

# Pneumatic Controller for Temperature

Type 3301



## Mounting and Operating Instructions

**EB 7065 EN**

Edition January 2014

## Definition of the signal words used in these mounting and operating instructions



**Note:**

*Supplementary explanations, information and tips*

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### 1 General safety instructions

- The device must be mounted, started up or serviced by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. Make sure employees or third persons are not exposed to any danger.
- According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.
- To ensure appropriate use, only use the device in applications where the operating pressure and temperatures do not exceed the specifications used for sizing the regulator at the ordering stage.
- The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.
- Any hazards that could be caused in the controller by the process medium, operating pressure or by moving parts are to be prevented by taking appropriate precautions.
- Proper transport, storage, installation, operation and maintenance are assumed.
- SAMSON does not assume any liability for damage caused when the device is not used as intended.

## 2 Process medium and scope of application

Pneumatic controller functioning as a proportional controller to control the temperature of gases and vapors at the point of measurement with a pneumatic control valve.

Medium temperatures from 0 to 300 °C

The controller compares the temperature measured by the fixed expansion bulb sensor with the adjusted set point and issues a pneumatic signal between 0.2 to 1 bar at the output. This signal pressure acts on the connected pneumatic control valve. The controller requires a supply pressure of 1.4 bar. The measured temperature is indicated at the controller.

### 2.1 Transportation and storage

Transportation and storage in the permissible temperature range from -10 to +90 °C. Protect the controller against adverse influences, such as dirt or moisture during storage.

### 2.2 Versions

Two versions of the Type 3301 Controller are available that have different set point ranges.

**Table 1:** *Type 3301 · Versions*

Type	Set point range	Configuration ID (Var.-ID)
3301-9001	0 to 200 °C	Var.-ID 1063422
3301-9002	100 to 300 °C	Var.-ID 1294879

The mounting parts are not included in the scope of delivery. They must be ordered separately (see section 4 on page 8, Fig. 4 and Fig. 5).

### 3 Design and principle of operation

The controller mainly consists of the controller housing containing a nozzle and flapper system, pressure gauges for supply air and output pressure as well as the temperature sensor with an outer tube (11) and Invar rod (12). The different expansion properties of the Invar rod and tube materials produce a deflection each time the temperature at the sensor changes. This deflection causes the differential plate (3) mounted on the plate spring (9) to tilt on the ball (5), and causes the distance between the nozzle (2) and flapper (4) to change. The supply air  $p_z$  ( $1.4 \pm 0.1$  bar) flows through the restriction (1) to the nozzle (2). These two components act as a pressure

divider controlled by the flapper. As a result, the output pressure  $p_A$  (controlled variable 0.2 to 1 bar) is regulated proportional to the system deviation and in relation to the fixed operating point of 0.6 bar.

The set point is adjusted at the screw (8) connected to the set point pointer (7). The proportional band is adjusted at the adjustment screw (6). The position of the red dot on the screw (6) indicates the operating direction adjusted.

Position in scale range  $\hat{\Lambda}$ : The output pressure  $p_A$  increases as the controlled variable increases.

Position in scale range  $\hat{\chi}$ : The output pressure  $p_A$  decreases as the controlled variable increases.

