Ice and Snow Detector
1873-ESM and 1875-ESM

Installation and Adjustment Instructions

1873-ESM

1875-ESM

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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
1873-ESM or
1875-ESM

Installation and Adjustment Instructions
Ice and Snow Detector
1873-ESM and 1875-ESM

Safety instructions 

tekmar pencil (only 1873-ESM)
(Rubber end can be used to operate the touch display)

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 73 ice detection system is an all-round system to be used wherever it is necessary to keep an area free of ice and snow: It is flexible, maintenance-free and inexpensive. It can be modularly extended to form a multi channel system and can be used in a cloud environment or in building management systems.

All system 73 control devices are easy to install and commission. They are characterised by intelligent factory settings and a straightforward commissioning function. The sensors and the control units can be freely combined so that the system can be optimally adapted to the operating conditions. All control units are designed for one combi sensor and one heating circuit.

Configurations

The **basic 1873 device** can either be used as a **single unit** or as a basis for setting up an ice detection system with one or several channel(s) and communication with the building management system or the tekmar Internet Server.

A single-channel **system** consists of a basic device in combination with a combi sensor and a heating circuit. It can be extended with an Internet or Modbus Gateway, so that remote control, monitoring and maintenance can be carried out via the central building management system or the platform-independent user portal of tekmar's TAV Server ("**T**ekmar **A**nlagen **V**erwaltung", Tekmar System Management).

If required, the System 73 can be expanded to a **multi channel** system with up to eight sensors and heating circuits using the **1875 extension unit**. The heating circuits can be assigned to up to four different zones, which have a separate pre-heating and base temperature mode and individual week time programs as well as a holiday program. The sensors of a zone can be coupled to one signalling circuit in which one of the sensors activates all

heating circuits of the channels belonging to the zone.

Ice and Snow Detector 1873-ESM

The Ice and Snow Detector 1873 is a single-channel basic device that can be used for all applications in the field of ice and snow detection. With the 1875 extension unit and the 1880 gateways, the 1873 can be expanded into multi-functional systems with up to 8 sensors/heating channels and connection to the internet or a building management system.

It is operated and adjusted via an illuminated touch graphic display, which is also used to set the parameters of all the other devices in a system. The multilingual menu with three-level password protection automatically adapts to the selected configuration (Single Unit, System or Multi Channel).

In addition to the basic functions of the ice detection channel, the 1873 has a zone management system that allows the device's own channel and the ice detection channels of the extension units to be centrally controlled via optional functions in up to 4 zones.

A comprehensive alarm management checks both the internal device functions and those of the connected sensors. Furthermore, the function of the heating relay and a downstream contactor can be monitored.

Ice and Snow Detector 1875-ESM

The 1875 extension unit, in conjunction with a 1873 basic unit, permits the modular design of multi-channel systems with up to 8 ice detection channels. The 1875 is operated and set via the touch graphic display of the 1873.

The 1875 ice detection channel can be integrated into the zone management of the 1873 and can thus participate in all control functions within a system. This also applies to alarm management and the gateway functions with regard to the internet or to the building management system.

The functions of the ice detection channel of the 1875 are identical to those of the 1873.

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)
- Gateway Internet 1880/(W)LAN-GWI: Installation and Adjustment Instructions
- Gateway Modbus 1880/D85-GMR/UNI: Installation and Adjustment Instructions

Terms and functions

Application

The basic unit 1873 can be set to three different complex configurations. These are called applications and are as follows:

- **Single Unit** refers to the use of a single 1873 to which no other devices are connected. An 1873 used as a Single Unit has an ice detection channel, but no zone for further control options.
- A **System** is an 1873 with zone functions, which can be optionally extended by a communication device to tekmar's TAV Server on the internet (Internet Gateway) or to the building management system (Modbus Gateway). An 1873 used as a System has an ice detection channel and a zone for further control options.
- A **Multi Channel** system is a combination of an 1873 and several 1875 devices, which can be optionally extended by a communication device to tekmar's TAV Server on the internet (Internet Gateway) or to the building management system (Modbus Gateway). The system has up to 8 ice detection channels that can be combined and controlled in up to 4 zones.

In addition to the internal functions, the application settings also optimise the menu so that only those settings that are relevant for the selected application are displayed.

Ice detection channel

An ice detection channel is a unit consisting of a heating circuit with its output relay, a combi sensor and the associated evaluation logic. The 1873 and the 1875 each have an ice detection channel. By combining an1873 and up to seven 1875 devices, multi channel systems with up to eight ice detection channels can be set up.

