

TÜV-tested double thermostat "Pilot"

Double thermostat "Pilot" – baelz 231/2-J

for water, oil, hot steam, air

up to installation length 300 mm and control range 350 °C


Caution!

The necessary instructions for installation, electrical connection and setpoint settings are described in this manual. Please do not perform any unauthorized interventions on this double thermostat should you experience problems.

The main office in Heilbronn, Germany will inform you of a Baelz technician in your area.

Any improper use or modification of the double thermostat will void the warranty.

Double thermostat "Pilot" baelz 231/2-J

Type examination according to PED 2014/68/EU

with ingress protection rating IP 54

compliant with VDE 0631 / DIN EN 60730

These instructions describe:

- the STB, i.e. the safety temperature limiter baelz 231-J with reset, also referred to as manual reset, contact type: changeover and restart lockout. In the event of faults, the STB puts the monitored system in an operationally safe state.
- the STW, i.e. the safety temperature monitor baelz 231-J without reset, contact type: changeover.



Type designation: baelz 231/2-J-W-15-fs-VA-150

231/2-J Double thermostat with rigid stem

W Changeover contact for STB

15 Immersion tube length 150 mm *1

fs Changeover switch for STW

VA Stainless steel protective sleeve

150 Control and limit value range +20°C....+150°C *2

*1 Immersion tube lengths available: baelz 231/2-J
100, 120, 150, 200, 300 mm

*2 Control and limit ranges available:
+30 ... +110°C; +60 ... +130°C; +20 ... +150°C;
+50 ... +250°C; +50 ... +300°C;

Switching function

Restart lockout:

The STB opens the electric circuit and locks it mechanically when the set limiting value is exceeded. After the temperature has fallen below the limiting value by approx. 10% of the temperature range, the microswitch can be reset manually. When using the STW (STB) as an STB limiter the reclosing lockout function according to VDE 0116 / DIN EN 50156 has to be provided by a subsequent circuit.

Self-monitoring:

In the case of measuring system break (leakage), both the STB and the STW (STB) open the electric circuit permanently. The STB also locks the microswitch.

Behaviour in case of low temperature:

If the minimum sensor temperature for STW (STB) and STB falls below -10°C, the electric circuit is opened. When the minimum sensor temperature is exceeded, the STB must be reset manually. The STW resets automatically.

Table of Contents

- | | | |
|--------------------------|---------------------------------------|------------|
| 1. General information | 5. Sensor installation | 9. Marking |
| 2. Installation | 6. Electrical connection | |
| 3. Installation examples | 7. Adjusting the temperature setpoint | |
| 4. Dimensional drawings | 8. Technical data | |

Work sheet and operating instructions

WS + OI baelz 231/2-J

1. General information

Even in the high-tech age of microprocessors and software, as available in the products baelz 4000 to baelz 7000, the purely electromechanical double thermostat "Pilot" is still being selected or even preferred by control engineers. Thanks to the best electromechanical elements, this is a reliable and low-priced Bälz controller for the wide field of on site applications. Nothing seems more appropriate than to use the physical law of expansion of bodies with temperature increase for control tasks by means of contactors. This use has proven its worth in experiments and practical experience. It would be one-sided to always see only the newest in the everyday life of control technology. When installed correctly and handled carefully, the "Pilot" will provide decades of reliable service for decentralized temperature control, whether as a controller, monitor or limiter.

Rod thermostats of this series use the volume expansion constant. The temperature measurement is based on the expansion difference between the volumes. The contactors are therefore precision measuring instruments and must be handled properly. **Please observe the warnings !**

Safety note Physical and toxicological properties of the substances which may escape in the event of a system break:



Caution!

Scale value	Dangerous reaction	Danger of fire and explosion		Water pollution hazard	Toxicology		
		Ignition temperature °C	Explosion limit Vol. %		irritant	Health hazard	toxic
Filled with liquid							
< +200^C	no	+355^C	0,6 – 8	yes	yes	1	no
≥ +200 ≤ +350^C	no	+490^C	- -	yes	yes	1	no

¹ If the measuring system breaks, the filling liquid can escape. At present there is no restrictive statement from the health authorities concerning any danger to health over short periods and at low concentration, e.g. in the event of a measuring system break.