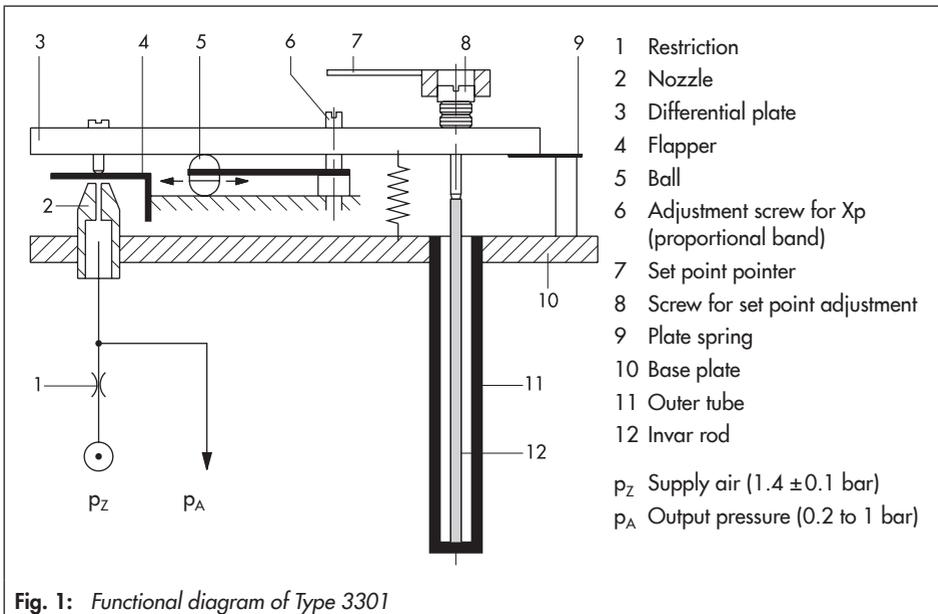
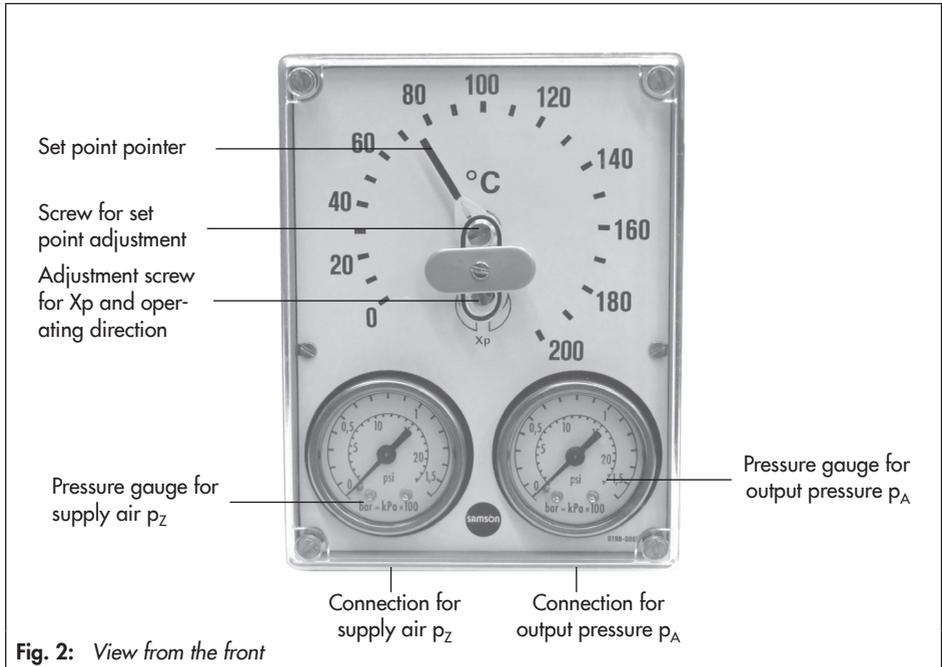


Fig. 1: Functional diagram of Type 3301

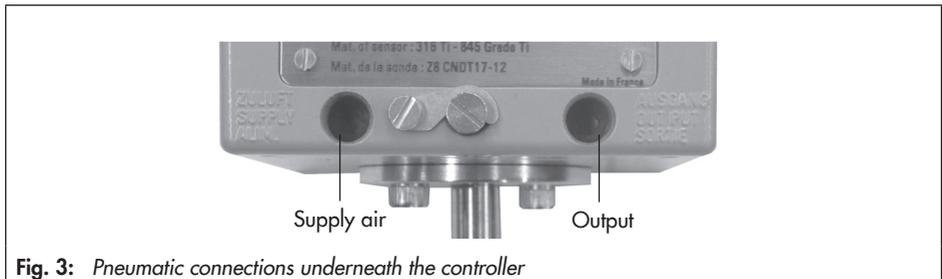
### 3.1 Operating and indicating elements



### 3.2 Pneumatic connections

The connections for supply air p<sub>Z</sub> and output pressure p<sub>A</sub> are located underneath the controller. They are designed as 1/8 NPT tapped holes.

