Ice and Snow Detector
1871-ESM (for gutter heatings)
1872-ESM (for slab heatings)

Installation and Adjustment Instructions

Content

Safety instructions

Always observe the attached safety instructions and the general regulations for electrical installation during installation and operation of the device!

Scope of delivery

Ice and Snow Detector
1871-ESM or
1872-ESM

Ice and Snow Detector
1871-ESM (for gutter heatings)
1872-ESM (for slab heatings)

Safety Instructions

Overview

Tekmar ice detection systems use their combi sensors to measure temperature and moisture in heated outdoor areas such as open spaces, roofs and gutters. This means that they operate in a particularly energy-efficient way, since the heating is only switched on when it is cold or if there is water, ice or snow.

The tekmar ice detection system 1871/72 is an all-round system wherever it is necessary to keep an area free of ice and snow: It is flexible, maintenance-free and inexpensive. Two different sensor types guarantee that the system can be used in all areas.

All the control devices of this tekmar ice detection system are easy to install and commission.

Ice and snow detectors

The two ice and snow detectors 1871-ESM and 1872-ESM are ideal as entry-level models, especially for controlling small systems with one temperature and moisture sensor and one heating circuit. An uncomplicated commissioning is achieved by only two rotary adjusters for setting the activation temperature and the moisture threshold.

Further parameters, such as the lower temperature limit, the minimum heating time and the follow up time, are pre-defined with factory settings and can be adjusted if required via a parameter setting mode. Two three-colour LEDs are provided to indicate the operating status.

The model 1871 with sensor 3354 is ideally suited for use with gutter heating systems, the model 1872 with sensor 3356 for small to medium-sized electrical slab heating systems.

Functions

- control and monitoring of one sensor and one heating circuit
- continuous temperature monitoring in the heated area
- activation of the moisture measurement if the temperature falls below the activation temperature
- start of the minimum heating time if the moisture threshold is exceeded on the sensor, alternatively by an external signal at the control input
- deactivation of the heating if the temperature falls below the switch-off temperature (lower temperature limit)

- output relay with 16 A - ideal for connecting smaller systems without contactor

Sensors

The System 73 sensors use a measuring principle based on the thermal capacity of the sensor surface and the water on it, possibly in the form of ice or snow. This measuring principle was developed by tekmar and has already proven itself over many years. Only one sensor is required to measure moisture and temperature, making installation very simple and cost-effective.

System 73 offers two types of sensors: The 3356 sensor is ideally suited for installation in open spaces such as roads, walkways or staircases. The 3354 sensor can be mounted, for example, in gutters and on roof surfaces thanks to its design with axial cable connection. Both sensors are characterised by a compact and robust design, which is achieved by the casing made of high-quality, corrosion-resistant brass and the microbe-proof, longitudinally watertight cable.

The sensors can be used for a wide variety of requirements due to the comprehensive range of accessories for their installation and mounting. This also optimises installation and maintenance costs.

Documentation

Other relevant documentation:

- Safety Instructions
- I-187x-ESM-Sensor-EN:
  summarised extract from M-MES-Sensorik
  (Installation instructions for sensors of the T, TF-E und TF-S systems, available in German only)

Terms and functions

Activation temperature (upper temperature limit)

If the temperature of the combi sensor - and thus of the heated area - falls below the defined activation temperature, the moisture measurement will be activated and, if necessary, the heating circuit will be switched on. If the temperature rises above the activation temperature, a possibly activated heating circuit will be switched off and the moisture measurement will be deactivated.

Moisture threshold

The moisture threshold can be used to adjust the sensor's sensitivity with regard to the detection of water, ice or snow on the sensor. The moisture threshold can be set within a range of 0 to 10. Low values mean high sensitivity.

The basic setting for the moisture threshold should be 1 to 2 points above the dry value indicated on the sensor.

If the system switches the heating system on too early, i.e. if there is very little moisture or the sensor is dry, the moisture threshold should be increased. If the system switches on the heating system too late, the moisture threshold should be reduced.

Note: If the moisture threshold is too low, the heating system may be permanently activated during times when the temperature is below the activation temperature. This can lead to increased energy consumption. In general: the lower the moisture threshold, the higher the energy consumption.

Moisture measurement

Below the activation temperature, the moisture measurement is repeated at regular intervals until a moisture value above the moisture threshold is detected or until the activation temperature is exceeded again. If moisture is detected, the heating circuit switches on for the minimum heating time and the moisture measurement is suspended. Only after the minimum heating time has elapsed is the moisture determined again at regular intervals. Depending on the result of the moisture measurement, the heating circuit remains switched on or is deactivated.

The system automatically optimises the duration of a measuring cycle depending on the sensor type and temperature.

Switch-off temperature (lower temperature limit)

In addition to the activation temperature, there is also a lower temperature limit (the switch-off temperature), below which the moisture measurement and, if necessary, the heating are deactivated again.