Functions of an ice detection channel:

- 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 triggered by an external signal at the control input)

- deactivation of the heating if the temperature falls below the switch-off temperature (lower temperature limit)
- monitoring of the heating circuit output for interruptions in the heating circuit and internal faults of the relay
- optional base temperature mode in order to preheat an open space in the "System" or "Multi Channel" configuration

In a multi channel configuration, the 1875's ice detection channels are automatically registered with the 1873's zone management within minutes after power-on.

All registered channels are alternately displayed in the idle display and listed with their channel number in the list of registered channels. If a registered channel is not available for too long, it is marked as "offline" and an alarm is triggered.

If a channel was known in the zone management once, it is permanently stored. If an 1875 is removed from the configuration, it must be explicitly deleted from zone management via a menu function.

Operating mode

The basic operation of an ice detection channel can be selected via the operating mode.

Temp. → Moisture

This is the normal operating mode of an ice detection channel. In this mode the temperature must first fall below the activation point, and a sufficiently high moisture measurement then activates the heating circuit. If channel coupling is used, the moisture measurement of another sensor in the zone may also activate the heating circuit.

T → Moi+BaseTemp

With regard to temperature and moisture measurement, the channel operates as in normal operation, but activates the base temperature mode if the base temperature is not reached.

Temperature

In the temperature mode, only the temperature is measured but not the moisture. The heating will be active if the temperature of the heating area is below the activation temperature.

Emergency mode

In addition to the automatic activation of the emergency mode, it can also be activated manually in the event of malfunctions around the system. Also refer to the explanations under "Emergency mode" on page 11.

Off

The ice detection channel is switched off.

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, an 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 0.5 to 9.5. 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 no information is available on the sensor, a test measurement can be triggered via the menu when the sensor is dry and the determined value can be used as the dry value.

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 an 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.)

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.

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 once, the heating is switched on for the duration of the minimum heating time.

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.

Base temperature mode

With the base temperature mode for an ice detection channel, the ground of an outdoor system can be kept at an adjustable base temperature at low outside temperatures (2-point control). This is useful to shorten the time it takes for very slow heating systems to reach a defrost and drying temperature in case of moisture. The base temperature mode is only possible in the "System" or "Multi Channel" configuration and can be activated individually for each ice detection channel via the "T → Moi+BaseTemp" operating mode.

Note: To switch off the base temperature mode in case of rising temperatures, it is necessary to install an additional weather sensor or to connect the system via the Internet Gateway to the TAV Server to provide a weather forecast.

The lower temperature limit can be used to deactivate the base temperature mode in case of very low temperatures. At very low temperatures, the surface might not be completely heated, so that the thawed ice could freeze again, increasing the risk of slipperiness.

Note: Depending on the weather conditions, the base temperature mode can lead to very high energy consumption.

Emergency mode

In the emergency mode the heating circuit output is activated with a PWM (pulse width modulation) behaviour, in which the basic time and the duty cycle can be set. The emergency mode can either be activated manually via the operating mode or automatically if there is a temperature error in the combi sensor.

In case of an error in the combi sensor additionally an alarm will be triggered. If only the moisture unit is affected by the sensor error, the emergency mode will only be activated if the temperature is below the activation temperature. If the temperature unit is also defective, the emergency mode will be activated independently of the outdoor temperature, but only if this has been explicitly enabled in the menu.

Note: The emergency mode should only be activated if the alarm can be registered centrally. An unnoticed emergency mode can possibly lead to extreme energy consumption.

Terms and functions

Zone

One or more ice detection channels can be assigned to a zone, which then have extended control options. When configured as a system, the 1873's ice detection channel is automatically assigned to the only zone. The assignment of the channels to the zones within a multi channel system can be freely defined.

Zone management functions:

- free assignment of an ice detection channel to one of the 4 zones, function options can be activated separately for each zone
- pre-heating mode with air temperature sensor for pre-heating all heating areas in a zone
- channel coupling in order to interconnect all sensors in a zone
- week program to automatically set the operating mode
- common holiday program for all zones

Week programs

Each zone has its own week program. In a week program a time control can be used to change the control mode of the zone automatically in a daily and weekly rhythm. A maximum of 16 switching points can be defined for each week program.

Available control modes:

- Channel: All ice detection channels in the zone operate solely on the basis of their set operating mode.
- Channel + preHeat: Additionally a pre-heating mode is activated for all heating circuits of the ice detection channels.
- Off: All ice detection channels are switched off.

An additional holiday program, which affects all week programs, allows you to override the set week programs for a period of time, e.g. company holidays.

The time underlying the week programs must be set manually (summer/winter time changeover is automatic), provided the system is not connected to the internet via the Internet Gateway.

Channel coupling

If several ice detection channels are assigned to a zone, the channel coupling can be used to activate an action grouping for all channels. When channel coupling is used, all heating circuits of this zone are activated as soon as one of the combi sensors of

the zone reports a temperature below the activation temperature together with a moisture value above its moisture threshold.

