

T 7034 EN

Type 3430 Pneumatic Indicating Controllers for Temperature with Capillary Sensor · Type 3432 Controller Station · Type 3436 Transmitter Module

Series 430



Application

Temperature controllers for process engineering and industrial applications for liquids, gases and vapors · Measuring range from -40 to 300 °C

The controller directly measures the temperature of the process medium, compares the measured variable 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 with capillary sensor corresponding to the temperature set point.

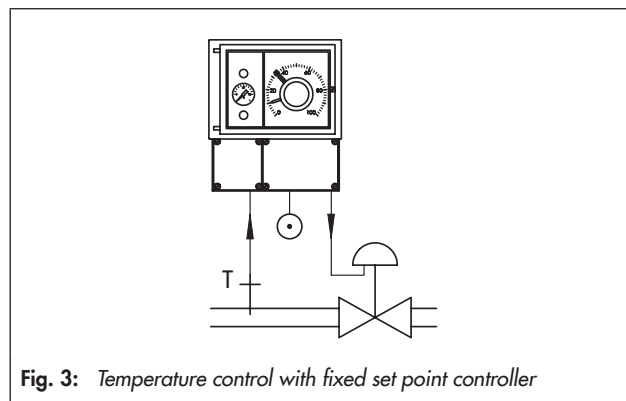
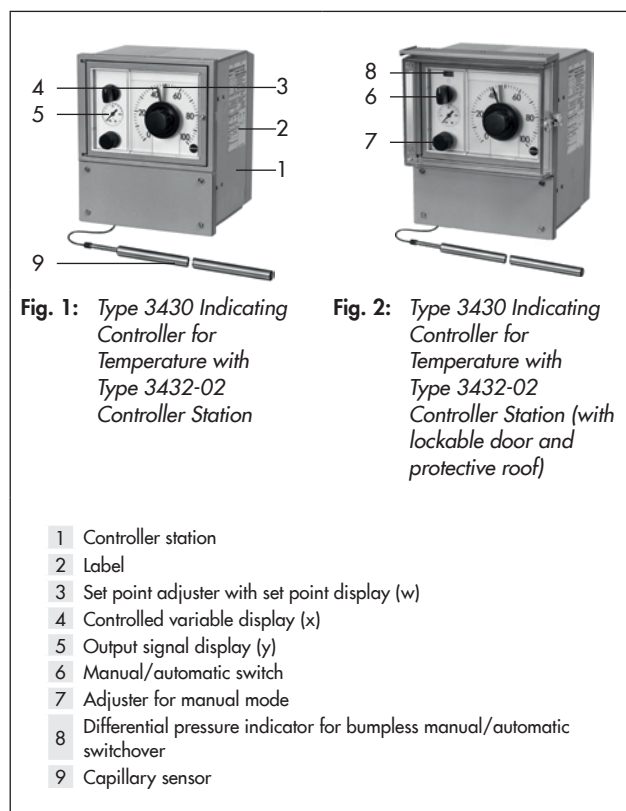
Special features

- 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
- Controller modules for PI or PID control
- 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 Type 3433 or Type 3434 Controller Module and a Type 3436 Transmitter Module

Fixed set point controller (Fig. 1 and Fig. 2) · With capillary sensor, measuring ranges from -40 to 300 °C · Optionally with supply pressure regulator for operating air pressure from 2.0 to 12 bar



Principle of operation (see Fig. 4)

The Series 430 Pneumatic Controllers with their modular design can be used in all kinds of automation applications. The temperature controllers 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 3436 Transmitter Module.

