

# Self-operated Temperature Regulators Series 43



## Temperature Regulators Type 43-1 · Type 43-2 · Valve closes when the temperature rises.

ANSI version

### Application

Regulators for district heating systems, heat generators, heat exchangers, and other building services and industrial plants.

**Temperature set points** from 30 to 300 °F (0 to 150 °C) · Valves **NPT 1/2 to 1** · **Nominal size 1/2" to 2"** (DN 15 to 50) · **Pressure rating Class 250** (PN 25) · Suitable for liquids up to 300 °F (150 °C) and non-flammable gases up to 175 °F (80 °C).

### Note

Typetested temperature regulators (TR), safety temperature monitors (STM) and safety temperature limiters (STL) are available.



### Special features

- Low-maintenance P-regulators requiring no auxiliary energy
- For liquids and gases
- Temperature sensor suitable for installation in any desired position and for operation at high permissible excess temperatures of up to 120 °F (50 °C) above the adjusted set point, designed for operating pressures up to 580 psi (40 bar)
- Globe valves with plug balanced by a piston
- Especially suitable for use in district heating systems
- Special version: fast-responding thermostats for instantaneous water heaters (see page 4 "Vapor pressure thermostats")

### Versions (Figs. 1 and 2)

The regulators consist of a valve and a control thermostat with a set point adjuster, a capillary tube and a temperature sensor which functions according to the adsorption principle.

Versions with double adapter Do3 K for the attachment of additional control thermostats or a manual adjuster (see Data Sheet T 2176 EN).

**Type 43-1** · Temperature regulator with Type 2431 K Valve · Nominal sizes NPT 1/2 to 1 female thread · Type 2430 K Control Thermostat - sensor available optionally with or without thermowell.

**Type 43-2** · Temperature regulator with Type 2432 K Valve · Nominal size 1/2" to 2" (DN 15 to 50) · Connection nuts with weld-on fittings (special version with threaded ends NPT 1/2 to 2) · Type 2430 K Control Thermostat - sensor available optionally with or without thermowell.

**Typetested safety devices** are available. Register numbers are available on request.

The maximum operating pressure of Type 43-1 and Type 43-2 Temperature Regulators (TR) must not exceed the maximum differential pressure  $\Delta p$  specified in the "Technical data". Only SAMSON thermowells can be used for sensors with thermowells.

Refer to the Information Sheet T 2181 EN for details on the selection and application of the typetested device.

**Safety Temperature Monitors (STM)** and **Safety Temperature Limiters (STL)** are also available. Refer to Data Sheets T 2183 EN and T 2185 EN for further details.

