

## Save heating cost with Danfoss RA plus-w

- **Intelligent Thermostats are well suited for significantly saving heating costs in apartments and offices**
- **Setback-thermostats such as Danfoss RA plus-w are the best choice for rooms with permanently changing heating conditions such as apartments and offices in use. They offer a very long battery life time and do not impact the room climate in a negative way**
- **Electrical thermostats are well-suited for rooms which are used only occasionally such as garden houses or holiday apartments. Since temperature control is not needed permanently the battery power is saved for a reasonable battery lifetime.**
- **Investments in intelligent thermostats pay off within two heating periods.**

### Electrical versus Setback Thermostats

Heating costs are a significant portion of the total accommodation costs. Control of heating in a conventional system is done centrally by changing the temperature of the heating fluid according to the detected outdoor temperature. This system threads all rooms similarly and ignores the individual heating demand per room and per person. To control the heating in a room intelligently heating thermostats are required. They are available in two different fashions:

1. **Electrical thermostat:** An individual target temperature per room is set either by an internal switching clock or a by a master controller using a wireless connection. An internal temperature sensor controls an electrical motor to achieve and keep the target temperature
2. **Setback thermostat:** An individual convenience target temperature per room is set manually on the thermostats like in conventional heating thermostats. A setback to an energy saving temperature is triggered via a wireless connection from a controller. Both the convenience and the setback temperature are controlled and regulated with a mechanical system, similarly to conventional mechanical thermostats.

The advantage of the electrical thermostat is that it can be set to any temperature within a broad range, usually between 5 and 30 degree. However, the electrical control using a motor costs a lot of energy and reduces the lifetime of the battery to about one heating period.

Setback thermostats are optimized for long battery life (up to four years) since only the switching between convenience and energy saving setback mode is performed electronically and all other functions such as the temperature control itself and the setting of the convenience temperature is done in the conventional way using mechanics and local control. Also the turn-off function - called frost protection – is done manually and mechanically.

The optimal temperature in a room depends on multiple factors, such as clothing, number and mood of people in the room or time of the day. It is therefore useful to manually set the convenience temperature right on the heating device in the conventional way.

### Danfoss RA plus-w

The RA Plus-w from Danfoss is a setback thermostat. Convenience temperature and frost protection are set manually right on the device. The convenience temperature can be set between 16 and 28 °C. Via a wireless connection the thermostat can be switched in a energy saving mode (setback temperature) which is always about 4K lower then the convenience temperature which was chosen on the device. To ensure that the energy saving function is performed even without a central wireless



control up to four energy saving times per day can be preset in the thermostat. In case the wireless control is not active the RA plus-w will switch the modes independently. The energy saving times can always be changed and manually overwritten by pressing the button on the device. The two AA batteries last for up to four years. The unit will send a warning via wireless connection and give a local LED warning when batteries need to be replaced.

### Usage Scenario

The installation of intelligent thermostats is useful only in rooms where the heating requirement is changing. Rooms such as the sleeping room or the closet, which are not heated most of the time, can be controlled with a conventional mechanical heating thermostat with frost protection. In rooms such as kitchens, children's rooms, office or living room, which are used daily but not the whole day the installation of a setback thermostat such as Danfoss RA plus-w is highly recommended. Using usage hours the rooms are heated with the convenience temperature set

manually on the device. In off-hours the thermostat switches to an energy saving setback temperature. The 4K temperature difference, which is preset in the Danfoss RA plus-w, is a good compromise between the demand for maximum energy saving and the need to prevent negative impact to the room climate. If the temperature is set lower the reheating to the original temperature will lead to problems with humidity and wrong subjective heating perception causing unnecessary overheating. The manual control and adaptation of the convenience temperature in a room is known from conventional thermostats. This can be done intuitively by non-technical persons. It does not have any negative impact on the heating situation, since the temperature difference is always 4 K regardless of which temperature was chosen manually. Malfunction or other damages caused by wrong usage are prevented. Battery life is extended by mechanically controlling the temperature chosen manually or as setback.

For rooms or buildings where the heating situation only changes occasionally the setback thermostat is not recommendable. In such a scenario a switching between frost protection and convenience temperature is needed which can be performed using an electrical thermostat. Since this thermostat stays in frost protection mode most of the time, no electrical control of the preset temperature is needed, which saves battery life as well.

### Financial facts

About five setback thermostats are needed to control the heating in a typical apartment (Kitchen, living room, bath room, dining room, children's room). A package of five Danfoss RA plus-w is available online for less than 300. - €.

Research shows that the average energy saving of room-specific temperature control using setback thermostats is 15 ... 17,5 %.<sup>1</sup>

Applying an average heating cost of 1000 € the investment in such a system pays off in less than 2 heating periods. The costs for the 10 alkaline batteries of less than 20€ can be disregarded. The effort to change all batteries every three to four years is acceptable.

More information on the Danfoss RA plus-w is available on the products webpage <http://raplusw.com/>.

<sup>1</sup> Ohl, J.: Energieeinsparung durch Intelligente Regelungen, Technik am Bau (TAB), 1999, Nr. 12, S 47-50