434 Controller Module and a Type 3438 Transmitter Module

Fixed set point controller (Fig. 1 and Fig. 2) · For connection to a Pt 100 resistance thermometer · Measuring ranges from –30 to +400 °C

Follower controller · Same as fixed set point controller, but with additional input for external reference variable w_{ext} = 0.2 to 1 bar, 3 to 15 psi, 0/4 to 20 mA · Without set point adjuster

Fixed set point and follower controller · Combination of fixed set point and follower controller, with w_{int}/w_{ext} selector switch to change between internal and external reference variable · Set point adjuster and differential pressure indication

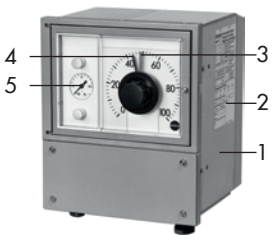

Fig. 1: *Fixed set point controller for temperature with Type 3432-01 Controller Station*

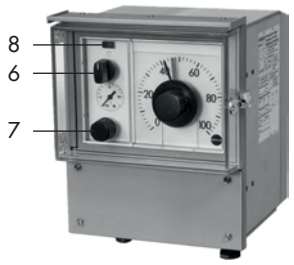

Fig. 2: *Fixed set point controller for temperature with Type 3432-02 Controller Station and lockable door*

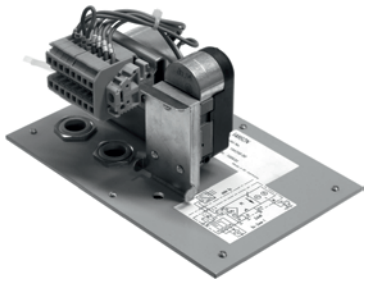

Fig. 3: *Type 3438 Transmitter*

1	Controller station	5	Output signal display (y)
2	Nameplate	6	Manual/automatic switch
3	Set point adjuster with set point display (w)	7	Adjuster for manual mode
4	Controlled variable display (x)	8	Differential pressure indicator for bumpless manual/ automatic switchover

Can optionally be equipped with one or two adjustable inductive limit contacts and/or supply pressure regulator for operating air pressures of 2.0 to 12 bar

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Principle of operation (see Fig. 4 and Fig. 5)

The Series 430 Pneumatic Controllers for temperature with their modular design can be used in all kinds of automation applications. They consist of a Type 3432 Controller Station (as the basic module) with a Type 3433 or 3434 Controller Module with the required control mode and a Type 3438 Transmitter Module.

The transmitter module (2) consists of an electric transmitter (2.1) and a downstream i/p converter (2.2). The resistance value of the Pt 100 sensor is converted into a 4 to 20 mA current signal in the electric transmitter. Its output signal (4 to 20 mA) is converted into a pneumatic signal (0.2 to 1 bar) by the i/p converter. The output pressure proportional to the temperature is applied as a pneumatic signal (controlled variable x) to the bellows measuring system of the controlled variable display (1.3) and controller module (3). Details in ▶ T 7045.

The controller station shown in Fig. 4 (fixed set point controller) includes a scale (1.2), controlled variable display (1.3), set point adjuster (1.4) and plug-in connections for a controller module (3). These pneumatic connections are self-sealing when the module is unplugged. The controlled variable signal x produces a deflection on the bellows measuring system of the controlled variable display (1.3) which is transmitted to the pointer over a gear mechanism. The set point (reference variable w) can be adjusted on a scale (1.2) at the controller front. The position of the set point adjuster is transmitted to the set point calibrator (1.4) over a gear mechanism. This servo system (1.41) converts the adjusted set point into a pneumatic set point signal (w), which is fed to the controller module. The controller module compares the controlled variable signal and the set point signal (x and w) and produces an output signal y_A based on the system deviation and the adjusted control parameters. The output signal is connected to the output signal display (1.5) and output port y.