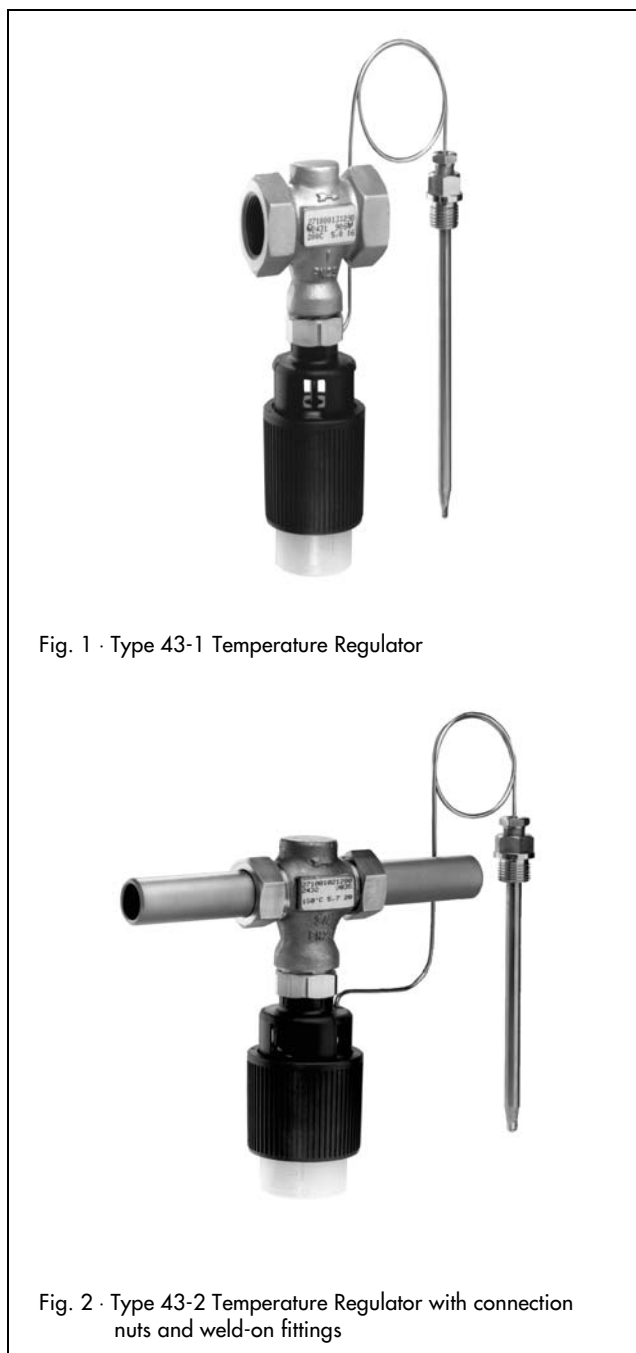


Fig. 1 · Type 43-1 Temperature Regulator

Fig. 2 · Type 43-2 Temperature Regulator with connection nuts and weld-on fittings

### Accessories

- Thermowells Class 300 (PN 40) made of copper or CrNiMo steel
- Double adapter Do3 K or manual adjuster

### Special versions

- 16.4 ft (5 m) capillary tube
- Oil-resistant internal parts
- Type 43-2: with connection nuts and threaded ends
- Fast-responding thermostats (see page 4 "Vapour pressure thermostats") available on request

### Principle of operation (Fig. 3 )

The temperature of the medium produces in the measuring sensor a pressure proportional to the actual temperature measured. This pressure is transmitted through the capillary tube (11) to the operating element (9), where it is converted into a positioning force. Depending on the adjusted set point, this force acts via the pin of the operating element (10) on the valve plug (3). By turning the set point adjuster (8), the point of response of the thermostat is changed so that the valve plug travels through its full travel range within a higher or lower temperature range measured by the sensor.

### Installation

Only the same kind of material can be combined, for example, a thermowell made of stainless steel 1.4571 installed in a stainless steel heat exchanger.

#### • Valves

The valves must be installed in horizontal pipelines. The thermostat must hang downwards - other installation positions are also possible at temperatures lower than 230 °F (110 °C). The medium must flow through the valve in the direction indicated by the arrow on the valve body.

#### • Capillary tube

The capillary tube should be run in such a way that the ambient temperature does not exceed the permissible range, this ambient temperature is kept as even as possible, and the tube cannot be damaged. The smallest permissible bending radius is 2" (50 mm).

#### • Temperature sensor

The sensor may be installed in any desired position. Its whole length must be immersed in the medium to be controlled. The sensor should be installed in a location where overheating or appreciable idle times cannot occur.