Various screw fittings to connect pipes and plastic hoses are available.



## 4 Installation

The controller may be installed in any position. Make sure that the effective length of the sensor (330 mm) is completely surrounded by the medium.

Install a reference thermometer close to the controller to monitor the temperature (and to check zero).

### 4.1 Mounting position

To install the controller, a coupling sleeve with G 1/2 or G 3/4 female thread must be present at the point of measurement. Screw or seal one of the mounting parts shown in Fig. 4 and 5 into this sleeve.

The mounting parts are not included in the scope of delivery. They must be ordered separately. Select accessories required for the operating conditions at the site of installation.

#### Screw gland (PN 10)

Suitable for pipes and pressure vessels up to max. 10 bar. Seal the screw fitting. Push in the sensor with screw gland and coupling nut. Tighten the coupling nut.

- \*) G 1/2: Order no.: 1080-4881
- G 3/4: Order no.: 1080-4882

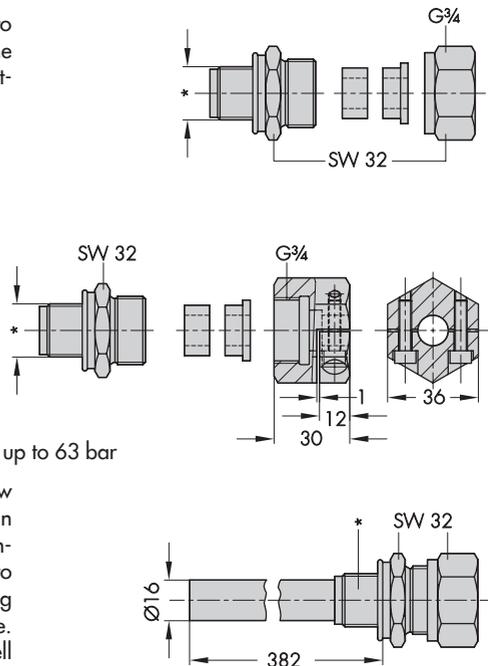
#### Screw gland with clamping nut (PN 40)

For use with pressure up to max. 40 bar. Tighten the clamping nut (instead of the coupling nut).

- \*) G 1/2: Order no.: 1080-4884
- G 3/4: Order no.: 1080-4885

#### Thermowell with thread (PN 63) for pressures up to 63 bar

A thermowell must be used in place of the screw gland if the pressure at the sensor is greater than the nominal pressure, if the medium to be controlled is corrosive or the controlled system is to continue to operate while the controller is being replaced. Screw the thermowell into the sleeve. Push the temperature sensor into the thermowell and fasten with the coupling nut.

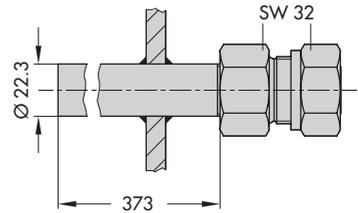


- \*) G 1/2: Order no.: 1080-4888
- G 3/4: Order no.: 1080-4889

Fig. 4: Mounting parts for sensor · Screw glands and thermowell

**Thermowell for welding** (PN 63) for pressures up to 63 bar

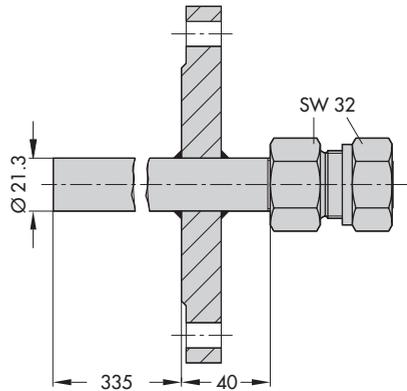
Order no.: 1080-4890



**Thermowell with flange** DN 25 for PN 40 or PN 100

Order no.: 1080-4891 (PN 40)