The controller station (Fig. 5) largely corresponds to the one shown in Fig. 4. However, it additionally contains a manual/automatic switch (1.6), adjuster for manual mode (1.7) and differential pressure indication (1.8). When the switch is in the AUTOMATIC position, the output signal display (1.5) and output port y are connected to the automatic output signal y_A. In MANUAL, the output signal display and output port y are connected to the manual output signal y_H set at the adjuster (1.7). A bumpless transfer from manual to automatic mode is possible when y_A and y_H are the same on the differential pressure indicator.

The follower controllers (not shown) have an additional pneumatic or electric input for the external reference variable w_{ext} (at input w_{ext} = 0/4 to 20 mA with integrated i/p converter).

The controller stations can be equipped with suitable controller modules, e.g. Type 3434 Controller Module for common P or PI temperature control, Type 3433 Controller Modules for P, PI, PID and PD control and additional modules for special control tasks. Details in ▶ T 7040 and ▶ T 7041.

The controllers stations can optionally be equipped with one or two inductive limit contacts adjustable on the scale. They are also available with supply pressure regulator (1.9, Fig. 5). In this case, the device is suited for connection to an operating air pressure from 2.0 to 12 bar. The additional supply pressure regulator reduces and controls the operating pressure (p_B) to the required supply pressure (p_Z) of 1.4 bar or 20 psi.

More details on the Type 3708-… Supply Pressure Regulator and Air Pressure Reducing Station in ▶ T 8545.

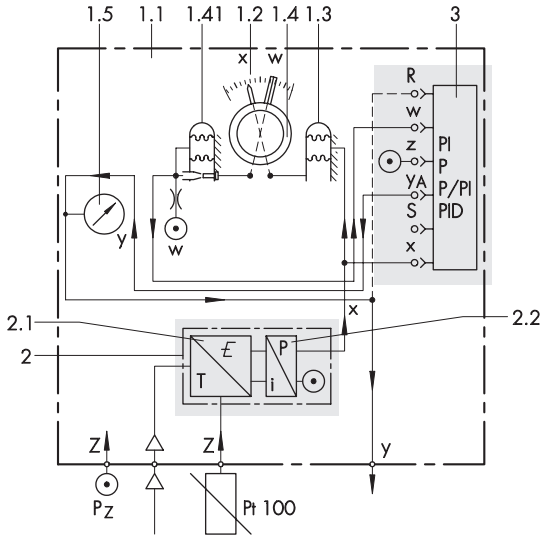
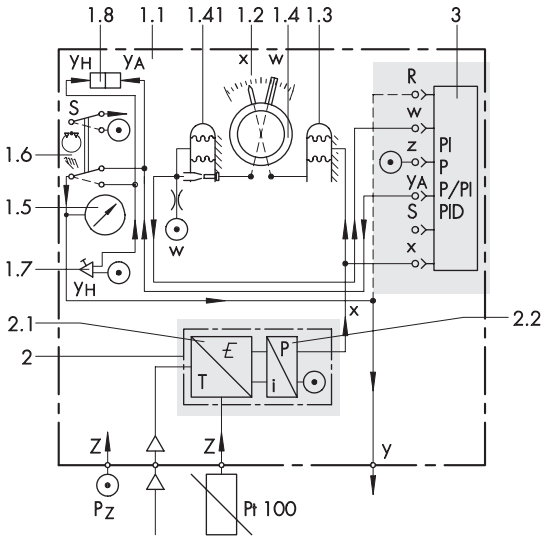


Fig. 4: *Schematic drawing of fixed set point controller for temperature, version with Type 3432-01 Controller Station*



Version with supply pressure regulator (1.9):

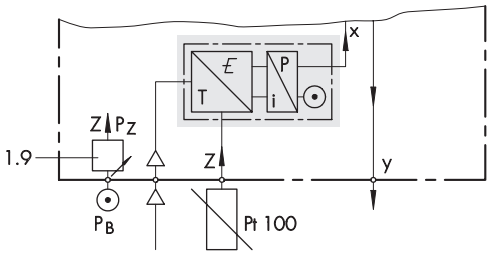


Fig. 5: *Schematic drawing of fixed set point controller for temperature, version with Type 3432-02 Controller Station*

