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INTRODUCTION

ECD4-1991 is an all-in-one thermostat for DIN-rail mounting in an approved cabinet. It covers the needs of a variety of applications in which maximum comfort and minimum energy consumption are required, e.g. electric floor heating, frost protection, ice and snow melting, cooling, etc. The thermostat allows a required temperature to be set within the range -20 to +80 °C. The thermostat can switch on your heating system at predetermined times on different days of the week. For each day of the week, you can set individual temperatures for different periods, called events. The thermostat comes with a default schedule suitable for most homes. Unless you change the settings, the thermostat will operate in compliance with the default schedule. Furthermore, the thermostat features an adaptive function that automatically changes heating period start times so as to ensure that the required temperature is reached at the set time. After three days the adaptive function has learned when the heating must be switched on.

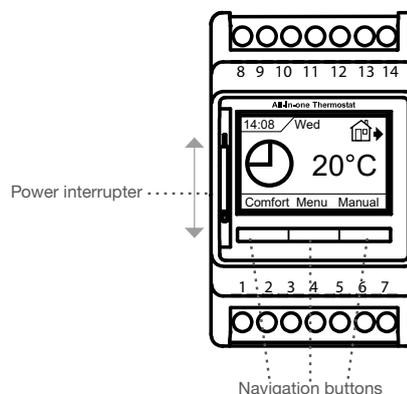
GENERAL OPERATION

First time settings

The first time you switch the interrupter ON “I”, language, time and date must be set. The menu will automatically guide you through the process.

- Choose your language with the arrows ▲▼ and confirm with **OK**.
- Set the actual hour and press the **OK** button. Then set the minutes. Press **OK**.
- Set the actual date: year, month and day. Confirm the settings with the **OK** button.

The thermostat is now ready for use and will control your heating in accordance with the pre-programmed event schedule, see **Factory settings**.



The power interrupter button turns the thermostat on when turned up, and off, when turned down, and the relay disengages but settings included time and date will remain .

Menu / OK

Menu changes to “**OK**” in the menus and submenus. And is used to accept your choices and move on to the next menu or sub menu.

Comfort / Manual

in the menus these buttons changes to arrow navigation arrows ▲▼.

Back

When you press back in a menu, you are moved 1 step back in the menu.

Exit

When you press Exit in a menu, you are moved to the main display screen.

Operation mode

The thermostat features three different modes of temperature control:

Auto mode

Select Auto if you want the temperature to be controlled automatically via the event schedule.

Manual mode

Select Manual to cancel the programmed Event schedule (e.g. during holidays) and to set the required temperature manually. You may, for example, want to adjust the temperature to 5°C for frost protection while you are away.

- Press **Manual**, confirm with **OK** and choose the required temperature.

Comfort mode

Select Comfort to set a temporary comfort temperature (so-called party mode) for a single event.

- Press **Comfort**, confirm with **OK** and choose the required temperature. Then enter the required duration of comfort mode.

After the set time has elapsed, the thermostat will automatically revert to **Auto mode**.

Please note: Comfort mode is a temporary manual setting that will be automatically cancelled by the next event in the programmed event schedule.

EVENT SETTINGS*

**Not available when application pipeprotection is selected.*

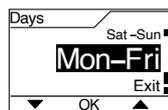
In the event settings menu you can access the following:

- Days
- Event
- Time
- Temp



Days: This allows you to choose event days. Mon - Fri and Sat - Sun.

From Use arrows ▲▼ to choose event days and press **OK** again to enter event.



Event: This allows you to set the daily events. pr. day.

4-Events*

- Morning
- Daytime
- Evening
- Night

6-Events*

- Morning
- Daytime
- Daytime2
- Evening
- Evening2
- Night

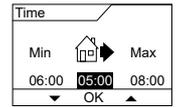


Note! To change events pr. day. See Menu Event schedule

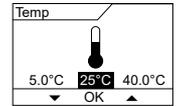
Use arrows ▲▼ to select Morning, Daytime, Evening, night. or back ore Exit. Press **OK** again in event menu to go to "Time menu"

Time: This allows you to set the time for the event you selectet to start. Use arrows ▲▼ to select start time.

Press the **OK** button to go to the Temp. menu.



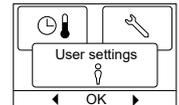
Temp: This allows you to set the temperature for the time you selected. Use arrows ▲▼ to select your temperature and press **OK** to accept.