Order no.: 1080-4892 (PN 100)

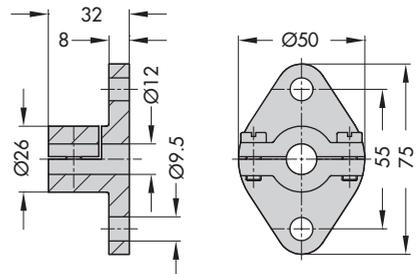


**Clamping flange**

For wall mounting, e.g. on pressureless vessels in air-conditioning and ventilation plants. Screw the flange to the wall using the two screws. Attach the temperature sensor in the flange using two other screws.

Order no.: 1090-9547 (PN 40)

Order no.: 1080-4892 (PN 100)



**Fig. 5:** Mounting parts for sensor · Thermowells and clamping flange

## 5 Operation

See Fig. 1 on page 6.

### 5.1 Adjusting the operating direction

Adjust the operating direction before start-up as follows:

1. Undo the screw on the cover and swivel the guard plate out of the way.



Screw with guard plate

2. Use a screwdriver to adjust the adjustment screw (6) counterclockwise (⤴) or clockwise (⤵) to make the red dot on the screw point to the required operating direction on the scale.



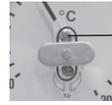
Adjustment screw (6)

- Increasing/increasing  $\hat{\Lambda}$ :  
The output pressure  $p_A$  increases as the temperature at the sensor increases.
- Increasing/decreasing  $\chi$ :  
The output pressure  $p_A$  decreases as the temperature at the sensor increases.

### 5.2 Set point adjustment

1. Undo the screw on the cover and swivel the guard plate out of the way.

2. Turn the adjustment screw (8) until the set point pointer (7) points to the required temperature on the scale.



Adjustment screw (8)

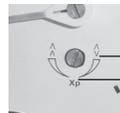


**Note:**

Do not turn the pointer past the adjustment range of the scale.

### 5.3 Adjusting the proportional band

The continuously variable adjustment of the gain is performed at the adjustment screw (6).



Gain  
High  
Low

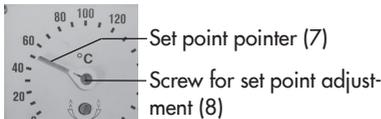
Make sure that the adjustment is only performed within the operating direction determined in section 5.1, i.e. either on the left or right side of the scale.

The gain can be adjusted continuously in the direction of the arrow between 2 and 20 %. The red dot on the adjustment screw (6) serves as the orientation mark.

## 5.4 Zero adjustment

If the measured temperature (reading at the reference thermometer) and the adjusted set point of the controller deviate from each other, you need to readjust zero.

1. Unscrew the four corner screws on the cover and remove cover.
2. Use a screwdriver to hold the screw for set point adjustment (8) in place and turn the set point pointer (7) until the indicated value matches the temperature measured at the reference thermometer.



3. Adjust the set point again.

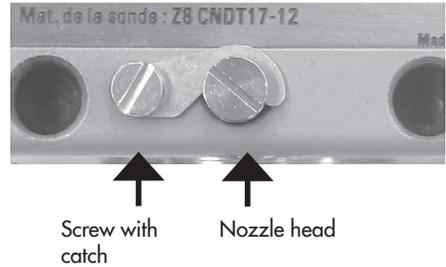
## 6 Maintenance

See Fig. 1 on page 6.

The controller only functions properly when the supply air entering the device is always clean. Therefore, check the air filter and trap installed in the upstream air reducing station regularly. If necessary, clean or renew the filter.

Insufficiently cleaned supply air will cause the restriction (1) to become blocked.

To clean the restriction, remove the nozzle head (between the pneumatic connections underneath the housing, see photo).



