Installation and user manual
EFIT™ 850 sensor

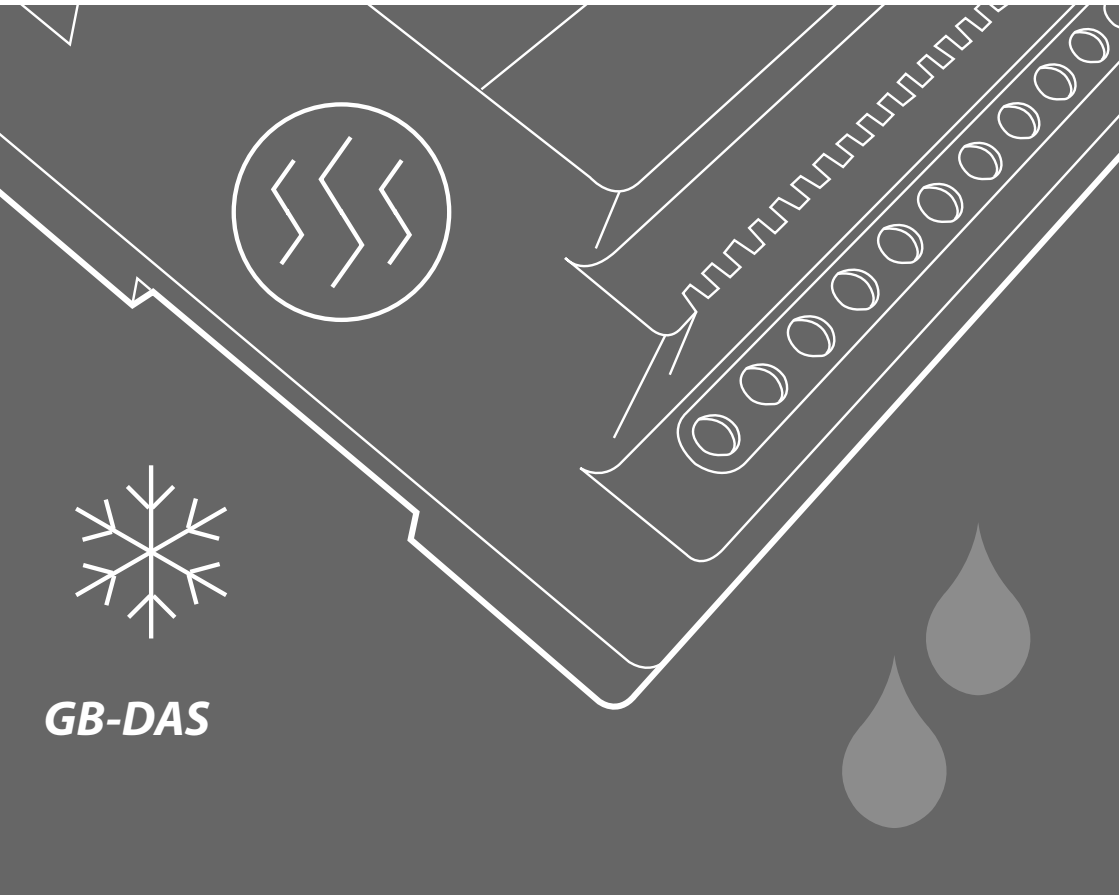

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Table of content

1 Sensors and control zones

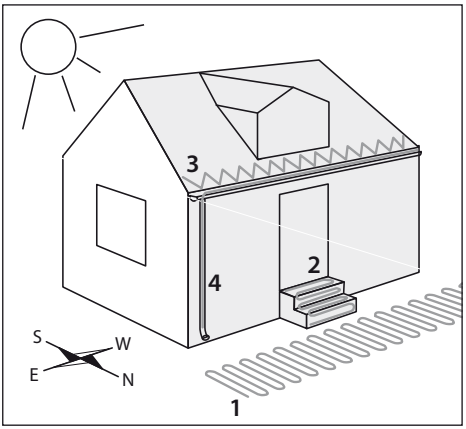
This section guides you through a short introduction to the terms used in the manual

- Area type
- Sensor type
- Controller
- Control Zones

Finally you will be able to assign a number of sensors to the chosen control zones.

