

# Pneumatic Indicating Controllers for Temperature with Pt 100 Resistance Thermometer Type 3430

## Controller Station Type 3432 Transmitter Module Type 3438

### Application

Temperature control for liquids, gases and vapors in industrial and process plants · Measuring ranges from  $-30\text{ }^{\circ}\text{C}$  to  $+400\text{ }^{\circ}\text{C}$



The controllers directly measure the temperature of the medium, indicate the measured value, compare the measured value with the set point, and deliver a pneumatic control signal of 0.2 to 1.0 bar or 3 to 15 psi. The required supply pressure is 1.4 bar or 20 psi or an operating air pressure of 2.0 to 12 bar (30 to 180 psi).

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

### Special features

- Controller and control valve form an easy-to-service and inexpensive automation solution for direct measurement of the temperature to be controlled
- Set point, controlled variable, system deviation and output pressure are visible at a glance; all required operating elements and switches are accessible from the controller front
- Can be equipped with P, PI, PID or PD controller modules as well as additional modules for special control tasks
- Housings for wall mounting, pipe mounting and panel mounting (front frame  $192 \times 228\text{ mm}$ ), optionally with lockable door in transparent plastic (IP 65), with conductive coating

### Versions

Type 3430 Indicating Controller for Temperature consisting of a Type 3432 Controller Station, a Type 3433 or Type 3434 Controller Module (depending on the control task) and a Type 3438 Transmitter Module.

**Fixed set point controller** (Figs. 2 and 3) · For connection to a Pt 100 resistance thermometer · Measuring ranges from  $-30\text{ }^{\circ}\text{C}$  to  $+400\text{ }^{\circ}\text{C}$

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

**Fixed set point and follower controller** · Combination of both controllers, with switchover  $w_{\text{int}}/w_{\text{ext}}$  to change from the internal to the external reference variable · Set point adjuster and differential pressure display

Can optionally be equipped with 1 or 2 adjustable inductive limit switches and/or supply pressure regulator for operating air pressures of 2.0 to 12 bar

*Details on selecting controller stations and controller modules can be found on page 4.*

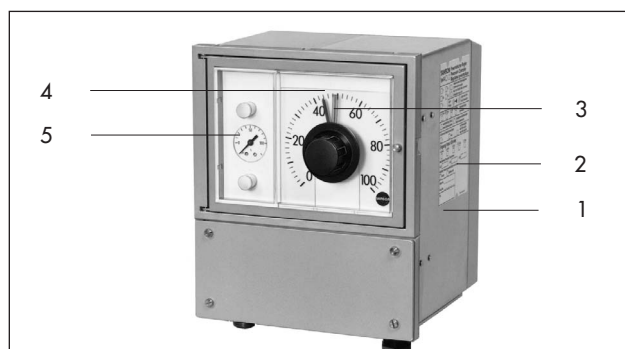


Fig. 1 · Fixed set point controller with Type 3432-01 Controller Station

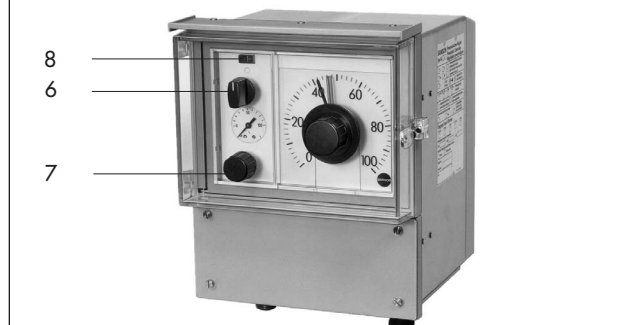


Fig. 2 · Fixed set point controller with Type 3432-02 Controller Station and lockable door