Pre-heating mode

The pre-heating mode, like the base temperature mode, allows heating of an open area even before moisture is detected. In contrast to the base temperature mode, however, the pre-heating mode operates with PWM performance control based on the measured or predicted outdoor temperature.

The pre-heating mode is a zone function that affects all assigned ice detection channels of the zone.

Note: The base temperature mode of a channel has priority over the pre-heating mode. If both pre-heating and base temperature mode are set for a channel, the pre-heating mode is automatically inactive.

The pre-heating mode operates within the parameter limits "start temperature" and "end temperature", which represent the upper and lower temperature limits. Both values are pre-defined with useful values, but can be adapted to local conditions if required.

The PWM performance at the start temperature is defined via the "start value". The performance at the end temperature is always 100%. The heating capacity is adjusted linearly between the start and end temperature.

The lower temperature limit is used to deactivate the base temperature mode in case of very low temperatures. At very low temperatures, the surface might not be completely heated so that the thawed ice could freeze again, increasing the risk of slipperiness.

Note:

Pre-heating is activated via the week program of the zone by setting the "Channel + preHeat" control mode.

If the system is run in the „Multi Channel“ application also option "Time control" of the respective zone has to be activated. In the "System" application the time control is always active.

For the pre-heating mode either a weather sensor or - even better, because it is connected to the weather forecast - an Internet Gateway with connection to the TAV Server must be available to determine the air temperature.

Note: Depending on the weather conditions, the base temperature mode can lead to very high energy consumption.

Weather sensor and weather forecast

For the base temperature and pre-heating mode, the system must have information on the outside air temperature. This requires either an outdoor weather sensor (north side, no direct sunlight) or a weather forecast that the system receives from tekmar's TAV Server via the Internet Gateway. Both sources are evaluated independently of each other as a single value and as far as possible as a time series. If both sources are equally available, the weather forecast has priority for determining the effective outdoor temperature, as it enables a predictive calculation of the heat demand.

With two parameters the calculation of the heat demand of the open area can be adapted to the local conditions. The "ground characteristic" takes into account the inertia of the open area with respect to changes in the ambient temperature. It thus takes into account the past outside temperatures for calculating the effective outside temperature. The "heat-up characteristic" is the speed at which the open area can be heated via the heating circuit.

Alarm management

The alarm management of the 1873 monitors all devices, sensors and heating circuit outputs in a system for fault conditions. A detected error is reported via the display and the alarm relay and can be forwarded to a higher level via the Modbus Gateway.

Functions of alarm management:

- monitoring of all ice and snow detectors and their sensors in a system
- monitoring of all heating circuit outputs in a system
- alarm function can be deactivated for each zone
- adjustable alarm delay
- forwarding of an alarm via the alarm relay and/or the Modbus Gateway

Alarm relay

The alarm relay is designed as a change-over contact and can therefore be used for both open-circuit and closed-circuit alarm circuits. By inverting the alarm relay in the menu, a power failure can also be

reported (alarm inverted and signal loop via the normally open/change-over contact).

Due to its insulation, the alarm relay can be used for both mains voltage and SELV circuits.

Heating circuit monitoring

The heating circuit connected to the heating circuit relay is monitored for interruptions and the heating relay itself for malfunctions. The heating circuit is monitored when switched off. An interruption of the circuit results in an alarm message.

Note 1: When using a contactor to increase the switching capacity, only the contactor is monitored, not the heating circuit connected to it.

Note 2: The switching output for relay R1/R2 must be operated at 230 V to detect a switching output error. When using a lower voltage (e.g. 24 V DC), this function is not guaranteed and an error message may occur.

Installation and commissioning

Proper use

The device must only be used for the control of electric and water-operated heating systems. 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(s) is mandatory. No additional fuse protection is required for the alarm relay if it is connected to a low voltage of up to 30 V maximum. 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:

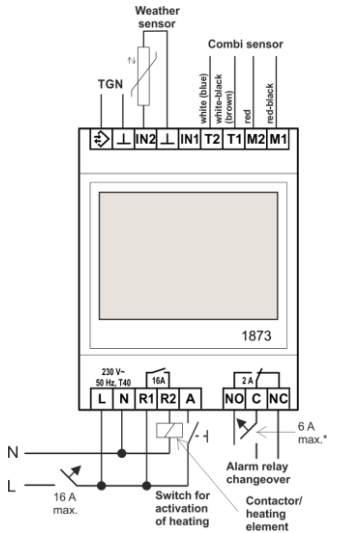
Installation in small distribution board according to

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!

