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Installation and Operating Instructions

INSTAT 868-r1

Radio Thermostat



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1 Application

The electronic *INSTAT 868-r1* room temperature controller (radio transmitter) may be used as:

- an individual room temperature controller, see Fig. 1 or
- a zone controller for dwellings and offices, see Figs. 2, 3 (in conjunction with the *INSTAT 868 RF*-clock thermostat)

It is designed to provide control for

- oil and gas hot-water heating systems
- actuators for radiator heating
- electric floor or direct heating
- circulating pumps, see Fig. 4, etc.

An *INSTAT 868-a1*, *INSTAT 868-a4* or *INSTAT 868-a6* (1-, 4- 6-channel) radio receiver is required for operation.

2 Features

- No controller wiring-up required
- Very simple operation by means of adjustment knob
- Temperature setback (by radio) via *INSTAT 868-r1* clock thermostat possible
- Zone control by radio possible
- Suitable for radio-controlled pump logic
- Mode selector switch for
 - permanent comfort temperature
 - permanent setback temperature
 - permanent Off
 - automatic mode (time control by means of *INSTAT 868-r* master controller, with 2 setback values)
- variant without mode selector switch
- variant for heating or cooling (2-pipe systems)
- energy-saving/timer/party mode for switching on the heating system for a limited period of time
- valve/pump protection (is activated every day for a short period of time)
- a transmitter can control any number of receivers
- self-learning address setting
- transmitter suitable for all *INSTAT 868-a1*, *-a4*, *-a6* (1-, 4-, 6-channel) receivers
- power supply via 2 commercially available batteries
- Housing: pure white in the new EBERLE 2000 design

3 Function description

The *INSTAT 868-r1* room temperature controller detects an actuating signal independently of a variable set temperature. This signal is transferred to a radio receiver by radio data transmission (*INSTAT 868-a1*, *-a4*, *-a6*). The final control elements for heating and cooling applications are switched by means of this receiver (230 V). There are plans to use the transmitting frequency used all over Europe for that type of application.

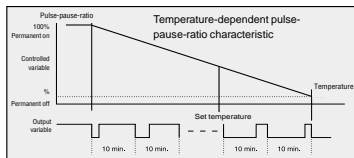
The transmitting power is very low. It is far below the power of a mobile telephone. Moreover, the transmitter is activated only every 10 min. The transmission quality is enhanced by employing special test procedures and repeating transmissions. Transmitter and receiver are tuned to each other by making use of the "learning mode".

3.1 Control mode

The controller supports two control modes which can be selected via jumper BR 3.

Fuzzy mode with PWM:
This mode is very similar to a continuous-action control. It is particularly suitable for electrothermal actuators, electric heaters and pumps.

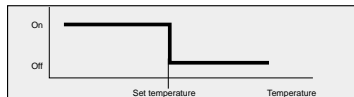
The controlled variable calculated from the difference between set and actual temperature is displayed as a variable pulse-pause-ratio (pulse width modulation =PWM).



The sum of pulse and pause times is constant and equals 10 min. In the case of larger temperature differentials, the controller switches permanently on or off, e.g. in the case of a temperature setback. The control algorithm used attempts to keep the room temperature constant without taking account of the switching differential. For that purpose it is necessary that heat be called (however, to a lesser extent) even if the set temperature has already been reached.

ON-OFF mode:

The heating system works at 100 % capacity until the set temperature is reached. Above this temperature, the heating system is switched off. This mode is used where frequent switching is to be avoided, say, in the case of burner control or if a rise in temperature above or a fall in temperature below a predetermined limit is to be signalled.



In the case of inexplicable malfunctions, the reset button should be pressed.

3.2 Mode selector switch (☉ ☼ ☽ ☾)

The following modes of operation can be set by means of this switch:

- ☉ Automatic mode
- ☼ Permanent comfort temperature
- ☽ Permanent setback temperature
- ☾ OFF

Thermostats, which are not equipped with a mode selector switch, always control in accordance with the ambient temperature set.