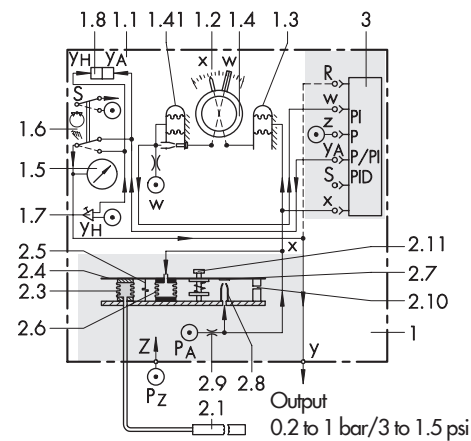
The temperature of the process medium produces a pressure proportional to the temperature in the gas-filled sensor (2.1) of the transmitter module. This pressure opposes a force at the beam (2.4) which is generated at the feedback bellows (2.6) by the output pressure p_A . The supply air flows through the restriction (2.9) and nozzle (2.8) onto the flapper (2.7). An increase in temperature causes the flapper to come closer to the nozzle. As a result, the output pressure p_A applied to the bellows (2.6) rises until a new equilibrium is reached, i.e. until the output signal reaches a value proportional to the temperature. Zero can be set at the adjustment screw (2.11) and the span by moving the feedback bellows. The output pressure p_A proportional to the temperature is applied as a signal (controlled variable x) to the bellows measuring system of the controlled variable display (1.3) and controller module (3).

The controller station (fixed set point controller) includes a scale (1.2), controlled variable display with pointer, gear mechanism and bellows measuring system (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 (1.4) is transmitted to the set point calibrator 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 pressure display (1.5) and output port y . However, the Type 3432-02 Controller Station additionally contains a manual/automatic switch (1.6), adjuster for manual mode (1.7) and differential pressure indicator (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 controller stations can be equipped with suitable controller modules, e.g. Type 3434 for common PI temperature control, Type 3433 for PI or PID control. Details on selection and principle of operation of controller modules in Data Sheets

► T 7040 and ► T 7041.

They are also available with supply pressure regulator (1.9, Fig. 4). 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. The operating principle of this supply pressure regulator is similar to that of Type 3708-5003 described in Data Sheet ► T 8545.



Version with supply pressure regulator (1.9):

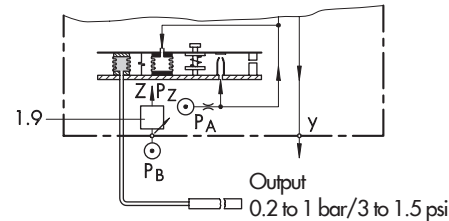


Fig. 4: Schematic drawing of fixed set point controller for temperature, version with Type 3432-02 Controller Station

1	Controller station	2	Transmitter module for temperature
1.1	Housing with door	2.1	Sensor
1.2	Dial plate	2.2	Capillary tube
1.3	Controlled variable display with pointer, gear mechanism and bellows measuring system	2.3	Measuring bellows
1.4	Set point adjuster with pointer, gear mechanism and set point calibrator (1.41); follower controllers: set point display only	2.4	Balance beam
1.5	Output pressure display	2.5	Cross spring pivot
1.6	Manual/automatic switch	2.6	Feedback bellows
1.7	Adjuster for manual mode	2.7	Flapper plate
1.8	Differential pressure indicator for bumpless manual/automatic switchover	2.8	Nozzle
1.9	Supply pressure regulator	2.9	Restrictor
		2.10	Damping
		2.11	Zero adjustment
		3	Controller station

Table 1: Controller station versions

Controller station	Type 3432-	02
Fixed set point controller		•
Equipped with ...	Set point adjuster	•
	Set point reading	•
	Controlled variable and output signal display	•
	Manual/automatic switch	•
	Manual adjuster and differential pressure indicator	•
	Transmitter module	•
Controller module	Type 3433-...	• -
	Type 3434-...	- •
Can additionally be equipped with ...	Type 3708-5003 Supply Pressure Regulator	•
	Door IP 65, with conductive coating	•