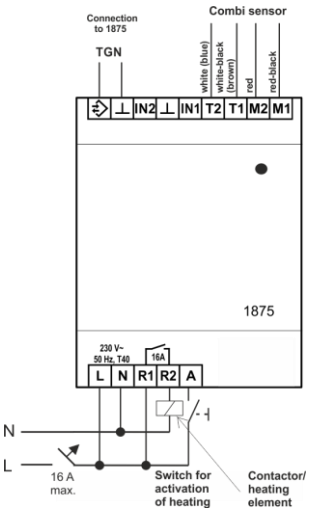
Connection diagrams

1873-ESM



* not required if used with 30 VDC max.

1875-ESM



Connection of a downstream building control system

It is intended to connect the heating circuit to a load contactor or directly to the relay output of the ice and snow detector. If, however, it is connected to a relay interface module, a reliable function cannot be guaranteed. This unintended application does not always work reliably.

tekmar has, with no obligation, developed and tested a solution for a correct function, also in connection with a recommended relay interface module for connection to a building management system:

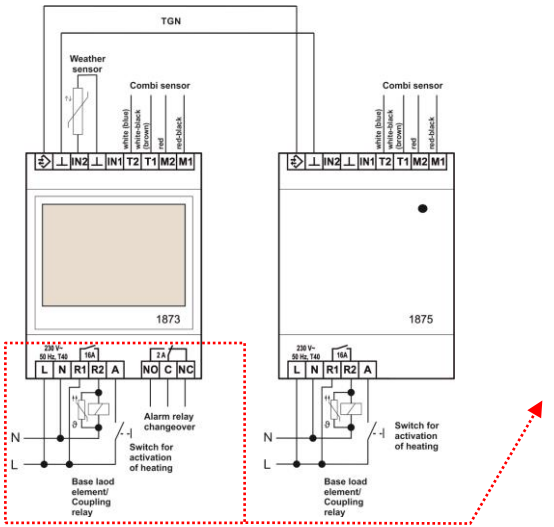
When using relay interface modules with the 1873-ESM or 1875-ESM ice and snow detector, a malfunction of the heating circuit monitoring can occur under certain circumstances due to the design. This leads to a faulty evaluation of the heating circuit or a malfunction of the connected relay interface modules. The faulty evaluation can result in an unintentional alarm. However, it would be more serious if the heating circuit(s) were unintentionally activated, which would lead to increased power consumption.

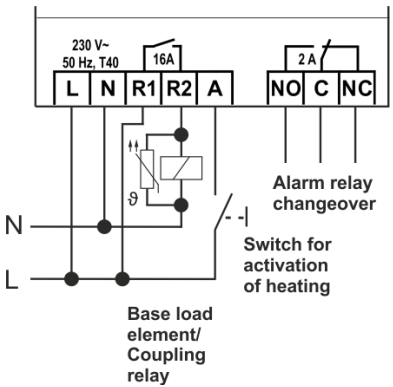
This kind of relay is normally only used in case of a downstream building management system.

For the recommended relay interface modules, proper function is only ensured if a base load element is connected in parallel with the relay interface module. In addition, the heating circuit monitoring function (**menu item Monitoring heating output active**) of all channels with a connected relay interface module must be deactivated in this case.

Recommended components:

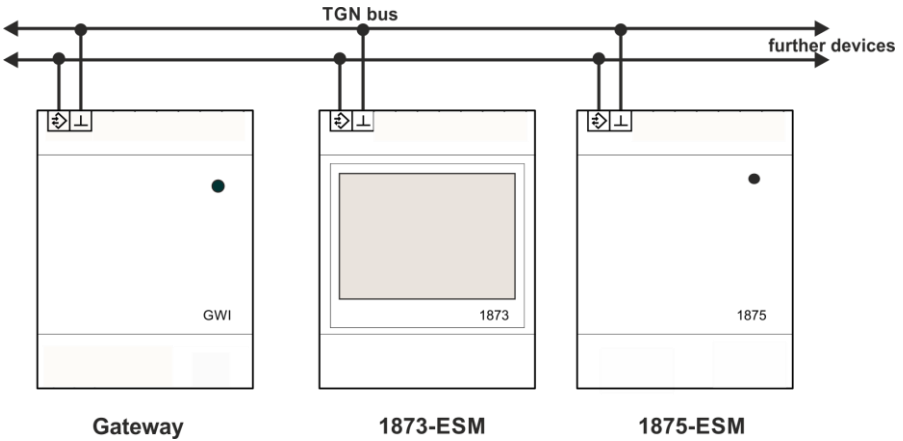
Relay interface module		
Manufacturer	**Article**	**Type**
Finder	38.51 230V (Series 38)	1 x 6 A
Finder	48.52 230V (Series 48)	2 x 8 A
Finder	49.72 230V (Series 49)	2 x 8 A
Base load device		
Eltako	EAN 4010312900970	