USER SETTINGS

In the user settings menu you can access the following items:

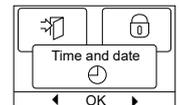
- Time and date
- Child lock
- Display settings
- Event schedule
- Energy monitor
- Backlight
- Language
- Information



NOTE! Menu options may change depending on which application is selected.

Time and date

Use arrows ▲▼ and press **OK** and set the actual time in hours and minutes. The date will then be displayed. Set the date and confirm with **OK**.

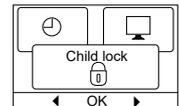


Child lock

This allows you to lock the thermostat settings, e.g. in public or other places where you do not want the settings changed.

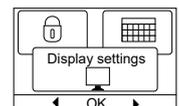
Use arrows ▲▼ to select **ON** and press **OK**.

The child lock can be locked/unlocked by pressing both the **Comfort** and **Manual** buttons simultaneously for 5 seconds.



Display settings

This allows you to select what is shown on the initial display.



Time/day: Shows the actual time and day at the top of the display.

Set temp.: Shows the current temperature setting.

Act. temp: Shows the actual measured temperature.

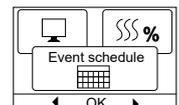
Scr. saver: Switches off the display after 30 seconds if no button is pressed. Any subsequent press of a button reactivates the display. The thermostat remains on and runs the selected program.

Scr. mode: Inverts the colours of the screen

Press the **OK** button to select or deselect the display options. Then select **Exit** in the menu to return to the initial display and view your chosen settings.

Event schedule

Use arrows ▲▼ and press **OK**. This this allows you to choose the type of weekly Event schedule you require.



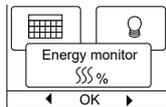
5:2 4-event : Monday to Friday with 4 events and Saturday to Sunday with 2 events.
Typically used if you work from Monday to Friday.

- 6:1 4-event :** Monday to Saturday with 4 events and Sunday with 2 events. Typically used if you work from Monday to Saturday.
- 7:0 4-event :** Monday to Sunday with 4 individual events. This allows you to choose individual programs for each of the 7 days of week.
- 5:2 6-event :** Monday to Friday with 6 events and Saturday and Sunday with 2 events. Typically used if you work from Monday to Friday.
- 6:1 6-event :** Monday to Saturday with 6 events and Sunday with 2 events. Typically used if you work from Monday to Saturday.
- 7:0 6-event:** Monday to Sunday with 6 events. This this allows you to choose individual programs for each day of the week.
- 0:7 6-event:** Monday to Sunday with 6 events and the same program for all days of the week.

Select the required event schedule and confirm with **OK**.
 For instructions on programming the time and temperature for the Event schedule, see **Event settings**.

Energy monitor

This this allows you to view energy consumption for the past 2 days, 30 days or 365 days. Press **OK** for the chosen period. The value in per cent (%) shows the relative amount of time the heating has been on. The following figure is the cost for the selected period. To ensure correct calculation, check the settings for currency, price per kWh and load.



- Currency:** Press **OK** and chose the required currency. Confirm with **OK**.
- Cost/unit:** Press **OK** and set the actual cost of electricity. The cost must be entered per kWh. Press **OK**.
- Load:** Press **OK** and enter the connected heating power. The value must be in watt (W). Press **OK**.

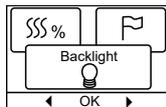
Leave the menu by pressing **Exit**.

Display Backlight

There are three settings for the display backlighting:

- **Auto:** Backlighting is activated whenever a key is pressed and goes out automatically 30 seconds after the last key press.
- **On:** Backlighting continuously on.
- **Heating active:** Backlighting comes on when heat is called for by the thermostat.

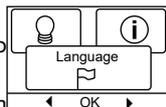
Select the desired backlighting setting and confirm with **OK**.



Language

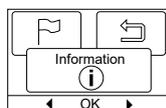
This this allows the language used on the display to be changed.

Use the **▲▼** select the required language. Confirm with **OK**.