Table 2: Technical data

Type 3436 Transmitter Module				
Measuring ranges (standard)	-20 to 30 °C 0 to 50 °C	0 to 100 °C 50 to 150 °C	0 to 150 °C	0 to 200 °C
Special measuring ranges	150 to 250 °C	-40 to 200 °C	-40 to 150 °C	-40 to 100 °C
Lower range value	-40 to 150 °C			
Fixed measuring span	50 K	100 K	150 K	200 K
Overload limit	350 °C			
Perm. pressure at sensor	Without thermowell PN 16 · With thermowell PN 63 or 100			
Supply air	Supply air 1.4 ±0.1 bar (20 ±1.5 psi)			
Output	0.2 to 1.0 bar/3 to 15 psi			
Deviation from terminal-based linearity	0.6 % with terminal-based conformity			
Hysteresis	<0.25 %			
Supply air	<0.25 %/0.1 bar			
Influence Pressure at the sensor	<0.6 %/10 bar	<0.25 %/10 bar	<0.15 %/10 bar	
Ambient temperature	<0.6 %/°C	<0.03 %/°C		
Capillary tube	Length 3 or 6 m · With/without metal protective hose · Filling medium: Nitrogen			
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			
Can be equipped with ...				
Controller module ¹⁾	Type	3434-2	3433-2	3433-3
Controller action		PI	PI	PID
Proportional-action coefficient K _p		1 to 20	0.2 to 20	
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	
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 <0.6 m _n ³ /h		
	Version with Type 3708-5003 Supply Pressure Regulator	Operating air 2.0 to 12 bar (30 to 180 psi) · Air consumption < 0.75 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		
Degree of protection		IP 40 · Front panel with optional door: IP 65		
Total weight (approx.)		6 kg		

¹⁾ Data Sheets ► T 7040 and ► T 7041

Table 3: Materials · Material numbers according to DIN EN

Capillary sensor ¹⁾	Stainless steel 1.4404/1.4571
Capillary tube with protective metal hose	Stainless steel 1.4404/1.4571
Screw gland, thermowells, clamping flange	Stainless steel 1.4404/1.4571
Housing	Die-cast aluminum, plastic-coated