TGN
Weather sensor
Combi sensor
Combi sensor
white (blue)
red-black (brown)
red
red-black
⊥ IN2 ⊥ IN1 T2 T1 M2 M1
1873
1875
230 V~ 50 Hz, T40
16A
2 A
L N R1 R2 A
NO C NC
N
L
Alarm relay changeover
Switch for activation of heating
Base laod element/ Coupling relay
Base load element/ Coupling relay


230 V~
50 Hz, T40
16A
2 A
L N R1 R2 A
NO C NC
N
L
Alarm relay changeover
Switch for activation of heating
Base load element/ Coupling relay

Connection via TGN

When several devices in a system are connected, they all need to be connected to each other via the TGN bus so that they can exchange data with each other.



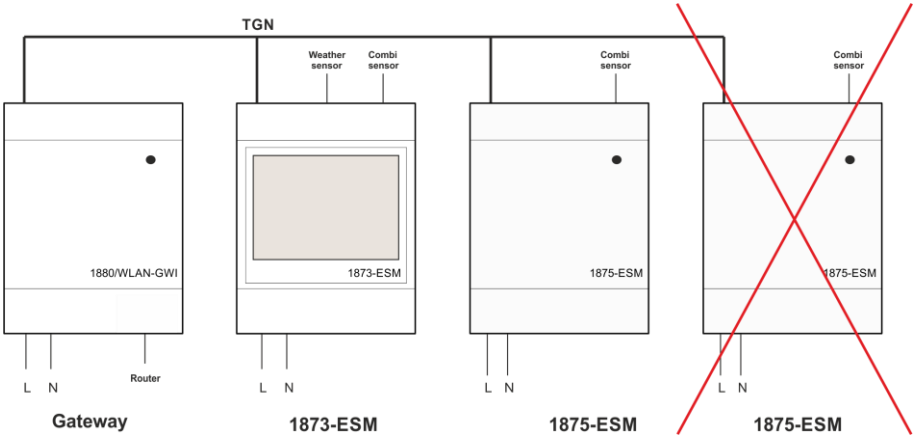
Installation and configuration of a Multi Channel system

The 1873-ESM is delivered with a fixed channel 1 and the 1875-ESM with a pre-set channel 2. In case of a two-channel system, no further adjustment of the channels is required. Only the channels 2 to 8 can be assigned to the 1875-ESM, since channel 1 is always reserved for the 1873-ESM.

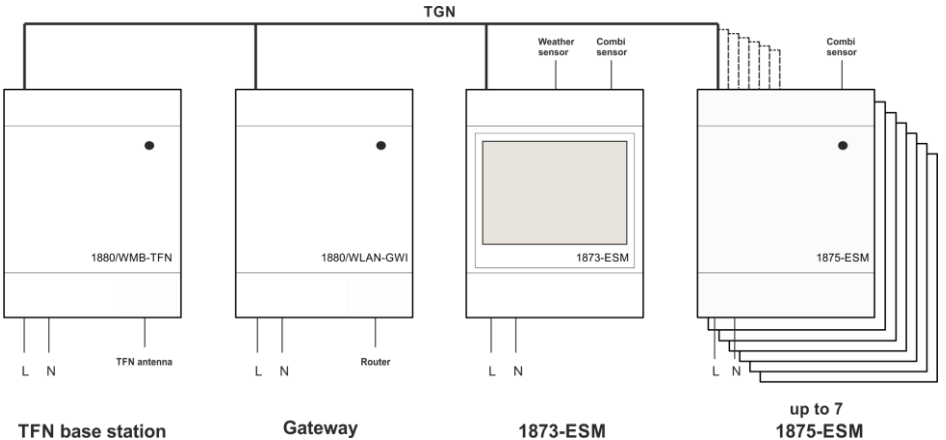
After changing the channel of one or more 1875-ESM(s), the entire system must be restarted. In addition, the active channels that no longer exist must be deregistered under *Installer → Config. modules → Delete registered channel*. You can check the channels registered on the 1873-ESM under *Installer → Information → Registered channels*.

During the configuration of a Multi Channel system with more than two channels, **only one 1875-ESM** may be connected to the 1873-ESM via TGN. The next device must not be connected and configured until the configuration for one device has been completed. If more than one device is connected at a time, the configuration will fail:

Installation and commissioning 1873, 1875



This is an example of a completed configuration:



Required settings

When the device is started for the first time, a start screen is displayed in which the menu language must be selected. The default language is German, which must be confirmed or changed.

Menu → Installer → Startup →

During initial startup, all parameters must be set under the menu item mentioned above. These are:

Application
: Here you can set the configuration (Single Unit, System or Multi Channel) in which the 1873-ESM is to be operated, see page 7. The selection changes the menu, since only the menu items relevant for the application are displayed.