Self-monitoring for safety temperature limiter STB and safety temperature monitor STW

If the measuring system is destroyed, i.e. if the expansion liquid escapes, the pressure in the diaphragm of the STB and STW (STB) drops and permanently opens the circuit. A reset is no longer possible.

If the sensor cools down to a temperature below -10°C, the circuit is also opened; if the temperature rises above -10°C, the STB must first be reset manually by pressing the restart button.

The STW (STB) is switched back on automatically.

2. Installation

The double thermostat must be installed on the side where the greatest temperature fluctuation occurs. Depending on the control task, this is either close to the heat source or close to the point where heat is extracted. The thermostat can be used in any required position. The active length of the sensor rod must be completely immersed in the fluid to be controlled. Installation in corners or angles of containers should be avoided, because the lack of circulation delays temperature changes here. When controlling the temperature of air or gases these fluid should be kept moving. Please comply with these instructions, otherwise the switching differential will increase and the setpoint temperatures will be incorrect.

Installation in closed containers, pipes, etc. may only be carried out with the supplied protection tube.

For installation, the double thermostat is pulled off the protection tube and the tube is screwed or sealed in position. The double thermostat is then inserted in the tube again and fixed with the fixing screw on the side. Please also note the technical data and installation examples for installation and operation.

The temperature sensor must be completely immersed in the measuring fluid to ensure correct measurement of the temperature. With an immersion tube length (dimension "S" of the protection tube) of 150 mm, at least 80 mm of the sensor must be surrounded by the fluid to be controlled. Please refer to Technical Data for details.

The protection tube is fixed with a fixing screw. The protection tube has a screw-in spigot form A according to DIN 3852/2.

For electrical connection, the housing cover must be opened by loosening two lead-sealable cheese head screws.

Only a qualified electrician may carry out the electrical connection. Screw connection up to 2.5 mm² wire cross-section. Please observe the wiring diagrams in the housing cover. When replacing the housing cover, make sure that the plastic seal is correctly seated in the lower part of the housing.

Tighten the two lead-sealable cheese head screws carefully.



Caution!

Subject to technical changes

Refer to protection notice ISO 16016

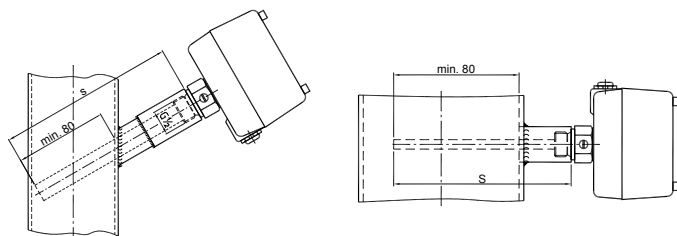
Work sheet and operating instructions
WS + OI baelz 231/2-J
3. Installation examples

The function is ensured in every installation position.

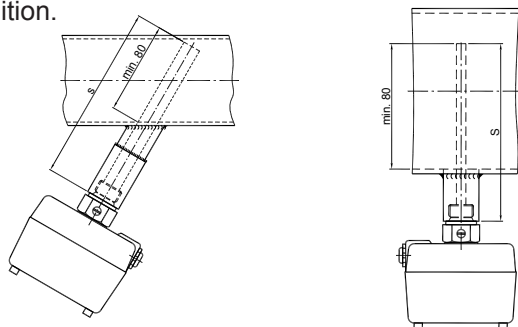
The installation position can also be independent of the flow direction of the fluid.

Some installation examples are shown here.