At very low outside temperatures, dripping condensation no longer occurs in roof areas and snowfall is no longer to be expected in open spaces. (If snow falls, it will be dry, light and not slippery. Since in this case the heating capacity is often not sufficient to completely defrost the surface and it would only be partially thawed instead, the risk of slipperiness would be rather increased by switching on the heating system).

The factory setting of the switch-off temperature is optimised for European conditions at -15°C and can be changed via parameter setting.

Minimum heating time

If moisture above the moisture threshold is detected after the temperature has fallen below the activation temperature, the minimum heating time starts, which ensures that the heated area is definitely defrosted. During the minimum heating time, no further moisture measurement takes place. However, the minimum heating time is discontinued if the activation temperature is exceeded.

The factory setting of the minimum heating time of 30 (Type 1871) or 90 (Type 1872) minutes can be adapted to the local conditions via parameter setting.

Follow up time

After the monitored area has thawed and dried with the help of the heating, i.e. when the combi sensor no longer detects moisture, a follow up time can be activated. In the event that the combi sensor cannot be optimally positioned, the follow up time can be used to ensure that any ice and snow residues are also defrosted, e.g. in shaded areas.

In the factory setting, the follow up time is switched off. It can be switched on via parameter setting.

Installation

Proper use

The device has been solely designed to control electric heating systems and must only be used for this purpose. It has to be installed in an electric distributor (fuse box or control cabinet) and connected to the existing heating system. When doing so it is absolutely necessary to observe all Technical data. Any different or improper use of the device may cause defects in the device and/or life-threatening states and situations. Additionally all guarantee claims are forfeited in such a case.

For the use of the unit, an on-site fuse protection by means of a miniature circuit breaker (MCB) is mandatory. Parameters for fuse protection can be found in the technical data.

Installation procedure

Only qualified personnel (electrician or similar qualification) may install the device. The relevant engineering practices and the enclosed safety instructions must be observed.

Disconnect the control cabinet before installation.

Mount the device on a 35 mm mounting rail in a subdistribution unit or another adequate housing. Wire it according to the following illustration.

Protection against contact according to protection class II is guaranteed by the following measures:

Installation in small distribution boards according to

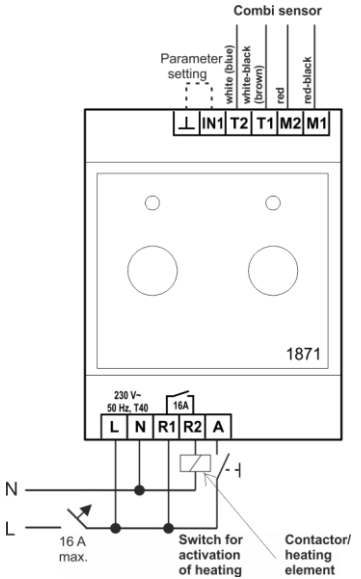
DIN 57603/VDE 0603 (e.g. distributor of the N-system)

or

DIN 57659/VDE 0659

The regulations according to VDE 0100 must be observed!

Connection of the device



Notes:

An external button on input A, which is switched to L, can be used to manually activate the defined minimum heating time. When the button is pressed, the heating is switched on for the duration of the minimum heating time, irrespective of the measured temperature and moisture.

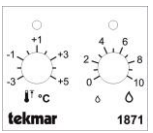
With a bridge between terminal IN1 and the adjacent ground connection, the parameter setting mode can be started in order to define further parameters. For detailed information on setting the parameters refer to section *Parameter setting* on page 14.

Commissioning and adjustment

Setting the temperature and moisture values

Use the rotary adjusters on the front of the device to set the two basic parameters during operation, i.e. the activation temperature (upper temperature limit) and the moisture threshold. Changes take effect immediately.

- left: activation temperature (upper temperature limit), range: -3 to +5°C
- right: moisture threshold, range: 0 to 10



Note: If the moisture threshold is too low, the heating system may be permanently activated during times when the temperature is below the activation temperature. This can lead to increased energy consumption

LED displays

Feedback of the various operating states is provided by two three-colour LEDs. The following tables show the meaning of the LED displays.

System displays upon start-up

L	R	Description
●	●	no supply voltage
●	●	hardware error
●	●	software error
●	● ●	software initialisation
●	● ●	reset to factory settings ongoing
●	●	reset to factory settings completed
●	● ●	device check ongoing
●	● ●	device check error
●	● ●	label/application error
●	● ●	software start

Status displays during operation

L	R	Description
●	● ●	several seconds after power-up
●	●	only temperature measurement active
●	●	temperature and moisture measurement active
●	●	heating with minimum heating time
●	● ●	heating with regular moisture measurement
●	● ●	follow up heating
● ●	● ●	error state
● ●	●	error state/heating active

Troubleshooting

If the controller identifies an internal error, this will be shown via the LEDs and the relay for the switching output and the two signalling relays will no longer be activated. If this error cannot be solved by resetting the device (power off/on), the device needs to be replaced.