☉ Automatic mode (master / slave):

In this mode, the *INSTAT 868-r1* acts as a slave. The *INSTAT 868-r* clock thermostat acts as the master. This is equivalent to zone control. The room temperature is modified depending on the time of the day. The switching times are preset by the *INSTAT 868-r1* radio thermostat with the following 3 different temperature steps:

- 1 Comfort
 - 2 Standard (comfort temperature reduced by 2 K)
 - 3 Setback (comfort temperature reduced by 4 K).
- For details see receiver instruction.

Notes:

- This function is working only if the "master/slave" mode is active on the receiver.
- If receiver is not operating in "master/slave" mode, comfort temperature is used.
- In case of losing slave, receiver is operating in alarm mode.
- In case of losing master, comfort temperature is used.
- The earlier heating start has to be noticed (due to master self learning heating curve)

☼ Permanent comfort temperature:

The comfort temperature selected on the adjustment knob is maintained permanently.

☽ Permanent setback temperature:

The temperature selected on the adjustment knob is permanently reduced. There is no change in the time setting. The setback value (-2 K, -4 K) can be selected in the thermostat by means of jumper BR 2.

☾ OFF:

There is no control action. The radio transmission to the receiver, however, remains active. Function 3.4 ... timer ... is possible

Note:

If the batteries are removed for more than one hour, the receiver changes to alarm mode, the heating system operates at 30 % capacity.

3.3 Changeover from heating to cooling (and vice versa)

(Available only with special variants)
The switch for changeover is located under the flap. Thus, the controller can be switched from summer to winter mode (and vice versa). The energy-saving steps "standard" and "setback" exceed the comfort temperature by +2 K or +4 K respectively in the cooling mode.

- ☀ Heating: as temperature rises, energy consumption is reduced
- ☁ Cooling: as temperature rises, energy consumption is increased

Note:

If the master/slave mode is used, the master must also be switched to heating/cooling.

3.4 Energy-saving/timer/party mode

For activating the comfort temperature for a limited period of time.

The switch-on-time can be selected freely from 1 up to 15 hours (in one-hour steps). After this period of time has elapsed, the controller switches again to the state selected on the mode selector switch (☉, ☽ or ☾).

☉ Automatic mode (= party function):

The comfort temperature is activated for the duration of the timer operating time.

☽ Comfort mode

The timer has no effect (no flashing of the indicator lamp)

☾ Setback temperature (= energy-saving mode):

The timer causes switching between comfort temperature and selected set back temperature.

☉ OFF (energy-saving mode)

Timer causes switching between comfort-temperature and "off".

Activating the timer:

- Every time the \bar{X} -button is pressed, the timer operating time is increased by one hour.
- Pressing once = 1 hour, pressing twice = 2 hours ...
- Pressing 15 times = 15 hours,
- pressing 16 times = 15 hours

Each time the push-button is pressed, the indicator lamp will light up briefly. If it is pressed more than 15 times, the time setting will remain unchanged at 15 hours. The lamp will no longer light up.

The button should be pressed in rapid succession. If not pressed for more than approx. 15 sec. setting will start again at one hour.

Termination:

- pressing the reset button or
- the timer is switched off when the position of the mode selector switch is changed.

3.5 Valve protection

This function prevents valve sticking e. g. during summer time (inclusion of particles). This protective function is activated every day for approx. 3 min. It is repeated every 24 hours, calculated from the last use of the reset button.

This function can be switched off by means of jumper BR 1, e. g. in the case of electric heating systems.

3.6 Function of indicator lamp

The following functions are indicated by means of this lamp:

Learning mode is lit during the learning mode
Timer activation short flash when pressing the push-button

Battery weak short flash every 15 sec.
After reset short flash (sign of proper functioning)

3.7 Jumper function

Jumper	Closed	Open
BR 1	Valve protection ON	Valve protection OFF
BR 2	Temperature setback 4 K	Temperature setback 2 K
BR 3	Fuzzy	on/off action

3.8 Battery change

If the indicator lamp lights up briefly every 15 sec., the batteries must be changed within the next few days (under the hinged lid).

Observe correct polarity.

Please use the type of battery specified under section 6. "Technical data". The quality of the battery determines its life.