Date/Time (System, Multi Channel)
: If the device is operated in the System or Multi Channel application, the date and time must be set correctly.
(If there is an internet connection, the device receives the date and time from the internet. If the device is put into operation for the first time and there is no internet connection, check whether the date and time are correct. The power reserve only keeps this data for a limited time if the device has no power supply.)

Sensor type (Single Unit, System)
: The factory setting for the sensor type is "to be defined". Select the sensor type according to the connected sensor. For further information see page 56.

ISD channels → ISD channel <No.> → Sensor Type (Multi Channel)
: In a Multi Channel configuration, the sensor type must be set for each channel.

Server communication active (System, Multi Channel)
: If tekmar's TAV Server is to be used, communication must be activated here.

Further basic settings

Moisture threshold

Menu ⟶ Installer →

It should be checked whether the factory-set moisture threshold matches the sensor used and its environment. Proceed as follows:

1. The sensor must be dry.
2. Start a test measurement.
   Single Unit: Service → ISD channel → Start moisture measurement?
   System: Service → ISD channel → Start moisture measurement?
   Multi Channel: Service → ISD channels → ISD channel <No.> → Start moisture measurement?
3. Add 1.0 to 2.0 to the determined moisture value depending on the desired sensitivity and set this value as the moisture threshold.
   Single Unit: Config. modules → Moisture threshold
   System: Config. modules → ISD channel → Moisture threshold
   Multi Channel: Config. modules → ISD channels → ISD channel <No.> → Moisture threshold

Also refer to Moisture threshold, page 9.

Minimum heating time

Single Unit: Operation
System: Operation
Multi Channel: Operation → ISD channels → ISD channel <No.>

Adjustment of the minimum heating time for the ice detector or the selected ice detection channel, also refer to Minimum heating time, page 10.

Upper temperature limit

Single Unit: Operation
System: Operation
Multi Channel: Operation → ISD channels → ISD channel <No.>

Adjustment of the upper temperature limit valid for the ice detector or the selected ice detection channel, also refer to Activation temperature, page 9.

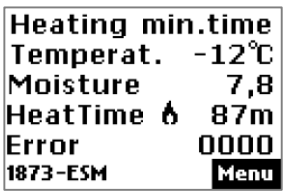
Password protection

Menu → Information → Set passwords

If required, password protection can be set for different menu levels. For further information refer to page 73.

Operation displays

Idle display: Single Unit 1873



- line 1: channel state
- line 2: temperature
- line 3: moisture value
- line 4: remaining heating time, state of heating output
- line 5: error code
- line 6: device type, menu button

Idle display: System 1873

- line 1: date, time, state of heating output
- line 2: channel state
- line 3: temperature, moisture value
- line 4: remaining heating time, error code
- line 5: If Internet Gateway and TAV Server are used: display of connection state
- line 6: device type, menu button

Idle display: Multi Channel 1873 + 1875

- line 1: channel number,
  state of heating output
- line 2: channel state
- line 3: temperature, moisture value
- line 4: remaining heating time, error code
- line 6: device type, menu button

The information for the registered channels is displayed on a rolling basis.

Displays during operation 1873, 1875

LED displays 1875

Feedback of the various operating states is provided by two three-colour LEDs. The following tables show the meaning of the LED displays. Two coloured dots indicate that the LED is flashing in these colours.

System displays upon start-up:

LED	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 ongoing
	label/application error
	software start

Status displays during operation:

LED	Description
	several seconds after power-up
	ice detection circuit switched off
	temperature measurement, outside range
	temperature within range, moisture measurement active
	heating with minimum heating time
	heating with regular moisture measurement
	Follow up heating after moisture = dry
	only temperature control
	manual emergency mode
	error state, automatic emergency mode

User interface 1873

Touch display with softkey buttons

The touch display of the 1873 may be operated by using up to four softkeys at the bottom of the screen, pressing them either with the finger or the rubber end of a pencil. The rest of the display does not have a touch function. The following table shows the possible functions of the four softkeys. After pressing the *Menu* button several menu items are available.

The plus and minus buttons (+ and -) as well as the arrow keys (> and <) have an auto-repeat function in case the buttons are pressed for a longer time.

If the menu does not receive an answer to a data request, the display will show the character string "~~~" (3x tilde) instead of the parameter value.

When the device is taken into use for the first time, the menu language (e.g. German or English) needs to be selected. For further information refer to page 55.

