

Data Sheet

FED Sensors - Sequence Control of Cooling and Heating Circuit

Products



FED-WIF with integrated sensor



FED-FF with remote sensor

The FED sensors are used in applications in which a cooling and a heating circuit are to be controlled by one controller.

Both FED-IF and FED-FF sensors can be applied to chilled ceilings, fancoils and induction units. For control of cooling and heating circuits in fan-coil and induction units use the FED-FF with remote sensor.

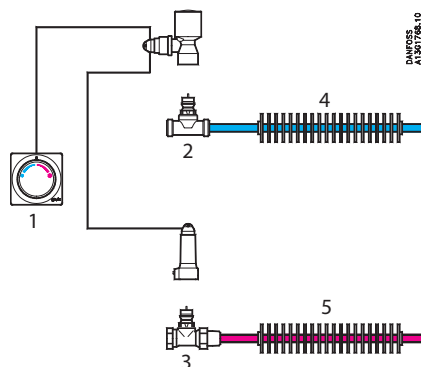
By placing the sensor in the air inlet a quicker reaction time of the air temperature changes is achieved. Using the remote sensor, the remote temperature adjuster can be placed directly on the cabinet.

Ordering and Specifications

Type	Sensor	Capillary tube	Setting range	Code no.
FED-IF	Integrated	7 + 8 m	17-27 °C	013G5461
FED-IF	Integrated	4 + 11 m		013G5463
FED-IF	Integrated	6 + 11 m		013G5469
FED-FF	Remote	2 + 2 + 2 m		013G5462

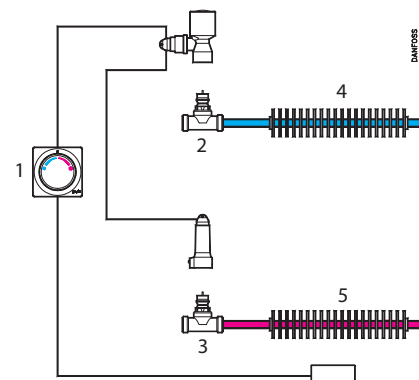
Application

Sequence control of chilled ceiling and radiator



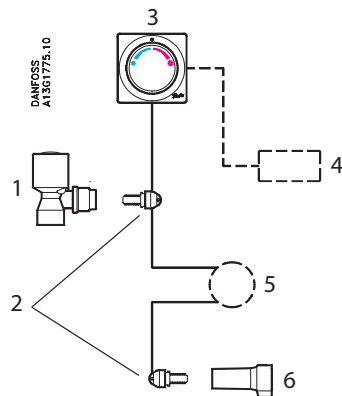
1. FED-IF
2. RA-C
3. RA-N
4. Cooling circuit
5. Heating circuit/radiator

Sequence control of fancoils and induction units



1. FED-FF
2. RA-C
3. RA-C / RA-N
4. Cooling circuit
5. Heating circuit

FED Sensor Design



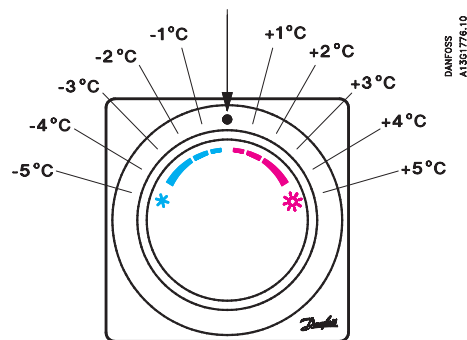
1. Cooling adapter
2. Actuator
3. Remote temperature adjuster
4. Remote sensor (only FED-FF)
5. Capillary reel (only FED-IF)
6. Heating adapter

The FED sensors are applied with the RA-N and the RA-C valves.
The FED sensors are equipped with a reverse device for the control of cooling circuits. With the reverse device the valve in the cooling circuit will

open when the temperature rises above the setpoint temperature. The valve in the heating circuit will open when the temperature falls below the set-point temperature.

Temperature Setting

Comfort temperature $\sim 22^\circ\text{C}$ at $X_p = 0\text{K}$



The FED sensors have been developed for room temperature control via water-based cooling and heating systems.
The FED sensors are based on the self-acting principle. The liquid-filled sensors control the valves via capillaries and adapters.