1.1 Sensor types and function

Identify the type(s) of area prepared for the Danfoss ice and snow melting system, by looking fig. below:



1. Walkways and parking areas
2. Steps and stairs
3. Roofs and roof edges
4. Gutters and down pipes

For ground areas like 1 and 2 you have one or more ground sensors.

For roof areas like 3 and 4 you have one or more roof sensors.

The ground and roof sensors both measure two things on the sensor surface

- **temperature**
- **moisture** from ice, snow, hail or rain

These measurements are input to the EFIT 850, and it decides how the ice and snow melting system should control the heated areas.

Details about the setup of the controller can be found in the EFIT 850 installation manual.

1.2 Control zones

A EFIT 850 and up to 4 sensors are able to control an area as a single zone, but can also control more areas as 2 separated control zones.

2 control zones consits of minimum 2 heating elements + 2-4 sensors and can be:
Combi zones = when you have both a roof and a ground area
Dual zones = e.g. if steps should have a better performance than a walkway

If the power supply is limited, both combi and dual zones gives you the possibility to prioritize which zone to operate first.

A EFIT 850 and up to 4 sensors give the following 5 control options:

Zone type			
Single zone ground	1-4 in one zone		**Maximum 4 sensors in all**
Single zone roof		1-4 in one zone	
Combi zones	1-3 in one ground zone	1-3 in one roof zone	
Dual zones ground	2-4 split in two zones		
Dual zones roof		2-4 split in two zones	

1.3 Assign sensors to control zones

There are some good reasons to have **2 or more sensors** in one control zone.

- Higher degree of **detection safety**, which is relevant for larger, complex or busy roof and ground areas.

- Approx. 1 hour **faster ground system**, as one sensor measures the ground temperature and other sensors measure the moisture whereas a single sensor must switch between temperature and moisture measurements.

Now decide how the ice and snow melting system should be operated and assign the sensors to the control zones. In case of questions the system designer must be consulted.

Draw circles around Zone type and 1-4 Sensors				
Single zone ground	**x**	1 2 3 4		**Maximum 4 sensors in all**
Single zone roof	**x**		1 2 3 4	
Combi zones	**x**	1 2 3	1 2 3	
Dual zones ground	**x**	2 3 4		
Dual zones roof	**x**		2 3 4	

2 Placing and installation of sensors

At this point you must have identified and assigned sensors to the control zones as prescribed in section 1.

In this section 2 you will be guided through a correct placing and installation of the sensors.
For placing and installation of ground sensors see section 2.1.
For placing and installation of roof sensors see section 2.2.

2.1 Placing ground sensors

Placing ground sensors in appropriate spots is very important for the performance of the ice and snow melting system. The appropriate spot must fulfill some characteristics, where the below 2 are the most important:

The sensors must be placed minimum 1 meter within the boundaries of the heated zone
The sensors must not be covered or prevented from being exposed to snow or rain. This includes dirt, leaves and pebbles.

2.1.1 Placing the first ground sensor in a zone

Find one who knows the area and make him describe the area function and weather conditions. The first ground sensor in a zone must now be placed where the **first snow** appears. The appropriate spot can be found by following below steps.

a) Where the heated area is in shade all day. Look e.g. for algae.
b) Where e.g. a wind shield make the snow drift
c) Where the most traffic from shoes or car wheels happens

If you have a dual zone system, the first sensor for the other zone must be placed by following the same steps above.

2.1.2 Placing the following ground sensors in a zone

The following ground sensors in a zone must be placed where the **surface dries up last**.
The appropriate spot can be found by following below steps.

d) Where the heated area is in shade all day
e) Where the melting water accumulates e.g. due to hollows in the area
f) So the whole zone is covered, but min. 1 meter from other sensors

If there is doubt about the appropriate spot, prepare a second spot for later use.