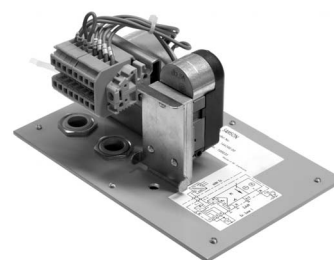


Fig. 3 · Type 3438 Transmitter Module

- |   |  |
|---|--|
| 1 Controller station                            | 5 Output pressure display (y)  |
| 2 Identification label                          | 6 Manual/automatic switch  |
| 3 Set point adjuster with set point display (w) | 7 Adjuster for manual operation  |
| 4 Controlled variable display (actual value x)  | 8 Differential pressure display for smooth manual/automatic switchover |

### Principle of operation (see Figs. 4 and 5)

The modular Series 430 Pneumatic Indicating Controllers for Temperature are suitable for use in various automation applications. They consist of a Type 3432 Controller Station as the basic module, a Type 3433 or 3434 Controller Module, depending on the control task, and a Type 3438-04/-05 Transmitter Module. The transmitter module (2) consists of an electric transmitter (2.1) and a subsequent 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 between 0.2 and 1 bar by the i/p converter. The output pressure, which is proportional to the temperature, is supplied to the bellows measuring system of the controlled variable display (1.3) and the controller module (3) as a pneumatic controlled variable signal (controlled variable x). For details refer to Data Sheet T 7045 EN.

The controller station (fixed set point controller) shown in Fig. 4 comprises the scale (1.2), controlled variable display (1.3), set point adjuster (1.4), and plug-in connections for a controller module (3). The pneumatic connections are sealed tightly when the module is removed. The controlled variable signal x produces a deflection on the bellows measuring system of the controlled variable display (1.3). This deflection is transmitted to the pointer over a gear mechanism. The set point (reference variable w) can be adjusted on the scale (1.2) at the controller front. The position of the set point adjuster (1.4) is transmitted to the set point transmitter over a gear mechanism. This transmitter system (1.4.1) 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 regulates the output signal y<sub>A</sub> as a function of the deviation and the adjusted control parameters. The output signal is connected to the output pressure display (1.5) and the output connection y.

The controller station shown in Fig. 5 largely corresponds to the version shown in Fig. 4. However, the station additionally contains a manual/automatic switch (1.6), an adjuster for manual operation (1.7), and a differential pressure display (1.8). Output pressure display (1.5) and output connection y are connected to the automatic output signal y<sub>A</sub> with switch position "automatic". With switch position "manual", the output pressure display and output connection are connected to the manual output signal y<sub>H</sub> set on the adjuster (1.7). A smooth switchover between manual and automatic operating mode is possible when the differential pressure display indicates that y<sub>A</sub> and y<sub>H</sub> are identical.

The follower controllers not shown have a pneumatic or electric input for the external reference variable w<sub>ext</sub> (for input w<sub>ext</sub> = 4 (0) to 20 mA with additional i/p converter).

The controller stations can be equipped with Type 3434 P or PI Controller Modules for common temperature control, with Type 3433 Controller Modules for P, PI, PID, and PD control as well as with additional modules for special control tasks. Refer to Data Sheets T 7040 EN and T 7041 EN for details.

Optionally, the controller stations can be supplied with 1 or 2 inductive limit switches adjustable on the scale. Optionally, a supply pressure regulator (1.9, see Fig. 5.1) can be added as well, which allows the station to be used with an operating air pressure of 2.0 to 12 bar. The additional supply pressure regulator reduces and controls the operating air pressure (p<sub>B</sub>) to the required supply pressure (p<sub>Z</sub>) of 1.4 bar or 20 psi. For details on the Type 3708-... Supply Pressure Regulator, refer to Data Sheet T 8545 EN.