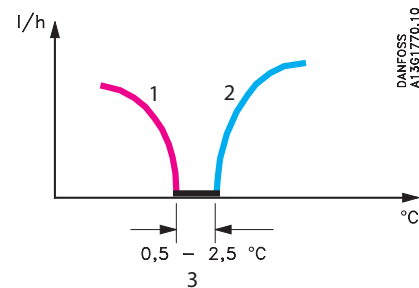
The scale above shows the approximate set-point offset from the standard comfort temperature which is approximately 22°C at $X_p = 0\text{K}$.

Sequence Control

The temperature control is done by the sensor, in which a neutral zone is built-in.
In the neutral zone neither an activation of the valve in the heating circuit nor of the valve in the cooling circuit takes place. This way it is secured that cooling and heating do not take place simultaneously.

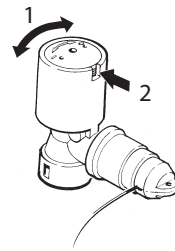
Sequence control of cooling and heating circuit

The neutral zone is in the area from $0.5 - 2.5^\circ\text{C}$, depending on the system design.
If the differential pressure is high on both circuits ($\sim 0.6\text{ bar}$), the neutral zone is at a minimum. On the other hand, if the differential pressure is low on both circuits ($\sim 0.1\text{ bar}$), the neutral zone is at a maximum.



1. Water flow through heating circuit
2. Water flow through cooling circuit
3. Neutral zone

An adjustment of the neutral zone can be made by turning the knob of the cooling adapter with a pair of pointed pliers. Turning clockwise, the neutral zone is increased, turning counter-clockwise the neutral zone is decreased. The factory setting of the neutral zone is marked in the knob recess.

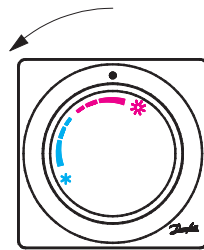


- 1. Adjustment of the neutral zone
- 2. Factory setting mark

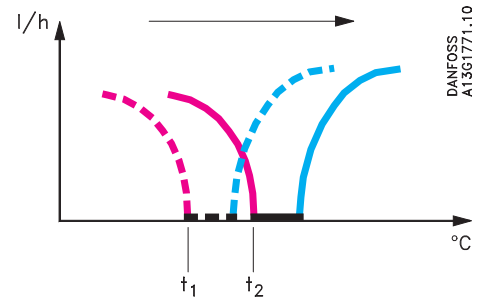
Irrespective of the temperature setting of the FED-sensor the necessary neutral zone will always be kept.

See also figures below.

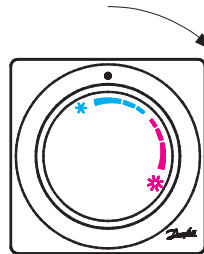
Setting of comfort temperature, example: hotter $t_1 \Rightarrow t_2$



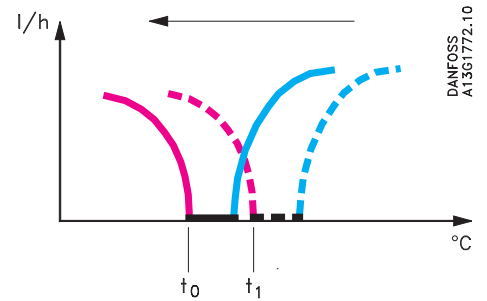
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Setting of comfort temperature, example: hotter $t_1 \Rightarrow t_0$



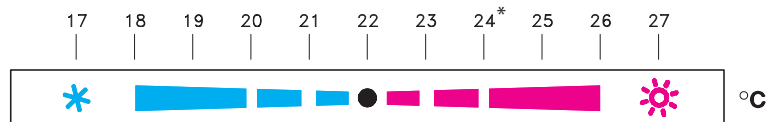
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Temperature Control Through Sequence Control with FED Sensor

a) Control of heating circuit - FED with RA-N valve

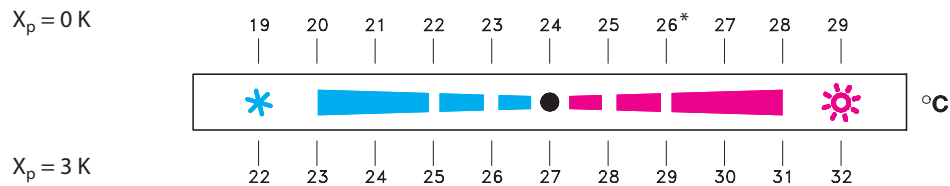
$X_p = 0 K$



$X_p = 2 K$



b) Control of cooling circuit - FED with RA-C valve



**Note!*
 Example at neutral zone = 2 °C
 Setpoint = 22 °C

The FED sensor controls in sequence via two temperature scales: one for the heating circuit (a) and one for the cooling circuit (b).