¹⁾ As Ø 12 mm bulb sensor

Dimensions in mm

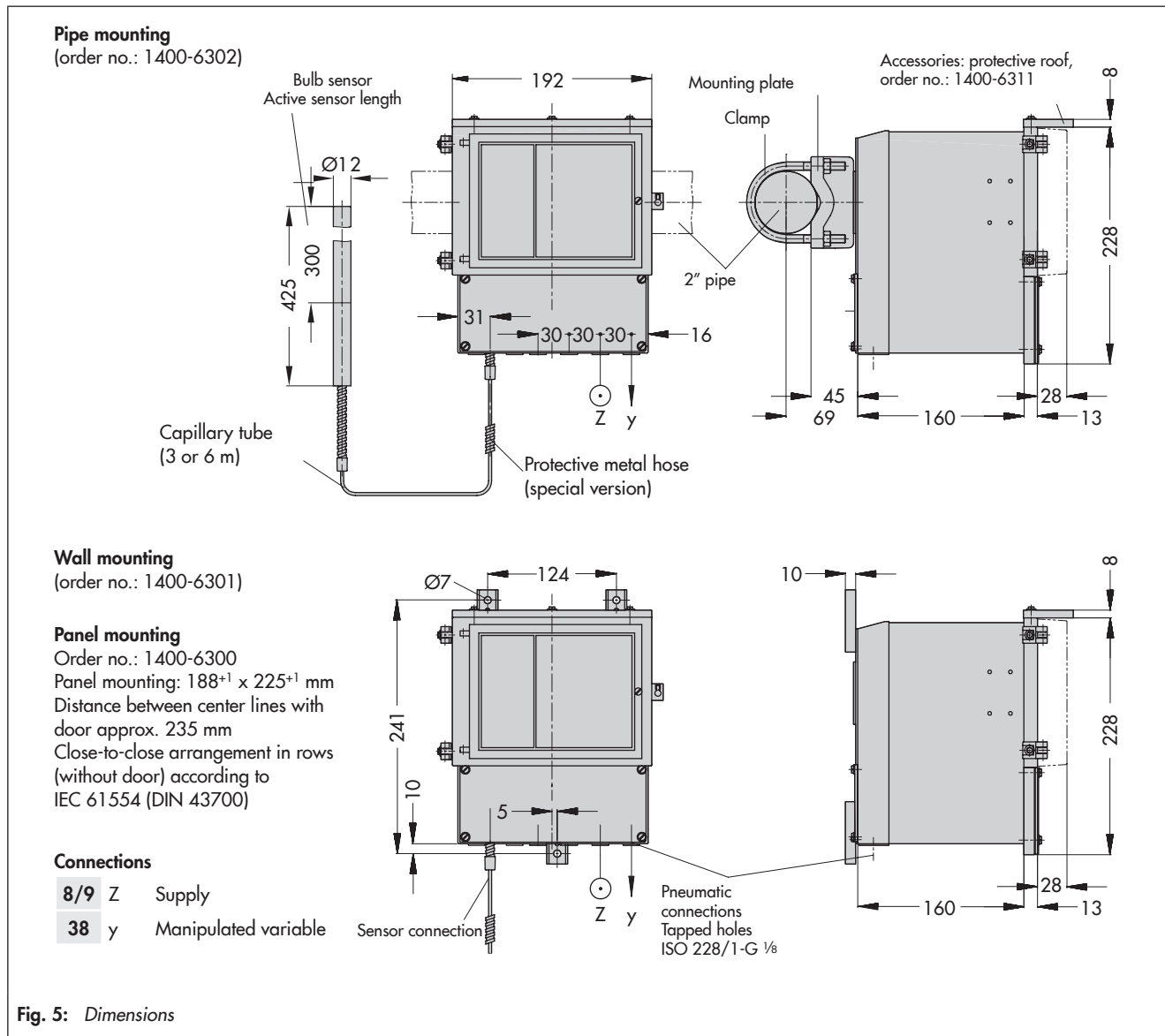


Fig. 5: Dimensions

Installation and connections

The following mounting positions are possible (see Fig. 5):

- Pipe mounting** With mounting part and clamp for attachment to a vertical or horizontal 2" pipe · Order no. 1400-6302
- Wall mounting** With 3 brackets for attachment to a wall · Order no. 1400-6301
- Panel mounting** With 4 fastening elements (C style, DIN 43835) for attachment to the control panel · Cut-out for panel mounting 188⁺¹x255⁺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) · Order no. 1400-6300
- Mounting orientation** Mount the controller station in the upright position.
- Pneumatic connections** Tapped holes G 1/8 according to DIN EN ISO 228-1 (output and supply air)
- Bulb sensor** Ø 12 mm, length 425 mm, active length 300 mm · The bulb sensor can be installed in any position. However, make sure its entire length is immersed in the process medium to be controlled. Choose a place of installation where neither overheating nor considerable dead times occur. Make sure no temperature fluctuations occur (ambient temperature approx. 20 °C). Install the capillary tube such that no mechanical damage can occur. The smallest permissible bending radius is 50 mm.

Accessories are part of the controller and must be ordered separately. Select accessories required for the operating conditions at the site of installation.

Materials of screw glands and thermowells: all wetted parts are made of stainless steel 1.4404/1.4571

Fastening parts for bulb sensor $d = 12 \text{ mm}$, 425 mm long, active length 300 mm