Only if the same error persists after the power has been switched on again, contact the tekmar Service.

In case of an error the sensor can be checked with the help of an ohmmeter. In order to do so, the sensor must be disconnected from the power and the ice and snow detector. The values in the following tables show the sensor's resistance values.

Resistance values of the temperature unit

After the sensor cables connected to the T1 und T2 terminals have been disconnected, the temperature unit can be checked at the wire end ferrules. The measurement must be done between the white and white/black wires (or between blue and brown) of the sensor.

The following table shows the comparison values from temperature to resistance for a functional temperature unit.

°C	Ω	°C	Ω	°C	Ω
-35	32,197	-10	8,941	15	2,970
-30	24,532	-5	7,070	20	2,431
-25	18,851	0	5,634	25	2,000
-20	14,616	5	4,520	30	1,657
-15	11,383	10	3,652	35	1,379

Resistance values of the moisture unit

After the sensor cables connected to the M1 und M2 terminals have been disconnected, the moisture unit can be checked at the wire end ferrules. The measurement must be done between the red and red/black wires of the sensor.

For a functional moisture unit the resistance value is:

Type	Ω
3354	77 to 94
3356	71 to 81

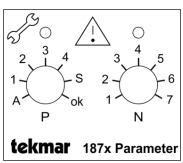
Further information on troubleshooting can be found under: www.tekmar.de.

Parameter setting

Usually the preset parameters of the device for the lower temperature limit, the minimum heating time and the follow up time do not need to be changed. If necessary, they may be adjusted during installation to suit the individual requirements. These settings will be permanently saved in the device.

The rotary adjusters and displays of the controller are used to set the parameters. No special tools are required.

The parameter setting mode is started via a bridge between the IN1 input and the ground connection. In this mode the rotary adjusters have special functions with which the relevant parameters can be set. The stencil in the adjacent picture can serve as a help. This stencil can be found once more in the end of this document where it can be cut out and placed on the device when changing the parameters.



The lefthand adjuster (P) has the following functions in the parameter setting mode. These functions are described in more detail further below:

- position A: start of parameter setting
- position 1-4: setting of the parameter number
- position S: not in use
- position ok: saving of the settings

The righthand adjuster (N) is used to set the parameter values from 1 to 7.

Start of parameter setting

1. Disconnect the device from the power supply.
2. Set a bridge between the IN1 and ⊥ terminals.
3. Turn the left rotary adjuster to its left stop (position "A").
4. Switch the power back on.

→ The device is now in the parameter setting mode and displays its settings via the two LEDs.

LED displays in the parameter setting mode

L	R	Description
🟡⚪	🟢⚪	parameter set
🟡⚪	🟡⚪	parameter changed
🟡⚪	🔴⚪	parameter inadmissible
🟡	🟢	parameter setting saved
🟡	🔴	parameter setting not saved: IN1 and ⊥ connected, lefthand rotary adjuster not in leftmost position or activity interval for parameter setting mode expired

Note:
In the parameter setting mode the output relay is not activated.

Setting the parameters

The parameters (lower temperature limit, minimum heating time, follow up time) may be adjusted with the lefthand rotary adjuster.

In the parameter setting mode each rotary adjuster has several positions equally distributed in the rotation angle with the following functions:

Rotary adjuster / LED left:
Setting the number of the parameter

Position	Function	Display
1 - 4 [1]	setting of parameter number	1 - 4x 🟡⚪
ok	save setting	🟡
	end	🟡

[1] Position 4: currently not in use

If the left rotary adjuster is set to *ok* the LED displays "Save setting" for 5 seconds. After that the settings are saved permanently. Before saving, the settings can be changed as often as desired.

The values for the respective parameter are set with the help of the right rotary adjuster.

Rotary adjuster / LED right:
Setting the value of the parameter

Position	Function	Display
1 - 7	value = current value	1 - 7x 🟢⚪
	value = changed value	1 - 7x 🟡⚪
	value = invalid value	1 - 7x 🔴⚪
	parameter not available	1 - 4x 🔴⚪ [1]
(left adjuster set to *ok*)	save setting	🟢🔴
	end, ok | not ok	🟢 | 🔴

[1] synchronous to lefthand LED

If there is no activity for a duration of approximately 5 minutes, the parameter setting mode is ended without saving. Each time the rotary adjuster is turned, this time period starts again. If the power is disconnected in the parameter setting mode, the changes are not saved either.

After all parameters have been set, remove the bridge on IN1.

The following tables give an overview of the parameters with their respective numbers, possible settings and factory settings.