When the setting knob is turned a parallel control of both temperature scales is taking place. The neutral zone ensures that cooling and heating do not take place simultaneously.

A setting in the red temperature area means that the set point of both cooling and heating circuit is raised.

A setting in the blue temperature area lowers the set point of both cooling and heating circuits.

Example

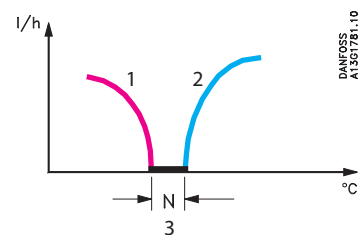
The setting knob is turned to increase the room temperature with 2 °C from 22 °C to approximately 24 °C at $X_p = 0$ K on the heating valve. Due to the neutral zone the set point of the cooling valve at $X_p = 0$ K will be between 0.5-2.5 K higher, depending on the system design.

The valve in the heating circuit will open at a sensor temperature below 24 °C. If a RA-N valve is mounted in the heating circuit and dimensioned at the presetting N, the RA-N valve will provide full water quantity at a P-band of 2 K, i.e. a sensor temperature of 22°C.

If the neutral zone e.g. is 2 K, the valve in the cooling circuit will start opening at a sensor temperature above 26 °C (setpoint: 24 °C + neutral zone: 2 K).

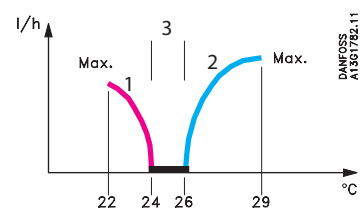
With a RA-C valve in the cooling circuit (dimensioned at presetting N) the valve will provide full water quantity with a P-band of 3 K, i.e. at a sensor temperature of 29 °C (setpoint: 24 °C + neutral zone: 2 K + P-band: 3 K).

Sequencing with FED thermostat



1. Waterflow, heating
2. Waterflow, cooling
3. Setpoint on knob (N = neutral zone)

Sequence control when rising the setpoint temperature with 2 °C



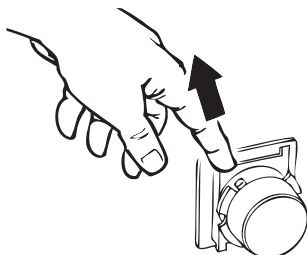
1. Waterflow, heating
2. Waterflow, cooling
3. Nneutral zone

Limiting the Set Temperature of FED Sensors

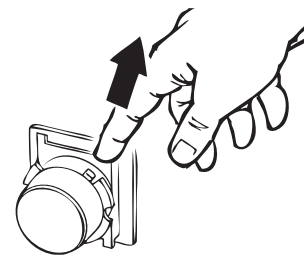
The set temperature of the remote temperature adjuster depends on the sensor type and the valves, which are used with the sensors.

It is easy to limit or lock the set temperature by means of the built-in locking/limiting device.

Minimum limitation of temperature area

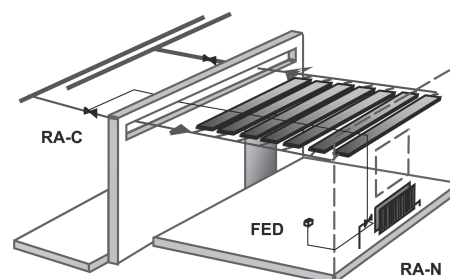
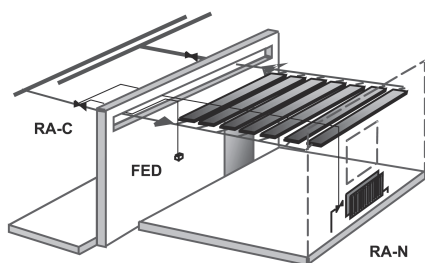