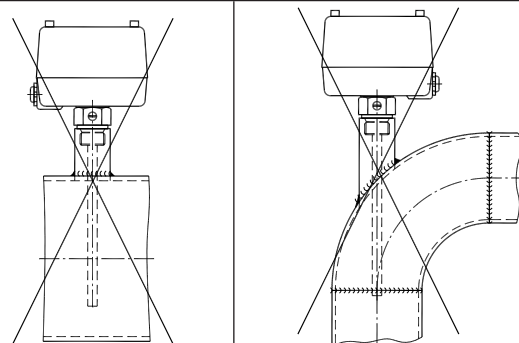
The specified installation length (min. 80 mm) refers to the control and limit value range +20°C ... +150°C



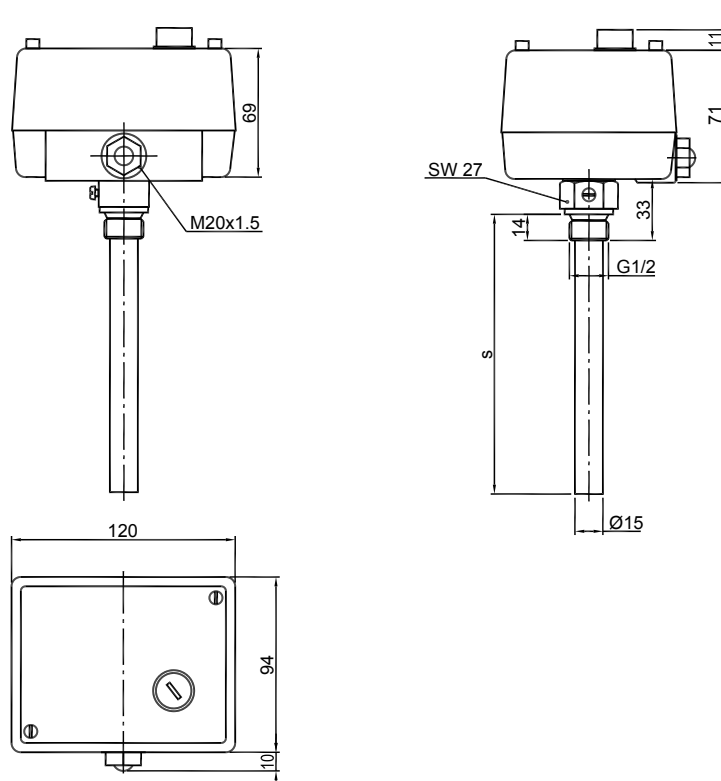
Caution! The ingress protection rating may no longer be guaranteed if the device is installed in a suspended position.



Thermostat too close to fluid
- radiant heat upwards -
perm. ambient temperature at the thermostatic head:
max. 80°C



Type	Setpoint range °C	s mm
baelz 231/2-J-W-15-fs-VA-150	20...150	150
baelz 231/2-J-W-30-fs-VA-150	20...150	300
baelz 231/2-J-W-30-fs-VA-250	50...250	300

4. Dimensional drawing


Installation length "s" = 150 / 300 mm

Work sheet and operating instructions

WS + OI baelz 231/2-J

5. Sensor installation

Cutting through or kinking the capillary of the double thermostat will lead to permanent device failure!

The temperature sensors (2) must be fully immersed in the fluid, otherwise greater switching point deviations will occur.

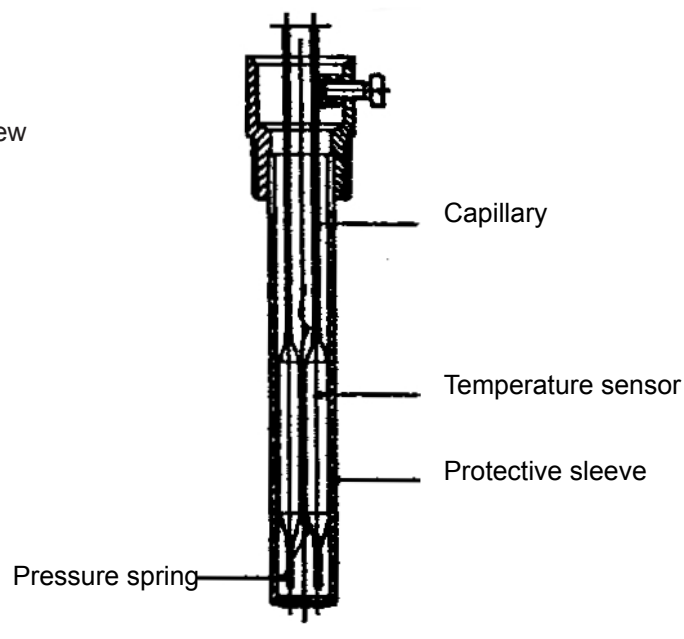
The temperature sensor must be installed in the factory-supplied protective sleeves – otherwise the approval of the surface-mounting thermostat expires and the general response accuracy cannot be guaranteed.