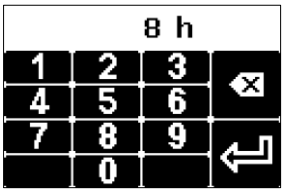
Menu	launch menu
>>	next menu level
<<	one menu level back
>	next (to select one of several parameters)
<	back (to select one of several parameters)
🡻	one line down
🡹	one line up
+	increase value
-	decrease value
Chng	change
OK	confirm
Esc	escape
Add	add entry
Del	delete entry
Edit	edit entry
Act	activate entry
0..9	numeric keypad
⌫	delete character (numeric keypad)
↵	confirm entry (numeric keypad)

Menu structure

The individual menu items are explained in detail in the chapters *Settings* and *Operation*. The menu items under *Menu → Installer* are reserved for the qualified installation technician. Some settings appear under several menu items because this will save time jumping back and forth in different menu levels during installation. The menu items under *Installer → Startup* can, for example, also be found under *Installer → Config. modules*.

For the applications "Single Unit", "System" and "Multi Channel" (to be defined under *Installer → Startup → Application)* an individually adapted menu with the relevant menu items is displayed.

Numeric keypad



Several values can be entered via a numeric keypad. In this case the display's touch function is extended to all keys of the numeric keypad.

Menu: Single Unit

Level 1	Level 2	Level 3	Level 4	Page
Operation	Operating mode			47
	Upper temperature limit			47
	Moisture threshold			48
	Minimum heating time			48
	Start minimum heating time?			49
Information	Channel state			51
	Heating output			52
	Temperature moisture area			52
	Last moisture measurement			52
	Remaining heating time			53
	Operating time			53
	Energy consumption			54
	Device data	Serial number		54
		Version		54
	Set passwords	Set level 1	Set password for level 1	54
		Set level 2	Set password for level 2	
		Set level 3	Set password for level 3	
Setup	Language			55
	Display	Contrast		56
		Brightness menu		56
		Brightness idle		56

User interface 1873

Installer	Startup	Application		56
		Sensor type		56
	Information	Channel state		51
		Heating output		52
		Error code		57
		Temperature heating area		52
		Last moisture measurement		52
		Remaining heating time		53
		Remaining inhibition time moisture		58
		Operating time		53
		Operating time total		58
		Energy consumption		54
		Energy consumption total		59
		Device data	Serial number	54
			Version	54
	Config. modules	Operating mode		47
		Sensor type		56
		Upper temperature limit		47
		Lower temperature limit		62
		Moisture threshold		48
		Minimum heating time		48
		Follow up time		62

		Heating performance		63
		PWM interval time		64
		Emergency duty cycle		64
		Alarm delay		60
		Alarm relay inverted		61
		Emergency mode with error temperature		65
		Blocking protection active		66
		Monitoring heating output active		66
		Operating time: Reset counters		66
	Service	ISD channel	Start minimum heating time?	49
			Stop heating?	69
			Start moisture measurement?	69
			Sensor temperature	69
			Last moisture measurement	52
			Remaining inhibition time moisture	58
		Restart		70
		Factory settings		70

User interface 1873

Menu: System

Level 1	Level 2	Level 3	Level 4	Opt.*	Page
Operation	Operating mode				47
	Upper temperature limit				47
	Moisture threshold				48
	Minimum heating time				48
	Start minimum heating time?				49
	Week program	Week progr. 1			49
	Holiday program	Start of holiday			50
		End of holiday			
		Control mode holiday			
Information	System	Effective outside temperature			50
		Pre-heating demand			51
		Control mode			51
	ISD channel	Channel state			51
		Heating output			52
		Temperature heating area			52
		Last moisture measurement			52
		Remaining heating time			53
		Operating time			53

		Energy consumption			54
	Server	for details refer to *Installation and Operation Instructions: Gateway Internet*		*1	
	Device data	Serial number			54
		Version			54
	Set passwords	Set level 1	Set password for level 1		54
		Set level 2	Set password for level 2		
		Set level 3	Set password for level 3		
Setup	Date/ Time	Date/Time			55
		Type of summertime			55
	Language				55
	Display	Contrast			56
		Brightness menu			56
		Brightness idle			56
Installer	Startup	Application			56
		Date/ Time	Date/Time		55
			Type of summertime		55
		Sensor type			56
		Server communication active			57
	Information	System	Effective outside temperature		50
			Pre-heating demand		51

			Control mode		51
		ISD channel	Channel state		51
			Heating output		52
			Error code		57
			Temperature heating area		52
			Last moisture measure-ment		52
			Remaining heating time		53
			Remaining inhibition time moisture		58
			Operating time		53
			Operating time total		58
			Energy consumption		54
			Energy consumption total		59
		Heat demand	State		59
			Status OAT measurement series		59
			Status weather series		59
			Outside temp. measured		60
			Outside temp. effective		60