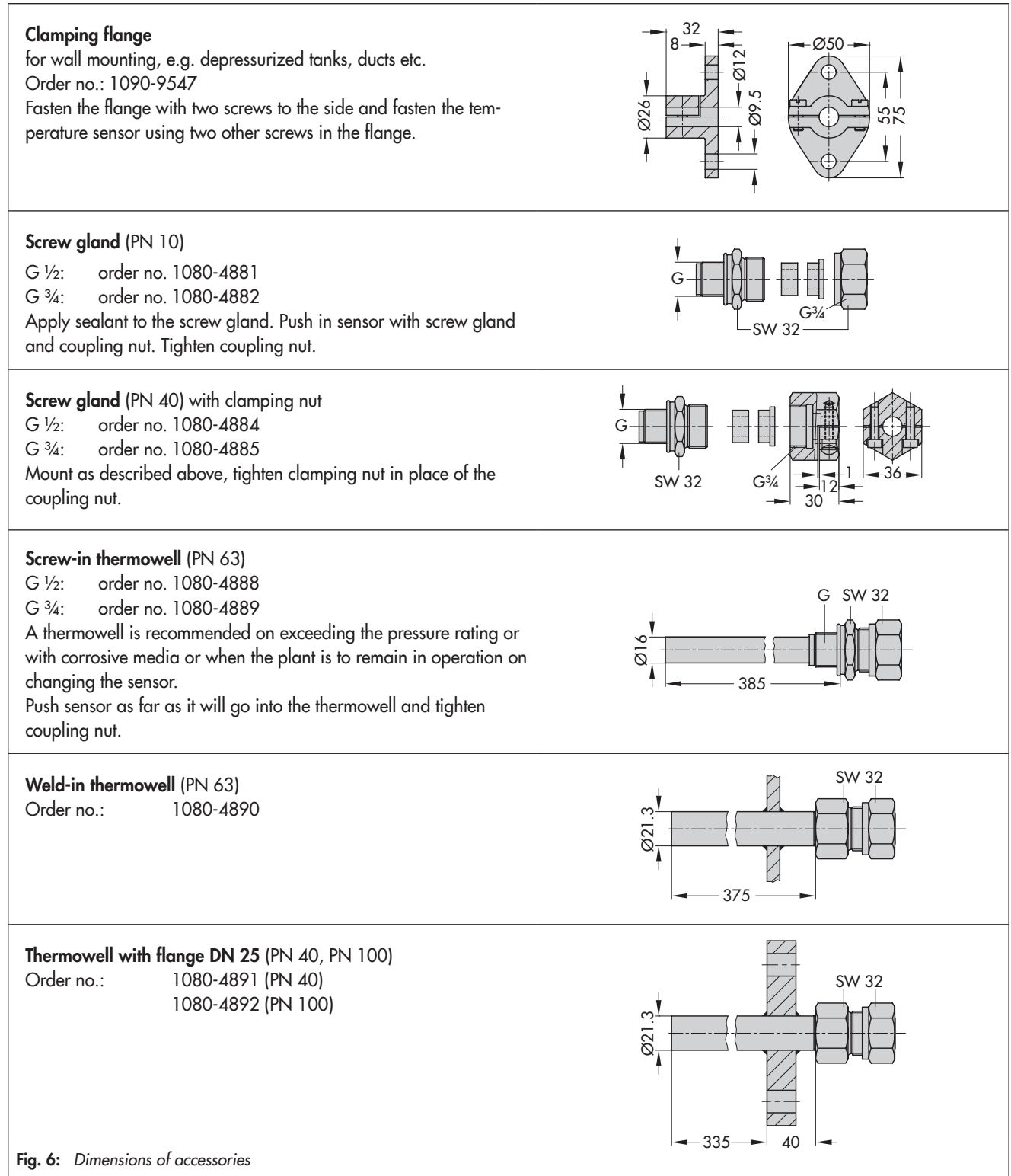


Fig. 6: Dimensions of accessories

Ordering text

Type 3430 Pneumatic Indicating Controller for Temperature, consisting of:

- Type 3432-02 Controller Station
- Type 3434-2, Type 3433-2 or Type 3433-3 Controller Module
- With/without Type 3708-0003 Supply Pressure Regulator
- With or without transparent door, IP 65, lockable or screw closure
- Type 3436 Transmitter Module
Measuring range ... to ... °C,
3 or 6 m capillary tube, with/without protective metal hose

Accessories

- For wall mounting (1400-6301)
- For pipe mounting (1400-6302)
- For panel mounting (1400-6300)
- Protective roof for front panel (1400-6311)
- Mounting parts for bulb sensor (see Fig. 6)