If 2 sensors are used, the factory-supplied pressure spring must be installed in the protective sleeve.

When used in air, a process connection without protective sleeve must be selected.

Execution of the protective sleeve:

Screw-in pocket with screw-in spigot, form A acc. to DIN 3852/2 with fixing screw



Permissible load capacity of the protective sleeve



Caution!

The following values describe the maximum load capacity. The maximum sealable pressure depends on the installation conditions and may be lower.

Stainless steel protective sleeve

material	tube and nipple: X 6 CrNiMoTi 17 122
temperature	tube diameter D
	15 x 0,75 mm
	max. pressure
100°C	50 bar
150°C	48 bar
200°C	45 bar
300°C	39 bar
400°C	36 bar

Permissible incident flow velocity: on inquiry

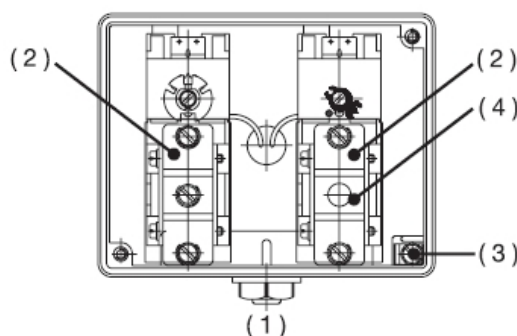
max. operating temperature*	with static load +400°C	without load +530°C
	*note max. operating temperature of the feeler in the with thermostat	

6. Electrical connection

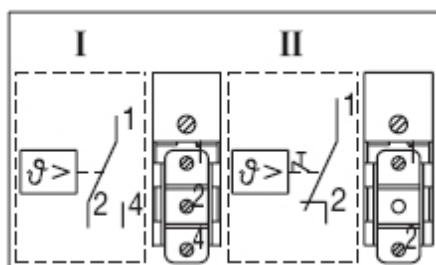
The device complies with protection class **I**.
Connections are suitable for fixed cables.
Cable routing without strain relief.

Open the housing:

- Loosen the cover screws.
- Remove upper part of housing.
- Pass the connection pipe (diameter 5 to 10 mm) through the screw connection (1).
Fitting type "X" (no special tools), screw connection up to 2.5 mm² wire cross-section.
- Establish the connection to terminals (2) according to the wiring diagram on the housing cover.
- Connect protective earth to terminal "PE" (3).
- Make sure the restart button (4) can move freely.



The connection is made according to the wiring diagram below.



Electrical connection diagram

System I: with changeover contact

Switching function: STW

System II: with changeover contact and restart lockout

Switching function: STB



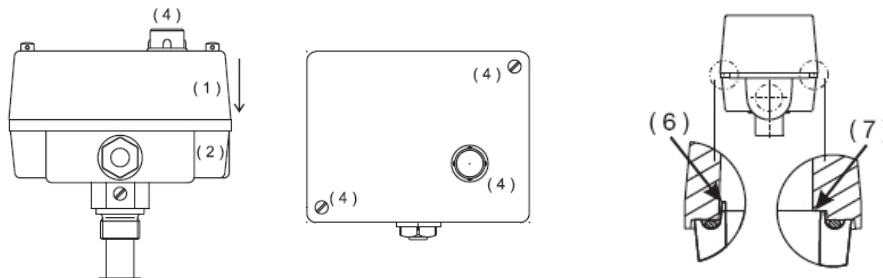
Caution!