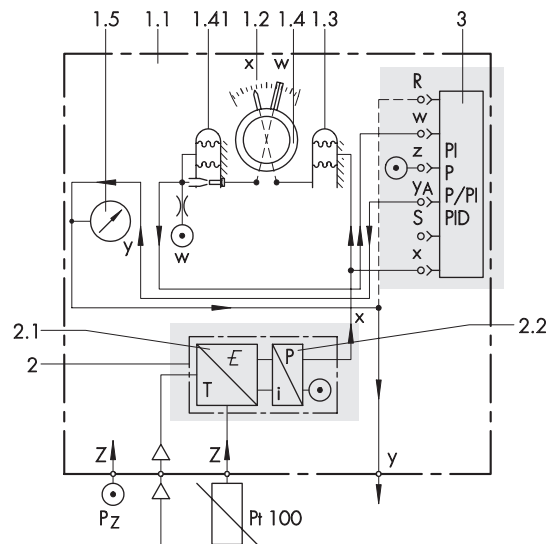
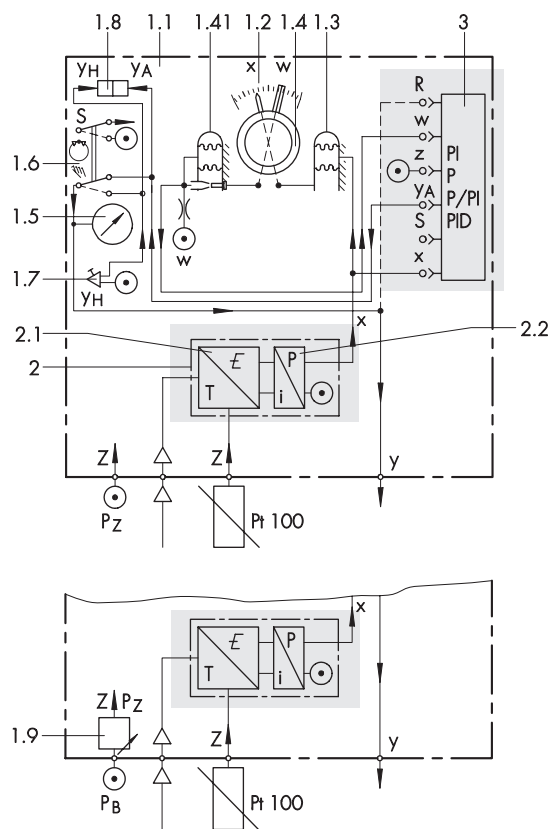


Fig. 4 · Functional diagram, fixed set point controller for temperature, version with Type 3432-01 Controller Station



5.1 · Version with supply pressure regulator (1.9)

Fig. 5 · Functional diagram, fixed set point controller for temperature, version with Type 3432-02 Controller Station

- |     |  |     |  |
|-----|--|-----|--|
| 1   | <b>Controller station</b>  | 1.5 | Output pressure display  |
| 1.1 | Housing with door  | 1.6 | Manual/automatic switch  |
| 1.2 | Scale  | 1.7 | Adjuster for manual operation  |
| 1.3 | Controlled variable display with pointer, gear mechanism, and bellows measuring system   | 1.8 | Differential pressure display for smooth manual/automatic switchover |
| 1.4 | Set point adjuster with pointer, gear mechanism, and set point transmitter (1.4.1); for follower controllers: set point display only | 1.9 | Supply pressure regulator  |
|     |  | 2   | <b>Transmitter module</b>  |
|     |  | 2.1 | Electric transmitter   |
|     |  | 2.2 | i/p converter  |
|     |  | 3   | <b>Controller module</b>   |