1	Controller station
1.1	Housing with door
1.2	Scale
1.3	Controlled variable display with pointer, gear mechanism and bellows system
1.4	Set point adjuster with pointer, gear mechanism and set point calibrator (1.41); follower controllers: set point display only
1.5	Output signal display
1.6	Manual/automatic switch
1.7	Adjuster for manual mode
1.8	Differential pressure indicator for bumpless manual/automatic switchover
1.9	Supply pressure regulator
2	Transmitter module
2.1	Electrical transmitter
2.2	i/p converter
3	Controller module

Table 1: *Technical data · Type 3438 Transmitter Module · Type 6112 i/p Converter Module (Ex i)*

Type 3438 Transmitter Module		
Type 3438 · General specifications		
Design		**Type 3438** consisting of the interconnection of **TTH200-E1H** temperature transmitter with **Type 6112-22** i/p Module
Input	Sensor	Pt 100 resistance thermometer (RTD), DIN EN 60751 · Four-wire circuit Wire resistance <50 Ω
	Measuring ranges	–30 to 60 °C, 0 to 40 °C, 0 to 100 °C, 0 to 150 °C, 0 to 200 °C, 0 to 400 °C Others on request
Output	Pneumatic	0.2 to 1 bar/3 to 15 psi
	Electric	4 to 20 mA, max. load = $\frac{\text{(supply voltage} - 16.5\ \text{V)}}{0.022\ \text{mA}}$
Supply air	Supply air	1.4 bar ±0.1 bar (20 psi ±1.5 psi)
	Supply voltage With explosion protection Without explosion protection	Two-wire supply: power supply lines = signal lines 16.5 to 28 V (25 V) DC, see EC type examination certificates 16.5 to 30 V DC
Explosion protection	Type TTH200-E1H	Ex II 2(1) G Ex [ia] ib IIC T6 EC type examination certificate PTB 05 ATEX 2017 X
	Type 6112-22	Ex II 2 G Ex ia IIC T6 EC type examination certificate PTB 00 ATEX 2021
TTH200-E1H electric temperature transmitter		
Measuring current		0.3 mA
Current consumption		<3.5 mA
Maximum output current		23.6 mA
Error indication	Sensor failure	>22 mA
	Sensor short-circuit	<3.6 mA
	Sensor line breakage	<3.6 mA or >22 mA
	Supply voltage, reverse polarity protection	0 mA
Deviation from terminal-based linearity		≤0.1 % or ≤0.2 K (the largest of the two values always applies)
Ambient temperature influence		≤0.08 %/10 K for lower measuring range value and measuring span (based on 23 °C)
Effect of supply voltage		<0.001 %/V inside the permissible range of the supply voltage/load
Galvanic isolation of I/O		3.5 kV DC/2.5 kV AC (60 s)
Long-term stability		≤0.05 % or ≤0.05 K annually (the largest of the two values always applies)
Type 6112-22 i/p Converter Module (Ex i)		
Input		4 to 20 mA
Output		0.2 to 1 bar or 3 to 15 psi
Deviation from terminal-based linearity		≤0.1 %
Hysteresis		≤0.3 %
Ambient temperature influence		≤0.1 %/10 K for lower measuring range value and measuring span (based on 20 °C)
Supply air		1.4 bar ±0.1 bar (20 psi ±1.5 psi)