Parameter setting

1871-ESM

lefthand rotary adjuster		*righthand rotary adjuster*						
Param. No.	**Parameter**	**Value 1**	**Value 2**	**Value 3**	**Value 4**	**Value 5**	**Value 6**	**Value 7**
1	Lower temperature limit [°C]	-5	-10	**-15 ***	-20	-25	-30	undefined
2	Minimum heating time [min]	**30 ***	60	90	150	240	360	600
3	Follow up time [min]	**0 ***	30	60	90	120	150	180
4	(not in use)							

1872-ESM

lefthand rotary adjuster		*righthand rotary adjuster*						
Param. No.	**Parameter**	**Value 1**	**Value 2**	**Value 3**	**Value 4**	**Value 5**	**Value 6**	**Value 7**
1	Lower temperature limit [°C]	-5	-10	**-15 ***	-20	-25	-30	undefined
2	Minimum heating time [min]	30	60	**90 ***	150	240	360	600
3	Follow up time [min]	**0 ***	30	60	90	120	150	180
4	(not in use)							

* factory setting

Example:
Setting the minimum heating time

In the parameter setting mode:

1. Set the **left** rotary adjuster to ***2*** in order to set the parameter "minimum heating time".

   → The lefthand LED blinks yellow/off once.

2. Use the **right** rotary adjuster to define the desired minimum heating time, for example ***60*** minutes (value 2).

   → The righthand LED blinks yellow/off twice.

3. In order to save the setting set the **left** rotary adjuster to ***ok***. For about 5 seconds "Save setting" will be displayed (the lefthand LED lights up yellow, the righthand one blinks green/red). Afterwards the setting is saved permanently.

   → When the setting has been saved successfully the lefthand LED is lit yellow and the righthand one green.

Technical data

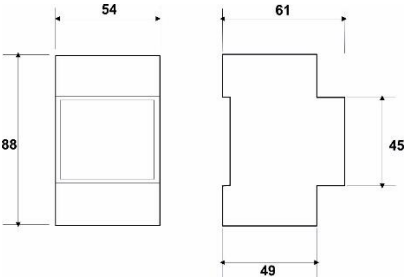
Ice and snow detector 1871-ESM and 1872-ESM

Moisture sensor/combi sensor:	tekmar Type 3354, 3356 (or 3355 with conversion kit)
Number of sensors:	1
Temperature measuring range:	-30 °C to +80 °C
Load output/primary relay:	- potential-free normally open contact - rated current 16 A (resistive load) - on-site fuse protection by means of miniature circuit breaker (MCB) required, rated current max. 16 A, tripping characteristic class B
Rated voltage:	230 VAC, 50 Hz
Acceptable voltage range:	195 V to 253 V
Power consumption:	max. 2 W or max. 10 W during moisture measurement
Connecting terminals:	cage clamp terminals for 2,5 mm², tightening torque ≤ 0,5 Nm
Rated surge voltage:	4000 V
Pollution degree:	2 (normal)
Action type:	Type 1.B
Degree of protection:	IP 20 (according to EN 60529)
Protection class:	II if installed properly
Area of operation:	up to 2000 m above sea level
Enclosure:	rail-mounted device 3 HP (according to DIN 43880)
Mounting:	mounting rail TH-35 according to DIN EN 60715
Weight:	approx. 0.25 kg

Technical data

Heat and fire resistance:	Category B/D
Ball pressure test:	+125 °C
Operating temperature:	-15 °C to +40 °C, no condensation
Storage temperature:	-20 °C to +70 °C, no condensation

Dimensions



Regulations

The product corresponds to the following rules and regulations:
EMC Directive
Low-voltage Directive
RoHS Directive
WEEE-Reg.-No.: DE 75301302
CE

Available accessories

1871-ESM

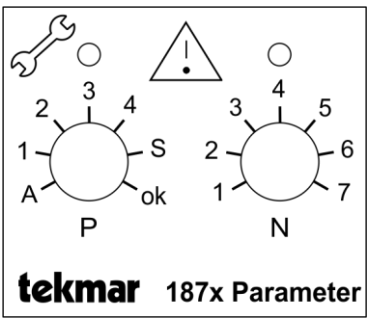
Gutter sensor 3354 for combined measurement of moisture and temperature values

Mounting plate for sensor 3354 (zinc or copper)

1872-ESM

Ground sensor 3356 for combined measurement of moisture and temperature values in open areas

Ground installation socket for sensor 3356


3
2
4
1
S
A
ok
P
4
3
5
2
6
1
7
N
tekmar
187x Parameter

tekmar Regelsysteme GmbH
Möllneyer Ufer 17
D-45257 Essen
mail@tekmar.de
www.tekmar.de

<ME-1871~2-ESM-EN>
Status 2022-09
Subject to change without notice