**Table 1 · Technical data · Type 3438 Transmitter Module · Type 6112 i/p Converter Module EEx i**

<b>Type 3438 Transmitter Module</b>		
<b>Type 3438 · General data</b>		
Design	<b>Type 3438</b> consisting of the interconnection of Temperature Transmitter <b>TTH200-E1H</b> with <b>Type 6112-22</b> i/p Module	
Input	Sensor	Pt 100 resistance thermometer (RTD), DIN EN 60751 · Four-wire circuit line resistance per wire < 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 $\frac{\text{Supply voltage} - 16.5 \text{ V}}{0.022 \text{ mA}}$
Auxiliary power	Supply air	1.4 bar ± 0.1 bar (20 psi ± 1.5 psi)
	Supply voltage	Two-wire connection: Power supply lines = Signal lines
	Use in hazardous areas Use in safe areas	16.5 to 28 V (25 V DC), see EC Type Examination Certificate 16.5 to 30 V DC
Explosion protection	Type TTH200-E1H	Ex II 2(1) G EEx [ia] ib IIC T6 EC-Type Examination Certificate PTB 05 ATEX 2017 X
	Type 6112-22	Ex II 2 G EEx ia IIC T6 EC-Type Examination Certificate PTB 00 ATEX 2021
<b>Electric temperature transmitter TTH200-E1H</b>		
Measuring current	0.3 mA	
Current consumption	< 3.6 mA	
Maximum output current	23.6 mA	
Fault indication	Sensor breakage	> 22 mA
	Sensor short-circuit	< 3.6 mA
	Sensor line breakage	< 3.6 mA or > 22 mA
	Supply voltage with reverse polarity	0 mA
Deviation from terminal-based linearity	≤ 0.1% or ≤ 0.2 K (the largest value always applies)	
Influence of ambient temperature	≤ 0.08 %/10 K for lower measuring range value and measuring span, based on 20 °C	
Influence of supply voltage	< 0.001 %/V within the permissible range of the supply voltage/load	
Electrical isolation	3.5 kV DC/2.5 kV AC (60 s)	
Long-term stability	≤ 0.05 % or 0.05 K per year (the largest value always applies)	
<b>Type 6112-22 i/p Converter Module EEx i</b>		
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 %	
Influence of ambient temperature	< 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 corresponding to class 1.6									
Adjuster for manual operation	Output 0.2 to 1.0 bar (3 to 15 psi) · Max. 0.02 to 1.35 bar · Max. air output capacity >1.5 m <sub>n</sub> <sup>3</sup> /h									
Limit switches	1 or 2 proximity switches SC 3,5-NO-YE acc. to EN 60947, Ex II 2 G EEx ia IIC T6									
i/p converter for w <sub>ext</sub> <sup>1)</sup>	Input 4 (0) to 20 mA (R <sub>i</sub> = 200 Ω)									
Can be equipped with...										
Controller Module <sup>2)</sup>	Type	3434-1	3434-2	3433-1	3433-2	3433-3	3433-4	3433-5	3433-6	3433-9
Controller function		P	PI	P	PI <sup>3)</sup>	PID <sup>3)</sup>	PD	P/PI	PD/PID	P <sup>4)</sup>
Proportional-action coefficient K <sub>p</sub>		1 to 20		0.2 to 20 (0.4 to 40 on request)						
Reset time T <sub>n</sub>		–	0.05 to 20 min	0.03 to 50 min						
Derivative-action time T <sub>v</sub>		–	–	0.01 to 10 min · Derivative-action gain of x: ≈ 10						
Optionally with Type ... Additional Modules <sup>3)</sup>		–		<b>3437-1</b> Signal limiter		<b>3437-2</b> Control mode selector switch		<b>3437-3</b> Smooth 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 <sub>n</sub> <sup>3</sup> /h								
	With supply press. regulator	Operating air 2.0 to 12 bar (30 to 180 psi) · Air consumption < 0.8 m <sub>n</sub> <sup>3</sup> /h								
	Version with i/p converters	w <sub>ext</sub> : +0.13 m <sub>n</sub> <sup>3</sup> /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 beneath the lowest ambient temperature to be expected								
Permissible ambient temperature		–20 °C to +60 °C (–40 °C 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								

<sup>1)</sup> Details in T 7045 EN · <sup>2)</sup> Details in T 7040 EN and T 7041 EN · <sup>3)</sup> Optionally with feedback limitation