2.1.3 Example with ground sensors

In this example a lower step section (1), a walkway platform (2) and an upper step section (3) is heated. Depending on number of zones and detection safety, 2-3 ground sensors is installed.

Sensor no. 1 is the most important as this is placed where snow is likely to appear first due to shade and snow drift also because the spot is stepped on by pedestrians.

Sensor no. 2 is also important as the platform is object to water puddles. Here the shaded spot will dry up last. If the power supply is limited, the platform could be a low priority zone in a dual zone system.

Sensor no. 3 is relevant if more detection safety is required, as additional to sensor no. 1. Can be prepared for later installation.

2.1.4 Extending the ground sensor cable

The ground sensor consists of two parts, a sensor part with a sensor cable and a sensor tube.

A 15-meter cable is supplied with the sensor part. Approx. 0.5 m of this cable should be coiled inside the bottom of the sensor tube, leaving 14.5 meter to be connected with the EFIT 850 controller.

If the appropriate spot is located out of this range, a feeder cable extension for the sensor may be needed. This sensor cable extension must be a 4-wired cable with a diameter in accordance with the table in Appendix A – Sensor cable extension.

Note each new colour of the 4 wire cable feeder extensions (white, white, red and black)
Dual zone sensors: Do NOT join feeder cable extensions from separate zones

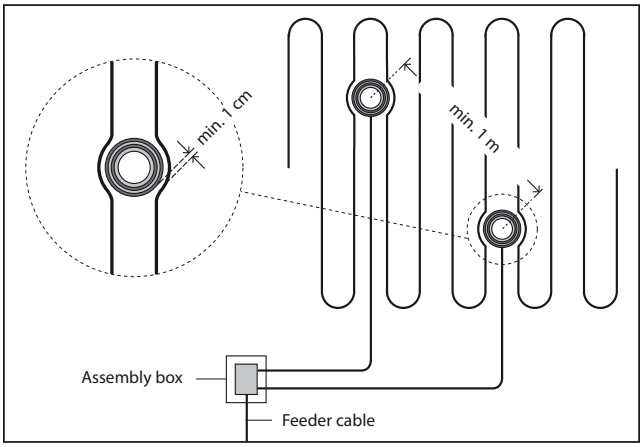
2.2 Installing ground sensors

At this point you must have located the appropriate spots for the ground sensors and extended the feeder cable if necessary as prescribed in section 2.1.

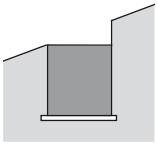
The sensor part and the sensor tube may now be installed in connection with the actual construction work and connected at a later date. The following applies for all types of installations.

a) The base below the sensor tube must be hard, e.g. a concrete plate or similar, in order to ensure that the sensor is not pushed into the ground if e.g. a lorry runs over it. The tube is designed to be mounted on a plate using the two screw holes inside the tube.

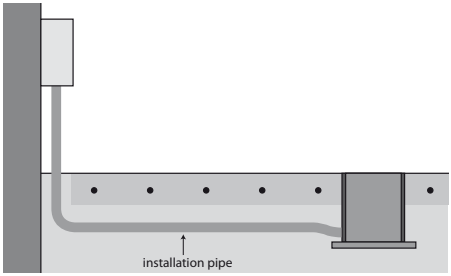
b) Place the sensor tube in between the heating cables with a minimum distance of 1 cm.



c) The sensor tube must be positioned so that it is flush with the surrounding terrain and so that the sensor part must be placed so that the upper brass surface is horizontal.

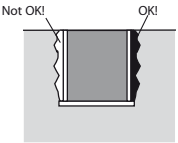


d) Lay a conduit for the sensor cable between the sensor tube and the EFIT 850 controller.