Instructions and notes

- The electrical connection may only be carried out by qualified personnel.
- The choice of cable material, the installation and the electrical connection of the device must comply with the regulations of VDE 0100 "Regulations for the installation of power circuits with nominal voltages below 1000 V" or the relevant local regulations.
- Disconnect the device completely from the mains if live parts can be touched during work.
- Earth the device at the PE terminal to the protective earth.
This cable should have at least the same cross-section as the supply cables.
Earth cables must be run in a star configuration to a common earth point which is connected to the protective earth conductor of the supply.
Do not loop earth cables, i.e. do not run them from one device to another.
- In addition to faulty installation, incorrect settings on the thermostat may also impair proper functioning of the subsequent process or lead to damage.
Please observe the relevant safety regulations in this context.

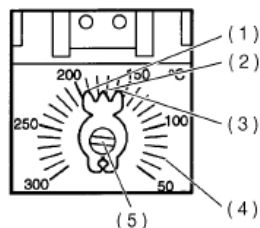
Work sheet and operating instructions
WS + OI baelz 231/2-J
Closing the housing

- Check the plastic seal in the lower part of the housing (2) for correct seating.
- Position the housing cover (1) so that the reinforcing rib (7) on the inside of the cover is opposite the tongue (6) on the lower part of the housing.
- The restart button (4) must be located precisely on top of the internal restart button of the microswitch since this is the only way the restart button (3) can be operated from the outside.
- Place the upper part of the housing (1) on the lower part (2).
- Tighten the lead-sealable cheese-head screws (5).

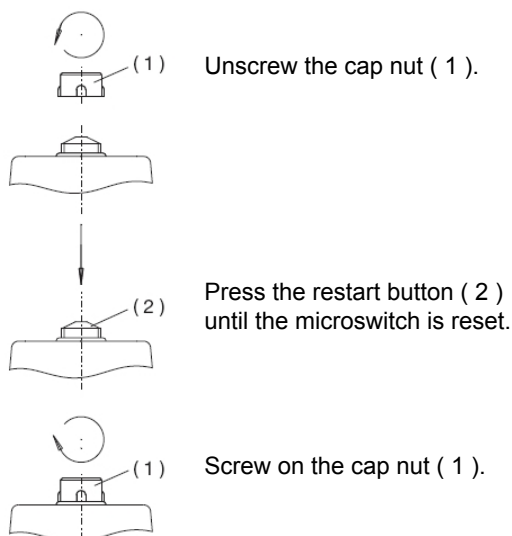

7. Adjusting the temperature setpoint for baelz 231/2-J
Safety Temperature Limiter (STB) and Safety Temperature Monitor (STW)

After removing the housing cover, adjust the setpoint on the scale with a screwdriver.
Please replace the housing cover and tighten the cheese head screws.

- (1) upper stop
- (2) setpoint indicator
- (3) lower stop
- (4) scale division
- (5) setpoint setter


Resetting the STB

After the temperature has fallen below the set limiting value (critical temperature) by approx. 10% of the scale range, the microswitch can be reset.


Caution!
Using the STW (STB) as STB

The required reclosing lockout must be guaranteed by the subsequent circuit. This circuit must comply with VDE 0116.

8. Technical data

Housing : cover polycarbonate, impact-proof; lower part die-cast aluminum, painted

Ingress protection rating: IP 54 - EN 60529

Contact type STW : changeover, fs

Contact type STB : changeover contact and restart lockout

Cable entry : clamping gland M20 x 1.5, sealing area 8 - 10 mm

Sensor: copper (Cu-DHP), Ø 6 mm

Protection tube : Ø15 x 0.75 mm, stainless steel 1.4571

Immersion tube lengths : 100, 120, 150, 200, 300 mm

Connection : G 1/2, screw-in spigot form A acc. to DIN 3852/2 with fixing screw

Compressive strength: stainless steel 1.4571 50 bar at 100°C

stainless steel 1.4571 48 bar at 150°C

stainless steel 1.4571 45 bar at 200°C

stainless steel 1.4571 39 bar at 300°C

Setpoint range : depending on selection, see table Control and limit value range

Max. perm. sensor temperature : depending on selection, see table Control and limit value range