**Table 1 · Materials** (Material number acc. to DIN EN)

Body	C 83600 (G-CuSn5ZnPb)
Plug	1.4104 and brass with EPDM soft sealing <sup>1)</sup>
Valve spring	Stainless steel 1.4310
Capillary tube	Copper
Sensor Thermowell	Copper, nickel-plated or stainless steel 1.4571
Set point adjuster	Glass fiber reinforced polyamide

<sup>1)</sup> With special version for oils (ASTM I, II, III): FPM (FKM) soft sealing

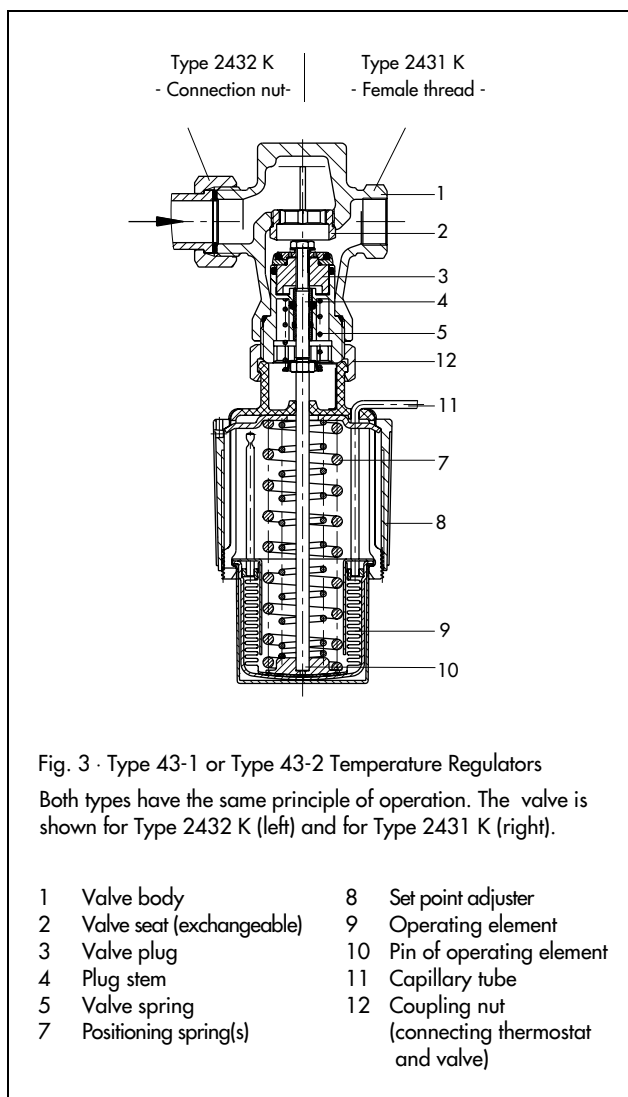


Fig. 3 · Type 43-1 or Type 43-2 Temperature Regulators

Both types have the same principle of operation. The valve is shown for Type 2432 K (left) and for Type 2431 K (right).

- |   |                           |    |  |
|---|---------------------------|----|--|
| 1 | Valve body                | 8  | Set point adjuster                             |
| 2 | Valve seat (exchangeable) | 9  | Operating element                              |
| 3 | Valve plug                | 10 | Pin of operating element                       |
| 4 | Plug stem                 | 11 | Capillary tube                                 |
| 5 | Valve spring              | 12 | Coupling nut (connecting thermostat and valve) |
| 7 | Positioning spring(s)     |    |  |

### Ordering text

#### Temperature Regulator Type 43-1

NPT ...

Set point range ... °F (°C)

Optionally, special version ... /accessories ...

#### Temperature Regulator Type 43-2

DN ...

with weld-on fittings or threaded ends

Set point range ... °F (°C)

Optionally, special version ... /accessories ...