Installation in asphalt:

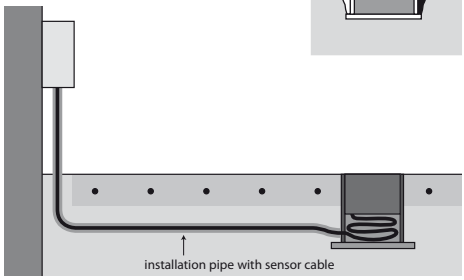
The temperature around the sensor part and sensor tube must not exceed 80°C.
A wooden dummy or similar must replace the sensor while asphalt is poured and cooled down.
The conduit must be a metal tube that can withstand the high temperatures.



e) Ensure that the sensor tube is closed with the supplied cap before the concrete is poured or the bricks are laid. Make sure that air gaps are filled with cement.

f) Coil approx. 0.5 m of the sensor cable inside the tube. If the sensor cable needs extension, see section 2.1.4.

g) Place the sensor part inside the sensor tube until it is horizontally flush with the edge of the sensor tube and rests on the collar inside the tube.



h) The sensor part may be inspected using the two holes around the edge of the sensor tube. The grooves on the outside of the sensor part correspond with the holes in the sensor tube.

2.3 Placing roof sensors

Placing roof sensors in appropriate spots is very important to the performance of the Ice & Snow melting system. The appropriate spot must fulfil some requirements, where the below 2 are the most important:

The sensors must be placed minimum 1 meter within the boundaries of the heated zone
The sensors must not be covered and prevented from being exposed to snow or rain. This includes dirt and especially leaves in the gutters.

2.3.1 Placing the first roof sensor in a zone

Find one who knows the area and make him describe the area function and weather conditions. The first roof sensor in a zone must now be placed where **ice and snow cause most problems.** The appropriate spot can be found by following below steps.

a) Where the heated area is in shade or oriented to the north/west
b) In the main gutter close to the main down pipe

If you have a dual zone system, the first sensor for the other zone must be placed by following the same steps above.

2.3.2 Placing the following roof sensors in a zone

The following roof sensors in a zone must be placed where the **surface dries up latest** .
The appropriate spot can be found by following below steps.

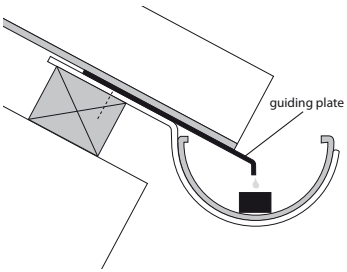
c) Where the snow slides e.g. due to roof joints or gutter valleys
d) In other gutters, close to other down pipes
e) So the whole zone is covered, but min. 1 meter from other sensors

If there is doubt about the appropriate spot, prepare a second spot for later use.

2.3.3 Guiding plates

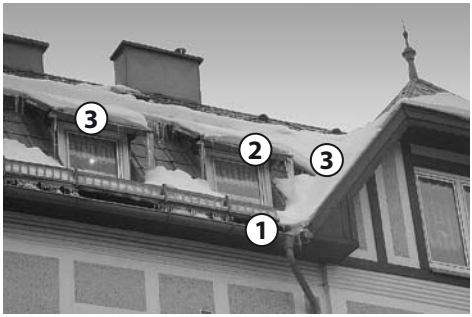
If a roof area is oriented to the south and the roof slope is steep it can be exposed to strong sun radiation.
In that case it can be necessary to install guiding plates above the sensor, so the slowly dripping melting water from the roof hit the roof sensor.

If there is doubt about the appropriate spot, prepare a second spot for later use.



2.3.4 Example with roof sensors

In this example a roof with several dormers is heated. Depending on the number of zones and required safety it is relevant to install 2-3 roof sensors.



Sensor no. 1 is placed in shady side of the front. It is the most important as all melting water passes the sensor until the gutter is dry. As snow is likely to slide down here, the spot is one of the last to dry up.

Sensor no. 2 is also important as the shaded dormer roof is more flat, which might cause sudden snow slides on a dry roof. The dormers could be the lower prioritized zone in a dual zone system.

Sensor no. 3 is relevant if a higher detection safety is required. It could both be placed near another down pipe or in the gutter valley. Thus it can be an additional sensor to both no. 1 and 2 and can be prepared for later installation.

2.3.5 Extending the roof sensor cable

The roof sensor is a sensor part with a sensor cable built in one.