Following a replacement of batteries, the controller will continue to operate in its previously selected function.

If the timer is operating it will be cancelled.

4 Installation

The temperature sensor can be arranged within the room where it is considered best by the user. However, for perfect temperature control it is reasonable to arrange the sensor at a position which:

- is easily accessible for operation
- is free from curtains, cupboards, shelves etc.
- enables free air circulation
- is free from direct sun radiation
- is free from draughts (e.g. opening of windows and doors)
- is not affected directly by the source of heat
- is not located on an external wall
- is located approx. 1.5 m above floor level
- permits safe radio transmission
 - is not in the vicinity of e. g. a radio receiver, a television set or a radio transmitter
 - is not in the vicinity of metal parts e. g. metal doors, metal cupboards, mirrors or steel-reinforced concrete
 - if unsure, check radio transmission before installation (see receiver instructions, section "Radio range test"), look for suitable position if necessary.

Installation is to be carried out in the following sequence:

- remove temperature adjustment knob
- loosen retaining screw
- remove housing top

Note:
Discharge static charge of human body before touching electronic equipment for repositioning jumpers, e. g. by briefly touching heat or water pipes.

5 Commissioning

Upon installation, a connection must be made between controller (transmitter) and receiver. For application examples, see receiver instructions.

To do so, proceed as follows:

1. Activate "learning mode" on the receiver (see there).
2. Activate "learning mode" on the transmitter as follows:
 - a) Hold the **X** button depressed.
 - b) Briefly press the reset button.
 - c) When the indicator lamp lights up, release the **X** button. When the connection has been successfully made, the indicator lamp automatically extinguishes (after approx. <1 min.).
 - d) Press the reset button on the transmitter. This will terminate the "learning mode" and the indicator lamp will extinguish.

Attention: Keep a distance of more than 2 m between transmitter and receiver.

Note:

When the learning mode is activated, the link with the receiver is canceled first. The transmitter exits the learning mode after 10 min.

The temperature controller is now ready for operation. When testing the radio transmission, please observe also the relevant receiver instructions.

5.1 Performance testing

The receiver has to be in the switching mode. After pressing the reset button, the transmitter changes to testing mode for 15 sec., different flashing signals are transmitted to the receiver depending on the position of the mode selector switch.

The flashing starts with a pause.

☀ Permanent comfort temperature

The receiver flashes 3 times

☾ Permanent setback temperature

The receiver flashes depending on the setback temperature set (see 3.7 Function of the jumpers)

2 times for a 2 K temperature setback

1 time for a 4 K temperature setback

⊕ Automatic mode

The receiver flashes depending on the current time zone of the master:

3 times for comfort temperature

2 times for standard temperature

1 time for setback temperature

⊖ OFF

The receiver does not flash.

Manual activation of receiver output

(not in OFF position):

In the case of a temperature differential exceeding 3 K (e. g. 30 °C or 5 °C), the receiver will be switched on or off within 30 sec.

Switching on:

Set a temperature of 30 °C, wait approx. 30 sec.

Switching off:

Set a temperature of 5 °C, wait approx. 30 sec.

6 Technical data

Order No.	INSTAT 868-r1
EDP No.	0536 10...
Temperature setting range	5 ... 30 °C
Operating voltage	battery: 2 microcells alkaline (LR03), 2 x 1,5 V = 3 V
Battery lifetime	approx. 3 years
Control mode	fuzzy logic with PWM
(selectable)	on-off action
PWM cycle time	approx. 10 min. (sum of on and off times)
Measurement interval	approx. 10 min.
Indicator lamp	red, see 3.6
Mode selector switch	Function of indicator lamp
depending on variant	time switch / comfort / setback / OFF heating / cooling
Temperature setback/increase	
by means of mode switch	by approx. 2 K or 4 K (via jumper)
master	by 2 K and 4 K
Timer	1 ... 15 h
Valve protection	every 24 h (can be switched off)
Temperature sensor	in the controller
Carrier frequency	868,95 MHz
Modulation mode	FM
Antenna	internal
Transmission interval	<10 min. (radio data transmission several times)
Typical range is	100 m free air or 1 ceilings or 3 walls respectively
Degree of protection provided by enclosure	IP 30 (moisture condensation not permitted)
Class of protection	III
Operating temperature	-25 ... 40 °C
Storage temperature	-25 ... 70 °C
Range narrowing	in adjustment knob
Weight (without battery)	approx. 100 g