Table 2: *Technical data*

Type 3432 Controller Station										
Controlled variable display		Measuring range 0.2 to 1.0 bar (3 to 15 psi) · Accuracy class 1.6 · Scale length 212 mm								
Set point adjustment		Output 0.2 to 1.0 bar (3 to 15 psi) · Scale length 212 mm · Accuracy class 1.6								
Adjuster for manual mode		Output 0.2 to 1.0 bar (3 to 15 psi) · Max. 0.02 to 1.35 bar · Max. air delivery >1.5 m_n^3/h								
Inductive limit contacts		1 or 2 SC 3,5-NO-YE proximity switches acc. to DIN EN 60947-5-6, Ex II 2G Ex ia IIC T6								
i/p converter for w_{ext} [1]		Input 0/4 to 20 mA (R_i = 200 Ω)								
With controller module [2]	**Type**	**3434-1**	**3434-2**	**3433-1**	**3433-2**	**3433-3**	**3433-4**	**3433-5**	**3433-6**	**3433-9**
	Controller action	P	PI	P	PI [3]	PID [3]	PD	P/PI	PD/PID	P [4]
	Prop.-action coefficient K_p	1 to 20		0.2 to 20 (0.4 to 40 on request)						
	Reset time T_n	–	0.05 to 20 min	0.03 to 50 min						
	Derivative-action time T_V	–	–	0.01 to 10 min · Derivative-action gain of x: ≈10						
Optionally with additional modules [3]		–		**Type 3437-1** Signal Limiter		**Type 3437-2** Control Mode Selector Switch		**Type 3437-3** Bumpless Manual/ Automatic Switchover		
Output		0.2 to 1 bar (3 to 15 psi) · Max. 0.02 to 1.35 bar								
Supply air	Standard version	Supply air 1.4 ±0.1 bar (20 ±1.5 psi) · Air consumption <0.65 m_n^3/h								
	Version with supply pr. regulator	Operating air 2.0 to 12 bar (30 to 180 psi) · Air consumption < 0.8 m_n^3/h								
	Version with i/p converters	w_{ext}: +0.13 m_n^3/h								
Air quality acc. to ISO 8573-1		Max. particle size and density: Class 3 · Oil content: Class 2 · Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected								
Permissible ambient temperature		–20 to 60 °C (–40 to 60 °C on request)								
Degree of protection		IP 40, front with door: IP 65								
Total weight (approx.)		6 kg								
Materials										
Housing		Die-cast aluminum, plastic-coated								

1) Details in ▶ T 7045
2) Details in ▶ T 7040 and ▶ T 7041
3) Optionally with feedback limitation
4) With set-point-dependent operating point

Table 3: *Controller station versions*

Controller station	**Type**	**3432-...**											
		01		**02**		**03**		**04**		**05**		**06**	
Fixed set point controller		•		•									
Follower controller						•		•					
Fixed set point and follower controller with w_{int}/w_{ext} selector switch										•		•	
Equipped with ...													
Set point adjuster		•		•						•		•	
Set point display		•		•		•		•		•		•	
Controlled variable and output signal display		•		•		•		•		•		•	
Manual/automatic switch				•				•				•	
Manual adjuster and diff. pressure indication				•				•				•	
Type 3438 Transmitter Module		•		•		•		•		•		•	
Controller module	Type 3433-... [1]		•		•		•		•		•		•
	Type 3434-...	•		•		•		•		•		•	
Input w_{ext}	0.2 to 1 bar					•	•	•	•	•	•	•	•
	0/4 to 20 mA						•		•		•		•
i/p converter for w_{ext}							•		•		•		•
Can additionally be equipped with ...													
1 or 2 inductive limit contacts		•		•		•		•		•		•	
Supply pressure regulator		•		•		•		•		•		•	
Lockable, transparent door (IP 65), with conductive coating		•		•		•		•		•		•	