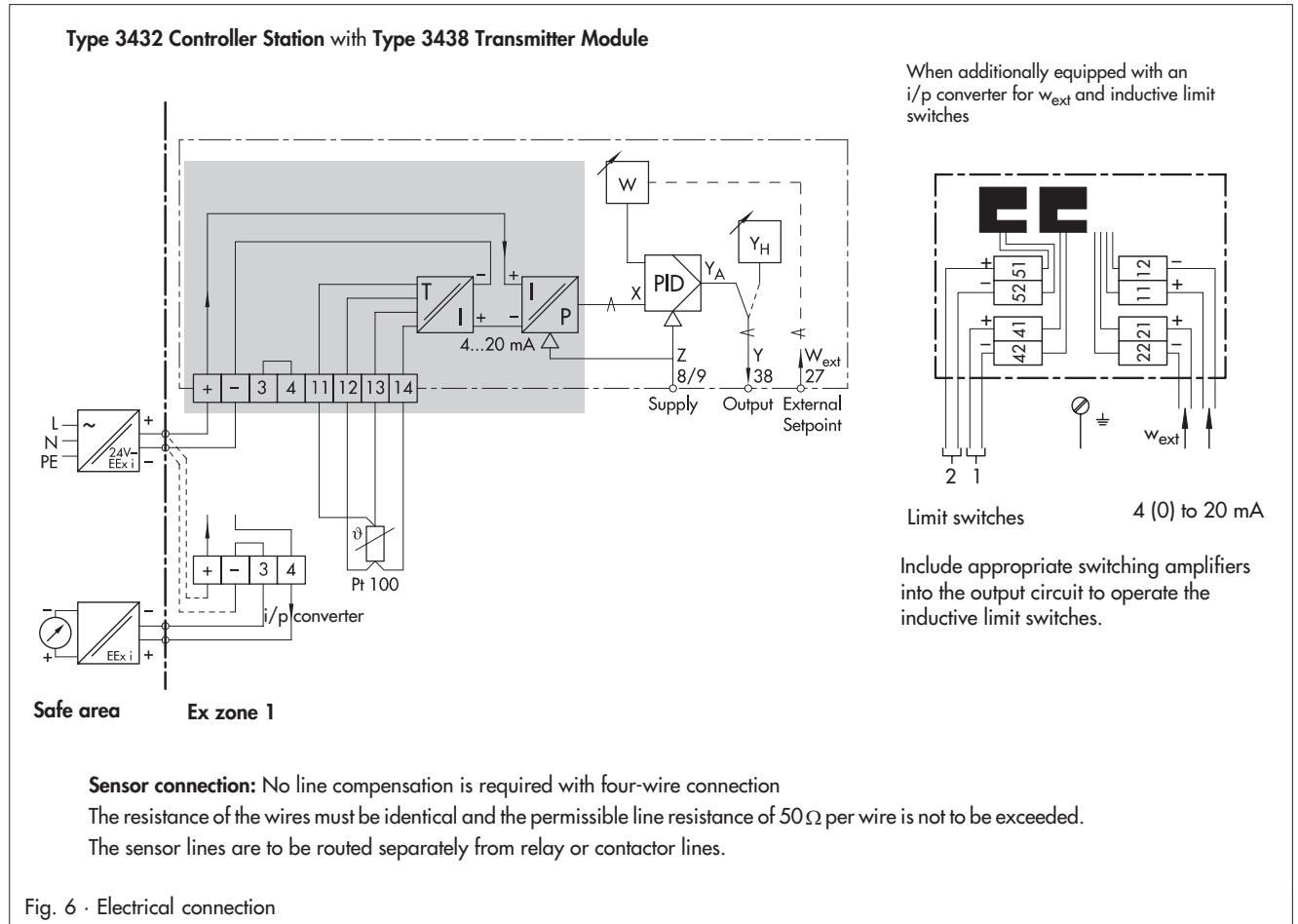
<sup>4)</sup> With set point dependent operating point