Information

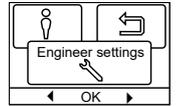
This displays the thermostat software version, CF, Temps. Contact



ENGINEER SETTINGS

In the Engineer setting menu you can access the following items:

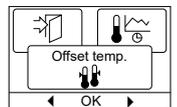
- Offset temperature
- Adaptive function
- Application
- Open window
- Temp scale
- Frost protection.
- Setback temp.
- Regulation
- Pipeprotection
- Selecting the sensor
- Factory reset
- EN50559



NOTE! Menu options may change depending on which application is selected.

Offset temperature

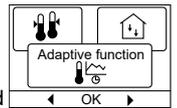
If the actual measured temperature does not corresponding to the thermostat value, you can adjust the thermostat by offsetting the temperature. Use arrows **▲▼** to enter the value of the measured temperature. Confirm with **OK**.



Adaptive function

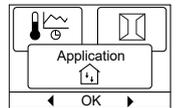
Ensures that the required temperature has already been reached when you get up in the morning or come home from work. After just a few days, the adaptive function will have automatically calculated when the heating must be turned on.

Use arrows **▲▼** and press **OK** and set the function to **On or Off**. Confirm with **OK**.



Application

Set the type of regulation used. Use arrows **▲▼** and press **OK** to select the required application. Confirm with **OK**.

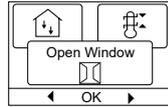


There are 6 options:

- Floor :** The thermostat regulates floor temperature only. A floor sensor must be connected.
- Room :** The thermostat regulates room temperature only. A room sensor must be connected.
- Pipeprotection :** The thermostat is factory set to control heating to a temperature setpoint. A temperature sensor must be fitted as the primary sensor.
- Limit :** The thermostat does not call for heating if the temperature drops below the min. limit temp*. Only one sensor is used, and it must be connected to the floor sensor input of the thermostat.
*min limit temp can be set in the menu under Temp scale.
- Room/limit :** The thermostat regulates room temperature with min and max. limits for floor temperature. A floor sensor must be connected.
- Regulator :** The thermostat functions as a simple regulator and no sensors are used. The setting is a percentage.

Open window

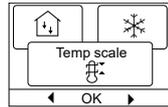
This setting allows you to enable the "Open window" function. The thermostat can detect an open window by registering a rapid drop in temperature. With the function enabled, the thermostat stops heating for 30 minutes if an open window is detected.



Use arrows ▲▼ and press **OK** and set the function to **On or Off**. Confirm with **OK**.

Temperature scale

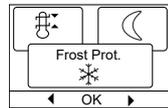
This allows you to set the temperature range within which the thermostat can be set. It is then only possible to set a temperature within this range in auto, comfort and manual mode. For some applications, Limit temp can also be selected here.



Use arrows ▲▼ and press **OK** to highlight **Min** temperature. Use arrows ▲▼ to select the minimum permissible temperature. Press **OK** and select the maximum permissible temperature. Confirm the settings with **OK**

Frost protection

Use arrows ▲▼ and press **OK** to adjust 0 - 15 °C, if in regulator mode 1 - 10 %. The lowest temperature for frost protection when the function is activated via an external signal (See instruction).



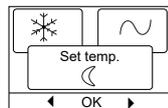
Setback temp.

The number of degrees the temperature setting is to be reduced.

Example: The setpoint is 25 °C.

Setback = -5 °C means temp. setting = 20 °C.

Setback = +3 °C means temp. setting = 28 °C.



External timer must be used (See instruction).

Use arrows ▲▼ and press **OK** to adjust - 30 / +30 °C.

"Regulator" mode in combination with "Night setback temp"

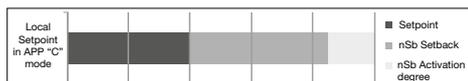
If both Regulator application and "Night setback temp" are selected, night setback temp. is set in relative values while frost protection is set in absolute values in per cent.

The setpoint specifies (in per cent) the time the unit is to remain active in a PWM cycle, which is usually 20 min, while setback degree is specified as a percentage of the setpoint.

The setpoint multiplied by the setback degree gives the activation degree.

Example: If the setpoint is set to 60 % and night setback is set to 25 %, the activation degree will be (0.60 x 0.25 = 0.15) = 15 %.

Graphic example:



The diagram should be read as follows:

Furthest to the left is 100 % duration of PWM, while the vertical lines indicate successive

20 % drops in the time heating is provided relative to 100 %.

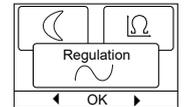
The black area indicates the percentage cut-out time determined by the setpoint.