**Table 2 · Technical data** · All pressures in psig (gauge in bar)

<b>Type 2431 K/Type 2432 K Valve</b>							
Nominal size <sup>1)</sup>	in / mm	1/2" / 15	3/4" / 20	1" / 25	1 1/4" / 32	1 1/2" / 40	2" / 50
C <sub>v</sub>		4.2	6.7	8.4	11.7	14.6	18.7
K <sub>v</sub> s		3.6	5.7	7.2	10	12.5	16
Nominal pressure (acc. to DIN 2401)		Class 250 (PN 25)					
Max. permissible differential pressure		290 psi (20 bar)			175 psi (12 bar)		
Max. permissible valve temperature		300 °F (150 °C)					
<b>Type 2430 K Control Thermostat</b>							
Set point ranges <sup>2)</sup> , continuously adjustable		30 to 95, 75 to 105, 100 to 210, 125 to 250 or 160 to 300 °F					
		0 to 35, 25 to 70, 40 to 100, 50 to 120 or 70 to 150 °C					
Capillary tube		6.5 ft (2 m); special version: 16.4 ft (5 m)					
Max. permissible excess temp. at the sensor		120 °F (50 °C) above the adjusted set point					
Max. perm. ambient temperature range		-5 °F to 175 °F (-20 °C to +80 °C)					
Perm. pressure at sensor/at thermowell		Class 300 (PN 40)					

<sup>1)</sup> Type 2431 K Valve: Nominal size NPT 1/2 to 1 female thread

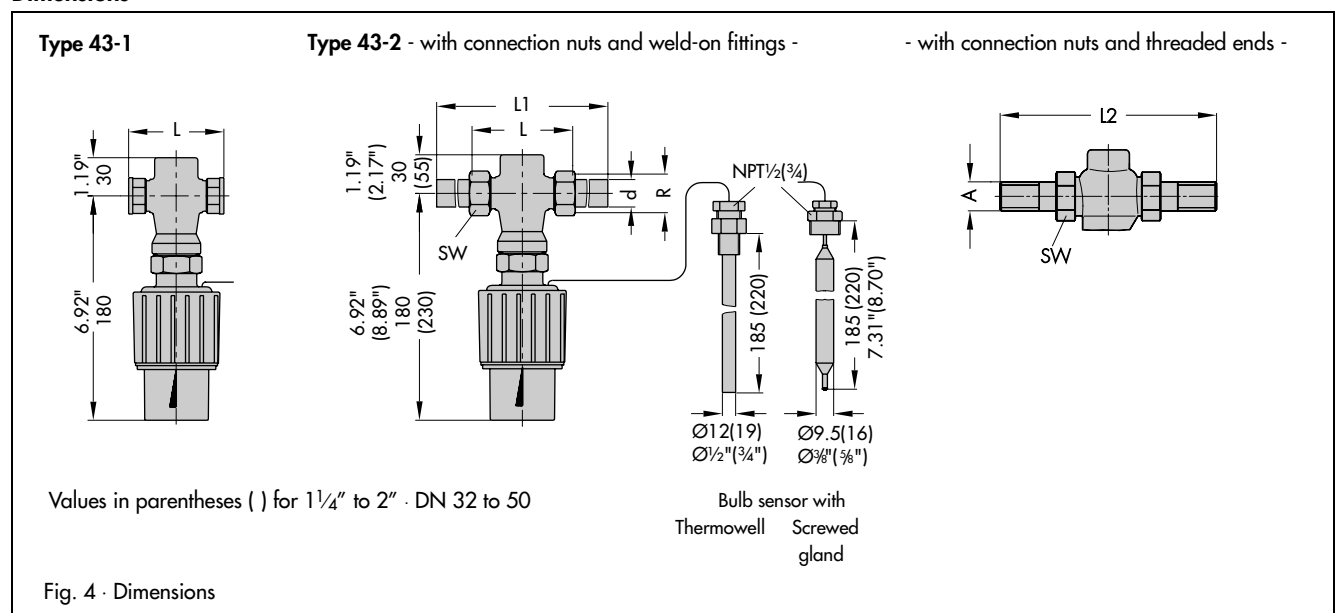
<sup>2)</sup> Further set point ranges available on request