**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 switchover w <sub>int</sub> /w <sub>ext</sub>					•	•
Equipped with ...						
Set point adjuster	•	•			•	•
Set point display	•	•	•	•	•	•
Controlled variable and output pressure display	•	•	•	•	•	•
Manual/automatic switch		•		•		•
Adjuster for manual operation and differential pressure display		•		•		•
Type 3438 Transmitter Module	•	•	•	•	•	•
Controller module	Type 3433 – ... <sup>1)</sup>	•	•	•	•	•
	Type 3434 – ...	•	•	•	•	•
Input w <sub>ext</sub>	0.2 to 1 bar			•	•	•
	4 (0) to 20 mA			•	•	•
i/p converter for w <sub>ext</sub>				•	•	•
Additionally can be equipped with ...						
1 or 2 inductive limit switches	•	•	•	•	•	•
Supply pressure regulator	•	•	•	•	•	•
Lockable, transparent door IP 65, with conductive coating	•	•	•	•	•	•

<sup>1)</sup> Optionally with additional module

## Electrical connection



## Installation and connections

### Pipe mounting

Fastening element and clamp for attachment to a horizontal or vertical 2" pipe (order no. 1400-6302)

### Wall mounting

Three brackets for wall mounting (order no. 1400-6301)

**Pneumatic connections:** ISO 228/1 - G 1/8 tapped holes

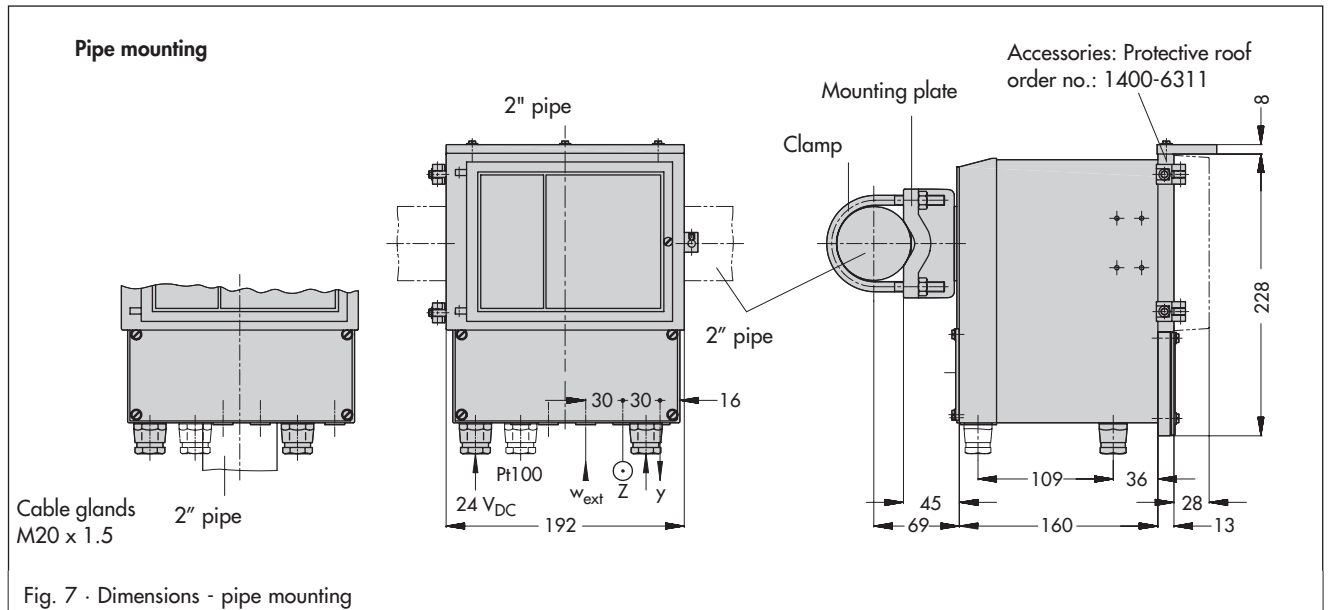
### Panel mounting:

Four C DIN 43835 fastening elements for panel mounting (order no. 1400-6300)