7 Short form operating instructions

	See	
Preparatory work	3.7 4	<ul style="list-style-type: none"> • Set jumpers according to their function • Insert battery • Install controller
Make radio link	5	<ol style="list-style-type: none"> 1. Hold X button depressed 2. Briefly press reset button 3. When indicator lamp lights up, release X button 4. when the radio link has been successfully made, press reset button.
Check transmitter function	5.1	After pressing the reset button, output switches <ul style="list-style-type: none"> • three times • twice = temperature setback 2 K; once = temperature setback 4 K • three times = comfort, twice = standard, once = temperature setback • not
Switch receiver output	5.1	<ul style="list-style-type: none"> • set a temperature of 30 °C, wait for 30 sec. • set a temperature of 5 °C, wait for 30 sec.
Set mode of operation	3.2	<ul style="list-style-type: none"> • permanent comfort temperature • permanent setback temperature (-2/4 K) • automatic mode by using master • OFF
Timer activates comfort temperature for a limited period of time	3.4	<ul style="list-style-type: none"> • press X button once for every hour, indicator lamp flashes • press reset button to terminate
Check for correct operation		Press reset key → LED lights up briefly → receiver switches (see 5.1)

8 Application examples

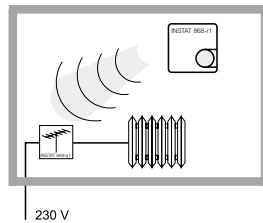


Fig. 1: One transmitter controls one receiver

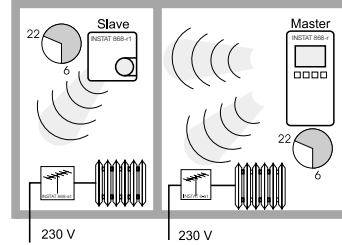


Fig. 2: Simple master/slave mode

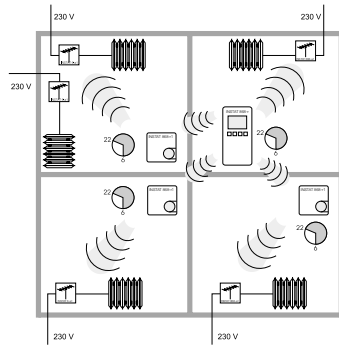


Fig. 3: Time control with one master and slave controllers

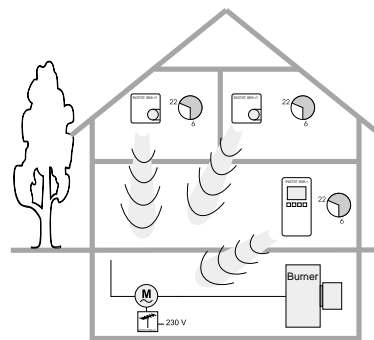
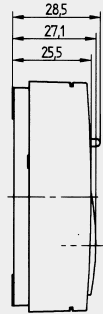
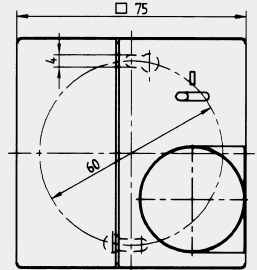


Fig. 4: Pump logic with master and slaves

9 Dimensions



RF approval has been obtained in the following countries:
Germany, France, Great Britain, Belgium, Netherlands, Luxembourg, Norway, Denmark, Sweden, Switzerland, Finland, Spain, Italy, Austria, Ireland, Island, Portugal.

CE 0125 !

Note:

In some rare cases it may not be possible to establish a permanent radio link between the radio transmitter and the radio receiver. The cause of this would not be in our radio control system, but in the frequency range to be used. We therefore recommend that the reliability in operation at the specific location be checked. In particular the operation of a radio headphone may be the cause of radio interference.

Subject to change without notice