1) Optionally with additional module

Dimensions in mm

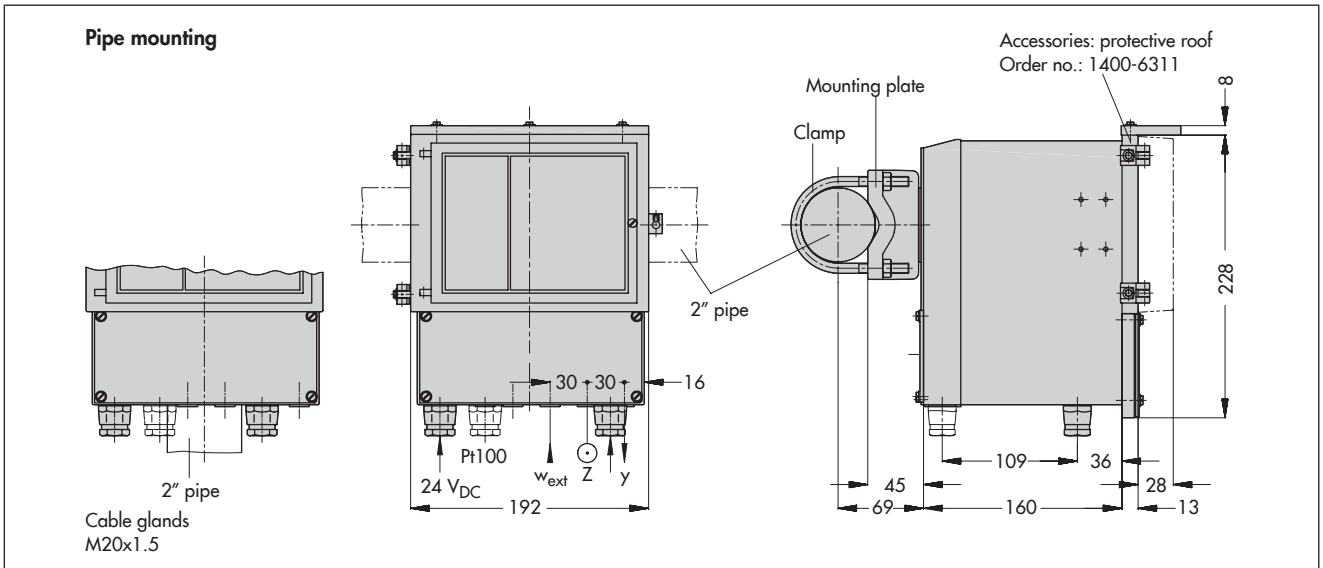


Fig. 6: *Dimensions · Pipe mounting*

Installation and connections

Pipe mounting:
With mounting part and clamp for attachment to a vertical or horizontal 2″ pipe Order no.: 1400-6302

Wall mounting:
Three brackets for attachment to a wall
Order no.: 1400-6301

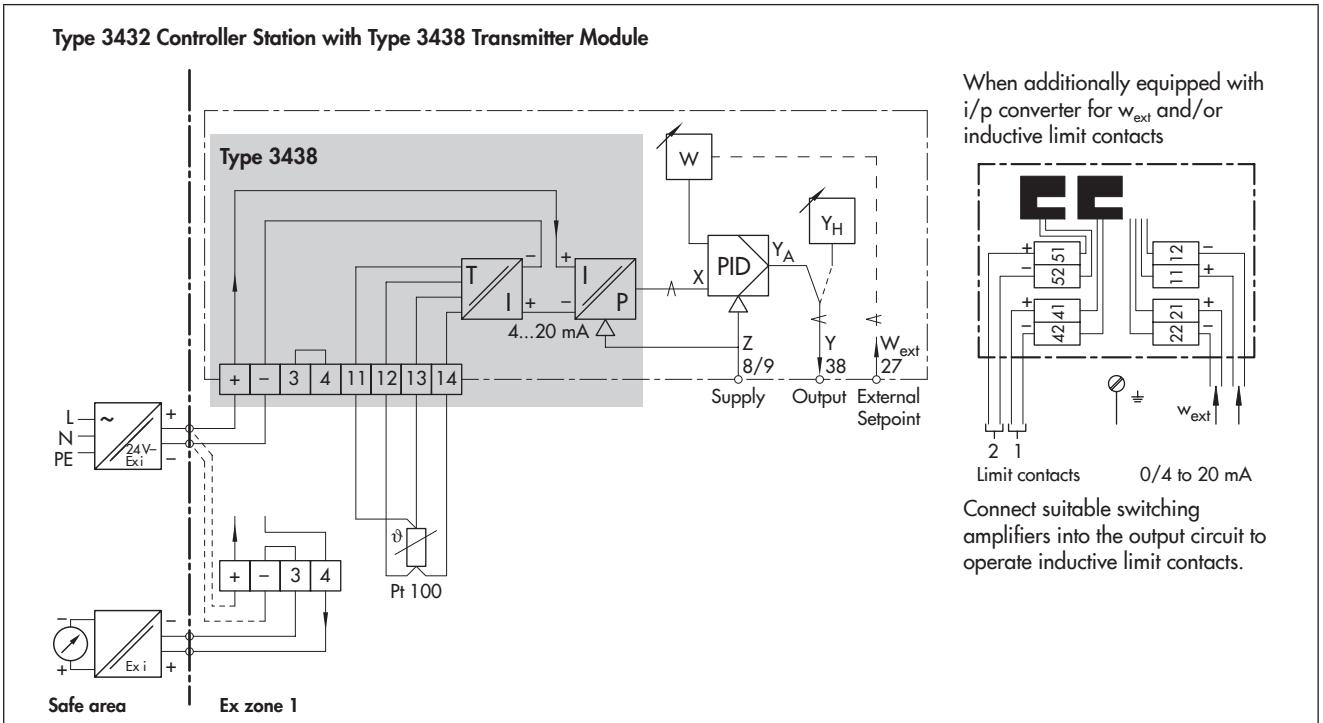
Pneumatic connections: tapped holes ISO 228/1-G ⅛