**Table 3 · Dimensions and weights**

<b>Type 43-1 Temperature Regulator</b>							
Nominal size	NPT	1/2	3/4	1			
Length L	in / mm	2.56 / 65	2.95 / 75	3.55 / 90			
Weight <sup>1)</sup> , approx.	lb / kg	3.1 / 1.4	3.3 / 1.5	3.5 / 1.6			
<b>Type 43-2 Temperature Regulator</b>							
Nominal size DN	in / mm	1/2" / 15	3/4" / 20	1" / 25	1 1/4" / 32	1 1/2" / 40	2" / 50
Pipe diameter d	in / mm	0.84 / 21.3	1.05 / 26.8	1.29 / 32.7	1.65 / 42	1.9 / 48	2.36 / 60
Connection size R	G	3/4	1	1 1/4	1 3/4	2	2 1/2
Width ac. flats SW	in / mm	1.18 / 30	1.42 / 36	1.81 / 46	2.32 / 59	2.56 / 65	3.23 / 82
Length L	in / mm	2.6 / 65	2.8 / 70	3.0 / 75	4.0 / 100	4.3 / 110	5.1 / 130
With connection nuts and <b>weld-on fittings</b>							
L1 with weld-on fittings	in / mm	8.27 / 210	9.22 / 234	9.61 / 244	10.55 / 268	11.57 / 294	13.0 / 330
Weight <sup>1)</sup> , approx.	lb / kg	3.8 / 1.7	4.4 / 2	5.1 / 2.3	9.7 / 4.4	11.2 / 5.1	13.0 / 5.9
<b>Special version</b>							
With connection nuts and <b>threaded ends</b> (male thread)							
Length L2	in / mm	5.1 / 129	5.67 / 144	6.26 / 159	7.1 / 180	7.72 / 196	8.98 / 228
Male thread A	NPT	1/2	3/4	1	1 1/4	1 1/2	2
Weight <sup>1)</sup> , approx.	lb / kg	3.8 / 1.7	4.4 / 2	5.1 / 2.3	9.7 / 4.4	11.2 / 5.1	13.0 / 5.9

<sup>1)</sup> Version without thermowell: minus 0.44 lb (0.2 kg)

**Dimensions**



## Special version - Vapor pressure thermostat -

Temperature regulator with short time delays

### Application

The temperature sensors functioning according to the vapor pressure principle are especially suitable for the use in instantaneous water heaters<sup>1)</sup> due to their short time constants of approx. 3 seconds.

Temperature set points from **115 to 150 °F (45 to 65 °C)** · Type 2430 K Control Thermostat combined with Type 2431 K (Type 43-1) or Type 2432 K (Type 43-2) Valve · Female thread **NPT 1/2 to 1 · DN 1/2 to 2" · Class 250 (PN 25)** · Sensor made of copper or CrNiMo steel · Special installation position of the sensor must be observed!

<sup>1)</sup> Versions for plate heat exchanger on request

### Principle of operation

Type 43-1/2 Temperature Regulator with a **sensor** which functions according to the **vapor pressure principle**.

The temperature sensor is partially filled with a liquid which vaporizes depending on the temperature. This causes a pressure proportional to the temperature to form in the sensor. The pressure is transferred through the capillary tube to the positioning bellows and is converted into a positioning force. It moves the valve plug depending on the set point adjustment.

### Installation

- To utilize the fast response characteristics of the vapor pressure sensor, the sensor must always be installed in the best position. In instantaneous water heaters, it should be installed directly in front of the flow outlet from the heat exchanger, yet in front of the hot water inlet (see Fig. 5).
- The ambient temperature must be at least 15 K below the set point adjusted at the thermostat.
- The installation position of the sensor depends on its type.
- Installation *without* thermowell only!