Maximum limitation of temperature area



Serial Coupling

Several possibilities of placing the FED remote temperature adjuster



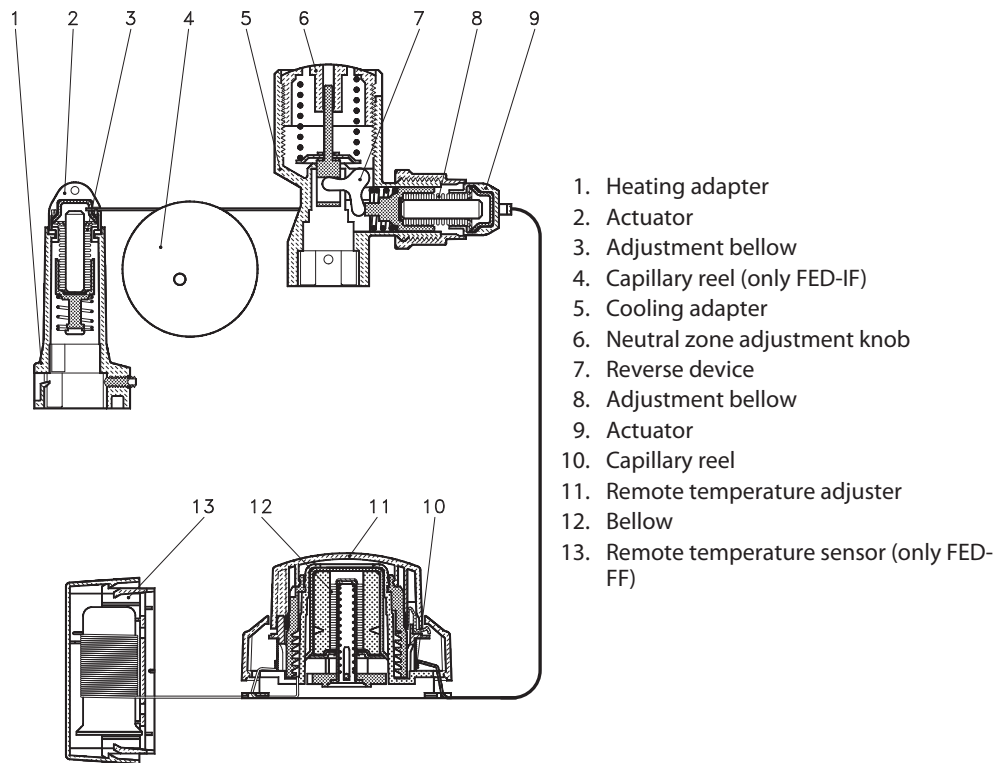
Via the soft but strong $\varnothing 0.8$ mm capillary and the patented serial coupling of capillary and adapters it is possible to control two valves in sequence.

It is easy to change the order of the valves: Just loosen the actuators from the adapters and exchange the adapters. The FED sensor still controls in the right sequence.

The FED sensors are delivered with the cooling adapter closest to the remote temperature adjuster and the heating adapter furthest away from the remote temperature adjuster.

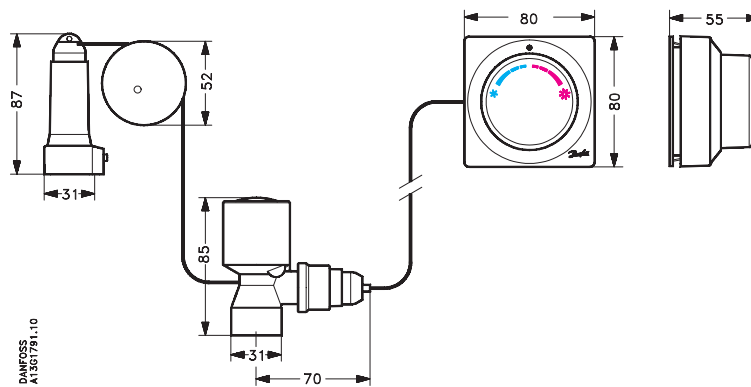
The interchange of valve adapters provide several different possibilities of placing the FED remote temperature adjuster.

Design

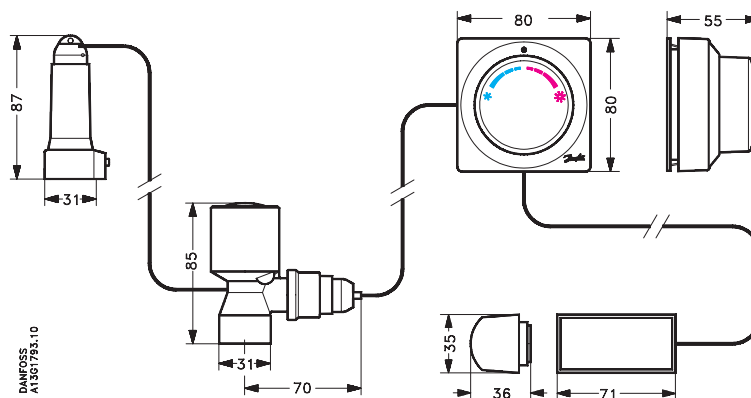


Dimensions

FED-IF



FED-FF



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