Panel mounting:
Four fastening elements type C DIN 43835 for fastening in the control pane Order no.: 1400-6300

Mounting position:
Mount the controller station in the upright position.

Electrical connection: terminals for 0.5 to 1.5 mm² wires

Electrical connection

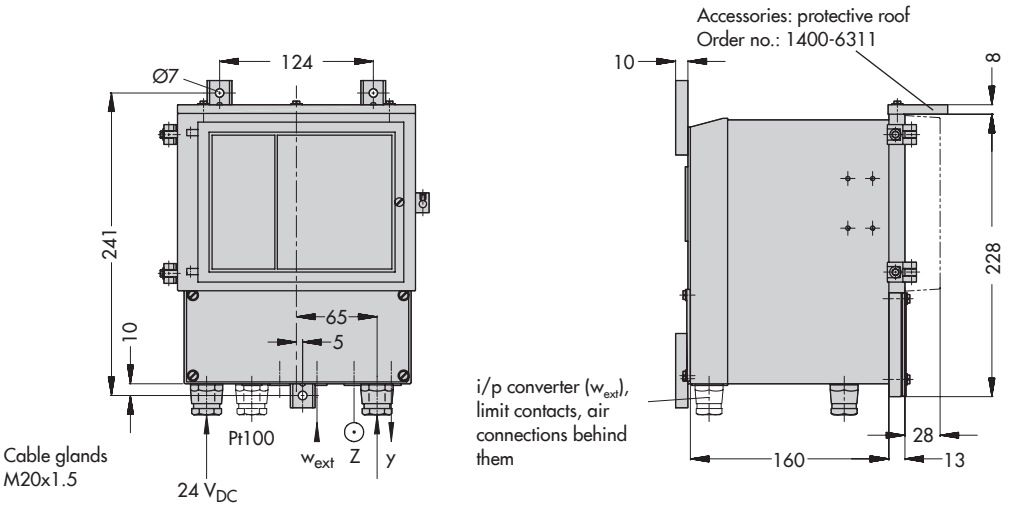


Sensor connection: no line calibration is required for four-wire connection.
The resistance of the wires must be identical and the permissible line resistance of 50 Ω per wire must not be exceeded.
The sensor lines must be routed separately from the relay or contactor lines.

Fig. 7: *Electrical connection*

Dimensions in mm

Wall mounting



Panel mounting
Cut-out for panel mounting 188^{+1}x255^{+1} mm
Distance between center lines with door approx. 235 mm

Close-to-close arrangement in rows (without door) according to IEC 61554 (DIN 43700)

Fig. 8: *Dimensions · Wall and panel mounting*

Ordering text

Pneumatic indicating controller for temperature with
Type 3432-..., output: 0.2 to 1 bar (3 to 15 psi)

Input w_{ext} for follower controllers: 0.2 to 1 bar, 3 to 15 psi, 0/4 to 20 mA

Optionally with lockable door/with 1 or 2 inductive limit contacts/with supply pressure regulator

Type 3438 Transmitter Module

Measuring ranges .../.../... °C

Type 3433-.../3434-... Controller Module

Optionally, **Type 3437-...** Additional Module (only with Type 3433)