**Table 4 · Installation position** - only for Type 2430 K Vapor Pressure Thermostat

2750-05 ...	003	053	004
Sensor position			
Horizontal	•	•	•
Tip facing upwards			•
Tip facing downwards	•	•	

### Conversion factors

#### Kvs and Cv coefficients

These coefficients are calculated exactly according to IEC 60534, Part 2-1 and Part 2-2. In addition, the ISA-S75.01-1-1985 standards and the VDI/VDE 2173 guideline are used for this purpose. In most cases, it is sufficiently accurate to calculate the KV according to this guideline. The relevant equations are listed in the SAMSON Calculation Sheet AB 04.

$$K_{vs} = 0.86 C_v \quad K_{vs} \quad [m^3/h]$$

$$C_v = 1.17 K_{vs} \quad C_v \quad [U.S. gallons/min]$$

### Pressure

$$1 \text{ pound/square inch } [lbs/in^2 = psi] = 0.06895 \text{ bar}$$

$$1 \text{ bar} = 14.5 \text{ psi}$$

### Area

$$1 \text{ square inch } [sq.in; in^2] = 6.452 \text{ cm}^2$$

$$1 \text{ cm}^2 = 0.155 \text{ in}^2$$

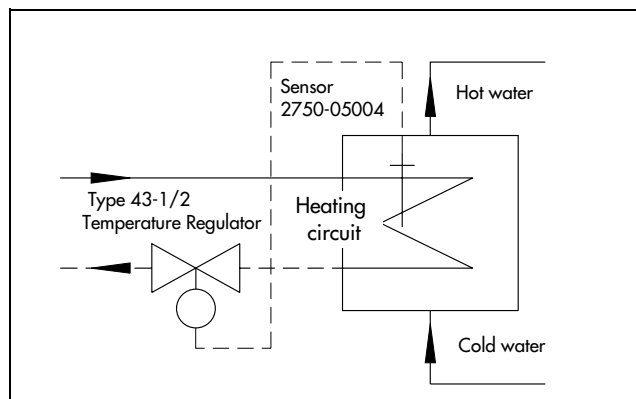


Fig. 5 · Installation position of the vapor pressure thermostat (principle)

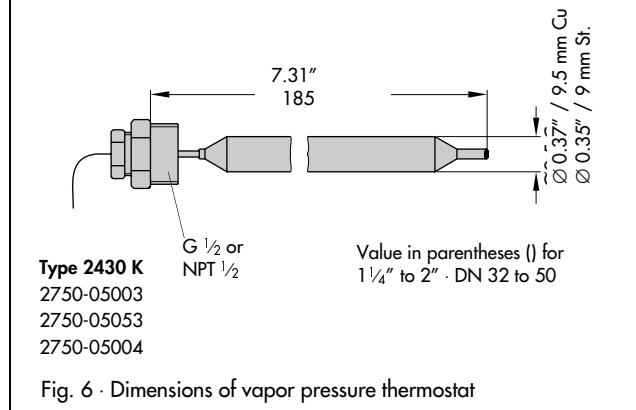


Fig. 6 · Dimensions of vapor pressure thermostat

- Only the same kind of materials can be combined, for example, a sensor of stainless steel 1.4571 installed in a stainless steel heat exchanger.

**Table 5 · Materials**

Type 2430 K Vapor Pressure Thermostat			
2750-05 ...	003	053	004
Sensor material	Copper	•	•
	Stainless steel	•	
Sensor connection	G 1/2 (NPT 1/2) <sup>1)</sup>		

<sup>1)</sup> Special version; please specify when ordering

### Mass

$$1 \text{ pound } [lb] = 0.4536 \text{ kg}$$

$$1 \text{ kg} = 2.2046 \text{ lb}$$

### Mass flow

$$1 \text{ pound per second } [lb/s] = 0.4536 \text{ kg/s}$$

$$1 \text{ kg/s} = 2.2046 \text{ lb/s}$$

### Volume flow

$$1 \text{ U.S. gallon per min } [U.S. g. p. m.] = 0.227 \text{ m}^3/h$$

$$1 \text{ m}^3/h = 4.4 \text{ U. S. g. p. m}$$

### Temperature

$$°F = 9/5 °C + 32$$

$$°C = 5/9 (°F - 32)$$

Specifications subject to change without notice.



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**T 2175 EN**