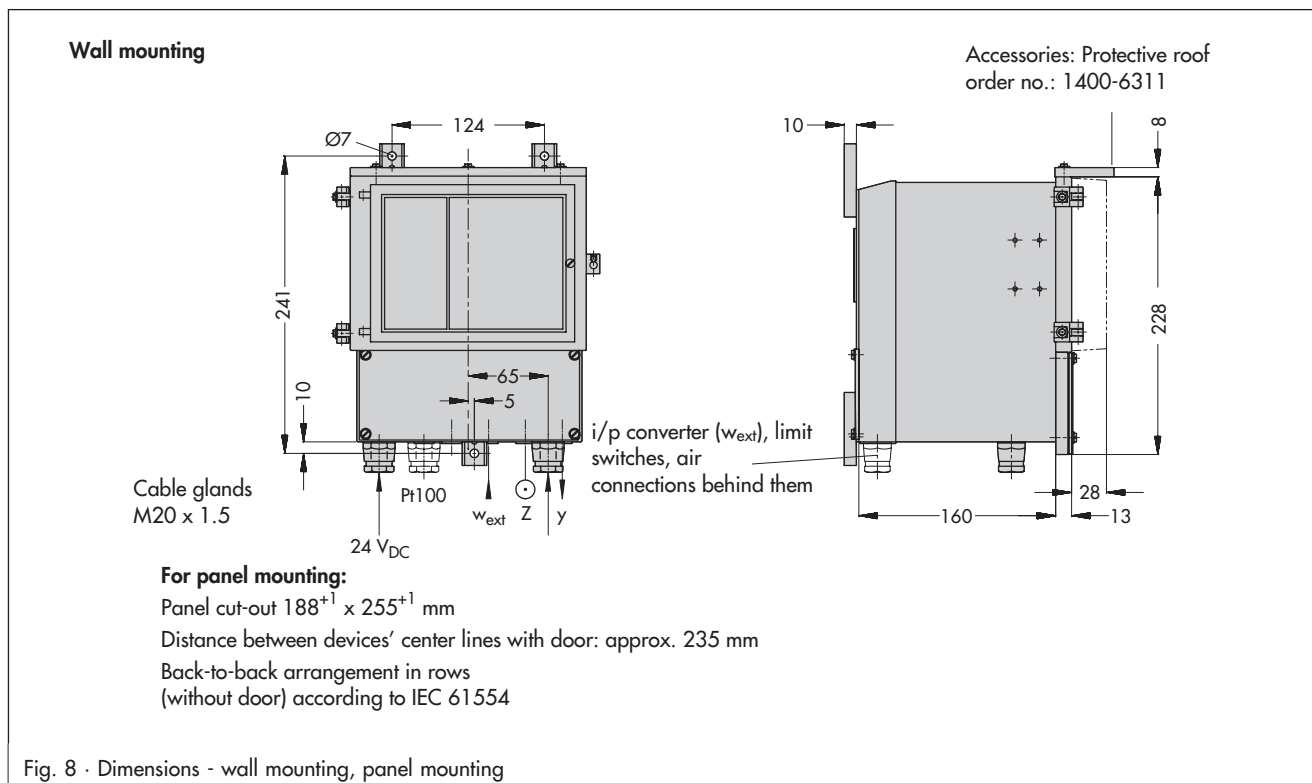
**Electrical connection:** terminals for 0.5 to 1.5 mm<sup>2</sup> wires

**Mounting position:** Controller station mounted in upright position

## Dimensions in mm



## Dimensions in mm



## Ordering text

Pneumatic Indicating Controller for Temperature with  
Controller Station Type 3432-...

Output: 0.2 to 1 bar / 3 to 15 psi

Input w<sub>ext</sub> for follower controllers: 0.2 to 1 bar/3 to 15 psi/  
4 to 20 mA/0 to 20 mA

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

Transmitter Module Type 3438

Measuring ranges ... / ... / ... °C

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

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

Specifications subject to change without notice.



SAMSON AG · MESS- UND REGELTECHNIK  
Weismüllerstraße 3 · 60314 Frankfurt am Main · Germany  
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507  
Internet: <http://www.samson.de>

T 7036 EN