A 15-meter cable is supplied with the roof sensor to be connected with the EFIT 850 controller.

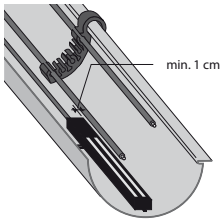
If the appropriate spot is located out of this range, a feeder cable extension for the sensor may be needed. This sensor cable extension must be a 4-wired cable with a diameter in accordance with the table in Appendix A – Sensor cable extension.

Note each new colour of the 4 wire cable feeder extensions (white, white, red and black)
Dual zone sensors: Do NOT join feeder cable extensions from separate zones

2.4 Installing roof sensors

At this point you must have selected the appropriate spots for the roof sensors and extended the feeder cable if necessary as prescribed in section 2.3.

The roof sensor may now be installed in connection with the actual construction work and connected at a later date. The following applies for all types of installations.



a) The sensor must be placed between or next to the heating cables, with a distance of minimum 1 cm between sensor and heating cable.

b) The sensor must be placed so that the upper brass surface is horizontal. If the sensor is placed on an angled roof, the sensor must be levelled until the surface is horizontal.

c) Fasten the sensor by using the attachments on the sensor or glue it to the surface.

4 Technical specification

Technical data	
Type number: - Ground - Roof	 D850 G1 Sensor D850 R1 Sensor
Voltage:	24VDC +10%/-20% (18-26VDC)
Power consumption: • Ground • Roof	 Max. 13W Max. 8W
IP class:	IP 67
Ambient temperature: • Ground • Roof	 -30˚C to +70˚C -50˚C to +70˚C
Sensor type:	Devibus connected moisture sensor(s)
Sensor lead:	15 m of 4x1 mm^2 (may be extended in accordance with the table in appendix A)
Indication:	2 x 16-character illuminated display.
Measurements • Ground sensor • Sensor tube (ground) • Roof sensor	 Depth = 87 mm; Heigth = 74 mm Depth = 93 mm; Height = 98 mm Depth = 15 mm; Height = 23,5 mm; Width 216 mm

3 Appendix A – Sensor cable extension

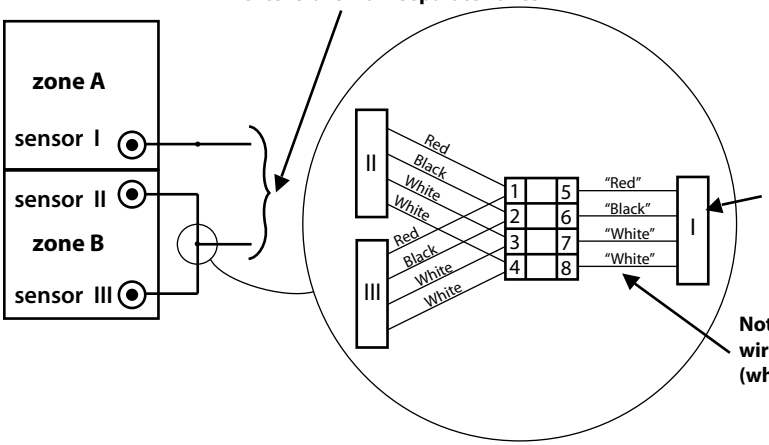
Ground system

Number of sensors:	1 or 2	3	4
Cable type	Max length (m)	Max. length (m)	Max length (m)
1 mm^2	300	150	80
1,5 mm^2	450	225	120
2,5 mm^2	750	380	200
4 mm^2	1200	600	310

Roof system

Number of sensors:	1	2	3	4
Cable type	Max length (m)	Max length (m)	Max length (m)	Max length (m)
1 mm^2	400	100	130	75
1,5 mm^2	600	150	200	110
2,5 mm^2	1000	250	330	190
4 mm^2	1600	400	525	300

Dual zone sensors: **Do not join sensor cables extensions from separate zones**



Sensor cable extension according to above table is led to EFIT™ 850

Note each new colour of the 4 wire cable sensor extensions (white, white, red and black)

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