1. Undo screw for catch using a suitable screwdriver.
2. Move the catch to release the nozzle head.
3. Pull out the nozzle head. Use compressed air to blow a blocked nozzle. Insert a fine wire (max.  $\varnothing$  0.25 mm) to remove any stubborn dirt particles.

## 7 Nameplate

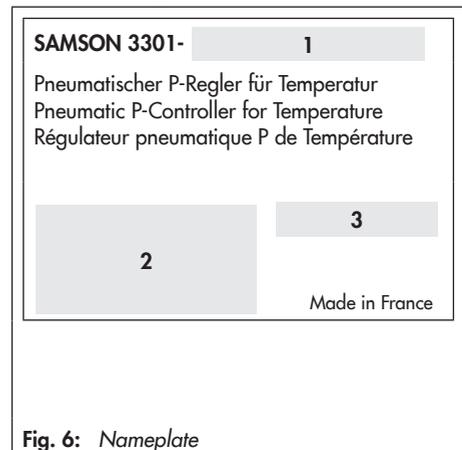


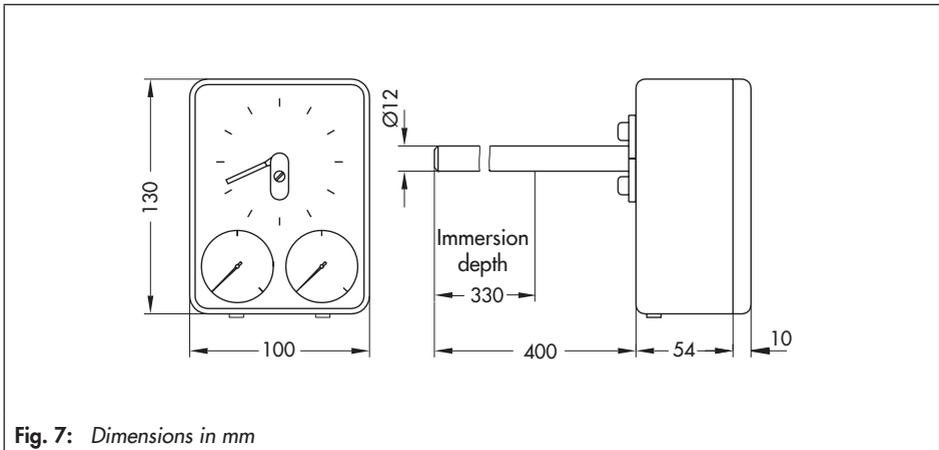
Fig. 6: Nameplate

## 8 Technical data

All pressures in bar (gauge) - Materials according to DIN EN

Type 3301 Pneumatic Controller for Temperature	
Measuring system	Mechanical-type expansion sensor
Bulb sensor Material	Ø 12 mm, 400 mm long, minimum immersion depth 330 mm, Stainless steel 1.4571
Set point, continuously adjustable	0 to 200 °C or 100 to 300 °C
Output Control signal y	0.2 to 1 bar
Supply air	Supply air 1.4 ± 0.1 bar
Air consumption in steady state	0.25 m <sub>n</sub> <sup>3</sup> /h
Max. air output capacity	0.11 m <sub>n</sub> <sup>3</sup> /h
Proportional band X <sub>p</sub>	Continuously adjustable between 2 and 20 %
Operating point	0.6 bar
Temperature influence	0.03 %/K
Ambient temperature range	-10 to +90 °C
Max. operating pressure at the sensor	60 bar
Weight	Approx. 2 kg

## 9 Dimensions



## 10 Customer service

If malfunctions or defects occur, contact the SAMSON After-sales Service Department for support. Please send your inquiries to: [service@samson.de](mailto:service@samson.de)

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on the SAMSON website, in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

To assist diagnosis and in case of an unclear mounting situation, specify the following details:

(see section 7 on page 11):

- Model number
- Serial no.
- Temperature and process medium
- Installation drawing showing the exact location of the controller and all the additionally installed components (shut-off valves, thermometer, control valve etc.)
- For return inquiries: Phone number or e-mail address







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