Together with the light grey area, the dark grey area indicates the relative amount of operating time when nSb has not been

activated, but the dark grey area cuts out when nSb is activated. The light grey area is the relative amount of operating time when nSb has been activated by the above-mentioned values. The default value of setback degree "night setback" (nSb) is 30 %. nSb is inactive as default. Frost protection "dEF" has the specified activation degree and is unaffected by the setback degree in nSb.

Regulation (PWM)

This allows cycle time to be set when using PWM control.



Auto: The cycle time is automatically adjusted between two limit values depending on the fluctuation of the temperature measurement. Use arrows ▲▼ to adjust min. PWM time 10 / 30 min. and press **OK**

On: At least 20 min is recommended. Use arrows ▲▼ to adjust PWM time 1 / 90 min. and press **OK**

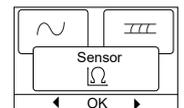
Off: PWM control can be switched off completely and run directly "On/Off" with a hysteresis that can be set under the menu item.

In this mode, you can also choose to invert the function of the relay output to create a "cooling control"

Use arrows ▲▼ to adjust hysteresis 0.1 °C / 10.0 °C. and press **OK** - Use arrows ▲▼ to select Norm.Ouv for an open relay or Norm.Fer for a closed relay.

Selecting the sensor*

Floor sensors other than the supplied (12 kΩ/ 25 °C) can be selected with this menu. The thermostat is preprogrammed for 4 other types:



Sensor 2 kΩ

Sensor 10 kΩ

Sensor 15 kΩ

Sensor 33 kΩ

In Engineer setting menu. Use arrows ▲▼ and press **OK** and use arrows ▲▼ and press **OK**, then confirm with **OK**. The resistance characteristics of the sensor for 15 °C, 20 °C, 25 °C and 30 °C are now displayed.

If the installed sensor does not have the same characteristic as that shown in the thermostat display, change the values at the four listed temperatures using the arrow keys.

Confirm with **OK** to switch to the next resistance characteristic.

Select **Information** with the arrow keys, then confirm with **OK**.

The display now shows the resistance characteristic of the selected sensor. Then confirm with **OK**. The new sensor values are now stored in the thermostat.

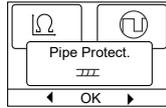
*Only for thermostats with floor sensor.

Note! If the incorrect sensor is selected there is a risk that the thermostat will not be able to regulate to the desired temperatures and therefore damage to the floor construction or covering may occur.

Pipe protection

(Only available when Pipeprotection is selected in applications)

Allowing it to regulate heating element within a temperature range defined by a maximum and minimum temperature. With this application, the thermostat features a temperature-dependent output controller, allowing heat reduction in warm weather. The thermostat uses one or two temperature sensors and can be set to operate in Summer mode if an outdoor sensor is used.



Use arrows ▲▼ and select pipeprotection, press **OK**. Back in Engineer settings, Use arrows ▲▼ and press **OK** to select Pipe Protect. Use arrows ▲▼ to select "2e capt." or "Gest. err."

If "2e capt." is selectet:

Off : Sensor 2 is not used. The thermostat uses only one sensor (sensor 1).

Pipe : Sensor 2 is used as a pipe sensor. The thermostat uses two sensors, both measuring pipe temperature. The thermostat will be controlled by the colder of the two temperatures.

Summer : Sensor 2 is used as an outdoor/summer sensor. The thermostat uses two sensors. Sensor 1 measures pipe temperature. Sensor 2 measures outdoor temperature. The thermostat can now utilise energy-saving Summer mode. If the temperature of the outdoor sensor is higher than the summer limit*, the thermostat will switch to summer mode. Summer mode lowers the starting point for heating effect by 3°C. As default, the thermostat will therefore call for heating at low effect when the temperature drops to 2°C.

*The summer MAX limit can be set in the menu under Temp scale.

If "Gest. err." is selected:

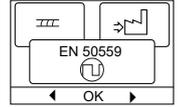
Error mode: The thermostat will enter Error mode if a sensor fault occurs (E1 or E2). In Error mode, the thermostat functions as a simple regulator and no sensors are used. The setpoint specifies (in per cent) the time the unit is to remain active in the 10-minute PWM cycle.

Example:

Setpoint = 80% = 8 min ON and 2 min OFF.
Default setpoint = 25% ON. When the thermostat is in Error mode, the setpoint can be easily adjusted up or down with the arrows ▲▼.