Switching differential : 4 - 6 % of control and limit value range

Switching capacity : AC 230 V +10%, 10 (2) A, $\cos \varphi = 1$ (0.6)

DC 230 V +10%, 0.25 A

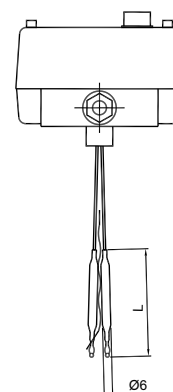
Weight : approx. 0.8 kg

Control and limit value ranges

filled with liquid			
switching function	control limit ranges in °C	max. feeler temperature in °C	length of feeler, dimension „L“ in mm feeler Ø d = 6 mm (standard)
STW and STB	+30 ... +110	135	108
	+60 ... +130	150	116
	+20 ... +150	175*	77
	+50 ... +250	290*	64
	+50 ... +300	345*	55

*For sensor temperature >150°C please use protection tube with intermediate piece (form UZ).

The sensor with the length dimension "L" must be fully immersed in the flowing fluid so that the sensor temperature can be accurately measured or monitored.



Switching differential at STW: 4...6% of the control range

The STB has no switching differential.

The electric circuit remains interrupted after the danger temperature has been reached.

The reset can be carried out manually only once the set danger limit value has been fallen below by 10% of the temperature range.

Switching point inaccuracy in % of control and limit value range:

in the upper third of the scale $+0/-5\%$.

at the beginning of the scale +0/-10%

Ambient temperature influence in relation to control and limit value range:

A deviation of the ambient temperature at the thermostatic head from the +22 °C calibration ambient temperature will result in a shift of the switching point.

Higher ambient temperature = lower switching point

Lower ambient temperature = higher switching point

For temperatures with scale limit: $< +200^{\circ}\text{C}$ $\geq +200^{\circ}\text{C} \leq +350^{\circ}\text{C}$

Influence on the switch head:	0.17%/K	0.13%/K
-------------------------------	---------	---------

Permissible ambient temperature : thermostatic head max. +80°C, min. 0°C

Mounting positions (NL) : according to DIN 16257, NL 0 ... NL 90 (other NL on inquiry)

Storage and transport temperature : -50 to max. +50°C

Work sheet and operating instructions
WS + OI baelz 231/2-J

Max. permissible switching capacity: AC 230 V +10%, 10 A, $\cos \varphi = 1$
AC 230 V +10%, 2 A, $\cos \varphi = 0.6$
at switching differential 1.5% and 2%: AC 230 V +10%, 6 A, $\cos \varphi = 1$
AC 230 V +10%, 1.2 A, $\cos \varphi = 0.6$

Required fuse protection (max. switching current): AC 230 V +10%, 10(2) A, $\cos \varphi = 1$ (0.6), DC 230 V +10% 0.25 A
Overvoltage category II

Contact reliability: To ensure the highest degree of switching reliability, we recommend a minimum loading of:
AC/DC 24 V, 20 mA (silver contact)

Operating medium: water, oil, air, hot steam

Time constant $t_{0.632}$

in water	in oil	in air / hot steam
≤ 45 s	≤ 60 s	≤ 120 s

Protection tubes

with fixed shaft	scale end value up to 150°C protective tube U (standard)	scale end value up to 150°C protective tube UZ
	protective tube with mit screw-in spigot G ½ form A acc. to DIN 3852/2	protective tube with mit screw-in spigot G ½ form A acc. to DIN 3852/2 and spacer, so that the max. ambient temperature of +80°C at the casing is not exceeded
material	X6 CrNiMo 17 122 (1.4571)	
fitting length „S“	Standard lengths: 100, 120, 150, 200, 300 mm other lengths upon request	
immersion rod Ø	D = 15 mm	

9. Marking

Name plate (example)