EN50559

This thermostat complies with EN 50559 (VDE 0705-559) for electrical floor heating. The regulation applies to electrical floor heating, with a maximum floor weight of 4 kN/m². To ensure that hotspots due to unintentionally covering up the surface are avoided, the heating function can be time-limited as per EN/DIN.



Note that this function is not applicable to other heating applications such as wall and/or ceiling heating. If it can be foreseen in advance that unintentional covering up of a floor might occur, then it is important to assess the correct period of time for which the floor heating must be time-limited. The heating can be limited using a set number between 0 - 20 minutes per hour.

Example:

If obstacles could be present that cover up the floor, then the heating might need to be limited by some number of minutes so as to avoid hotspots in the floor.

If you want the thermostat to heat a maximum of 90 % of the time, then the thermostat should be limited by 10 %.

Ten percent of one hour is 6 minutes.

Enter 6 min. in the EN50559 menu in order to lower the heating by 10 %.

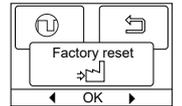
Equation to calculate number of minutes that could be entered in the EN50559 menu - when an average heating effect is desired:

$$\left(1 - \left(\frac{\text{Average wanted heating effect pr. } m^2}{\text{Floor heating element effect pr. } m^2} \right) \right) * 60 \text{ MIN.}$$

Note! If the result of the equation is negative, then nothing should be entered.

Factory reset

This allows factory settings to be restored. Your personal settings will be lost, see **Factory settings**.



Use arrows ▲▼ and press **OK** and choose **Reset** in the menu. Confirm with **OK**.

Back

Use **Back** to return to the last step.

Exit

Returns to home screen display.

FACTORY SETTINGS

Preset schedule

Day 1-5			
Event	Time	Temperature	Regulator mode
Morning	06:00-08:00	25 °C	50%
Daytime	08:00-16:00	20 °C	20%
Daytime2*	08:00-16:00	20 °C	20%
Evening	16:00-23:00	25 °C	50%
Evening2*	16:00-23:00	25 °C	50%
Night	23:00-06:00	20 °C	20%
Day 6-7			
Event	Time	Temperature	Regulator mode
Morning	08:00-23:00	25 °C	50%
Night	23:00-08:00	20 °C	20%

Default values

Parameter	Factory settings	Comment
Max. temperature Scale	40 °C	Can be changed to 80°C under the „Temp scale“ menu
Min. temperature Scale	5°C	Can be changed to -20°C under the „Temp scale“ menu
Max. limit temperature	28 °C	If Room limit application is selected
Min. limit temperature	15 °C	If Room limit application is selected
Min. limit temperature Limit function	-25 °C	If Limit application is selected
Frost protection	10 °C	Only available with external timer
Night setback	-3 °C	Only available with external timer
Application	Floor	
Mode	Auto	Auto, Manual, Comfort and test can be selected.
Control method	PWM On	
Regulation cycle time	20 minutes (1-90 min)	If Regulation application is selected
Differential temperature	0.4 °C	If Regulation PWM is off under application
Relay function	no = normally open	
EN50559	0 min (0 - 15 min.)	

If Regulator mode is selected under Application, the floor and room sensors are disconnected and heating is controlled directly with 0-100 % of full power.

ERROR CODES

If a fault occurs, the thermostat will display one of the following error codes:

Error code	Fault	Remedy
E0	Internal fault. Thermostat defective.	Replace thermostat.
E1	Secondary sensor (sensor 2) defective or short-circuited (terminals 10-11).	Replace sensor/sensor cable. The thermostat will automatically enter Error mode.
E2	Primary sensor (sensor 1) defective or short-circuited (terminals 8-9).	Replace sensor/sensor cable. The thermostat will automatically enter Error mode.
E3	Secondary outdoor sensor (sensor 2) defective or short-circuited (terminals 10-11).	Replace sensor/sensor cable. Only applicable for pipeprotection application in Summer mode. If an outdoor sensor is used as the secondary sensor, Summer mode will be disabled and the system will operate with the primary sensor only.
E5	Internal overheating. Thermostat shuts off heating.	Check installations. Check that heating cables are not overloaded or that ambient temperature is not excessive. When internal temperature drops, the thermostat automatically reactivates.



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