		Server	for details refer to *Installation and Operation Instructions: Gateway Internet*	*1	
		Device data	Serial number		54
			Version		54
	Config. modules	System	OT-Limit preHeating		64
			Check OT value continuously		65
			Alarm delay		60
			Alarm relay inverted		61
		ISD channel	Operating mode		47
			Sensor type		56
			Upper temperature limit		47
			Lower temperature limit		62
			Moisture threshold		48
			Minimum heating time		48
			Follow up time		62
			Base temperature		63
			Heating performance		63
			PWM interval time		64
			Emergency duty cycle		64

			Emergency mode with error temperature		65
			Blocking protection active		66
			Monitoring heating output active		66
			Operating time: Reset counters		66
		Heat demand	Pre-heating start temperature		67
			Pre-heating start value		67
			Pre-heating end temperature		67
			Ground characteristic		68
			Heat-up characteristic		68
		Server	for details refer to *Installation and Operation Instructions: Gateway Internet*	*1	
		LAN setup	for details refer to *Installation and Operation Instructions: Gateway Internet*	*1	
	Service	ISD channel	Start minimum heating time?		49
			Stop heating?		69

			Start moisture measurement		69
			Sensor temperature		69
			Last moisture measure-ment		52
			Remaining inhibition time moisture		58
		Restart			70
		Factory settings			70

* Only displayed if the following condition is met:

1: Gateway communication active (*Server communication active* = “Yes”)

User interface 1873

Menu: Multi Channel

Level 1	Level 2	Level 3	Level 4	Level 5	Opt.*	Page
Operation	System	Week programs	Week progr. 1			49
			Week progr. 2			
			Week progr. 3			
			Week progr. 4			
		Holiday program	Start of holiday			50
			End of holiday			
			Control mode holiday			
	ISD channels	ISD channel <No.>	Operating mode			47
			Upper temperature limit			47
			Moisture threshold			48
			Minimum heating time			48
			Start minimum heating time?			49
Information	System	Registered channels				50
		Effective outside temperature				50
		Pre-heating demand				51

	Zones	Zone <No.>	Control mode			51
	ISD channels	ISD channel <No.>	Channel state			51
			Heating output			52
			Temperature heating area			52
			Last moisture measurement			52
			Remaining heating time			53
			Zone number			58
			Operating time			53
			Energy consumption			54
	Server	for details refer to *Installation and Operation Instructions: Gateway Internet*			*1	
	Device data	Serial number				54
		Version				54
	Set passwords	Set level 1	Set password for level 1			54
		Set level 2	Set password for level 2			
		Set level 3	Set password for level 3			
Setup	Date/	Date/Time				55

	Time	Type of summer-time				55
	Language					55
	Display	Contrast				56
		Brightness menu				56
		Brightness idle				56
Installer	Startup	Application				56
		Date/ Time	Date/Time			55
			Type of summer-time			55
		ISD channels	ISD channel <No.>	Sensor type		56
		Server communi-cation active			*1	57
	Information	System	Registered chan-nels			50
			Effective outside tempera-ture			50
			Heat demand Preheating mode			51
		Zones	Zone <No.>	Control mode		51
		ISD channels	ISD channel <No.>	Channel state		51
				Heating output		52
				Error code		57

				Temperature heating area		52
				Last moisture measure-ment		52
				Remaining heating time		53
				Remaining inhibition time moisture		58
				Zone number		58
				Operating time		53
				Operating time total		58
				Energy consumption		54
				Energy consumption total		59
		Heat demand	State			59
			Status OAT meas-urement series			59
			Status weather series			59
			Outside temp. measured			60
			Outside temp. ef-fective			60
		Server	for details refer to *Installation and Operation Instructions: Gateway Internet*		*1	

		Device data	Serial number			54
			Version			54
	Config. modules	System	OT-Limit preHeat-ing			64
			Check OT value continuously			65
			Alarm delay			60
			Alarm relay inverted			61
			Delete registered channel			61
		Zones	Zone <No.>	Time control		61
				Channel coupling		62
		ISD channels	ISD channel <No.>	Operating mode		47
				Sensor type		56
				Upper temperature limit		47
				Lower temperature limit		62
				Moisture threshold		48
				Minimum heating time		48
				Follow up time		62
				Base temperature		63
				Zone number		63
				Heating performance		63
				PWM interval time		64

				Emergency duty cycle		64
				Emergency mode with error temperature		65
				Blocking protection active		66
				Monitoring heating output active		66
				Operating time: Reset counters		66
		Heat demand	Pre-heating start temperature			67
			Pre-heating start value			67
			Pre-heating end temperature			67
			Ground characteristic			68
			Heat-up characteristic			68
		Server	for details refer to *Installation and Operation Instructions: Gateway Internet*		*1	
		LAN setup	for details refer to *Installation and Operation Instructions: Gateway Internet*		*1	
	Service	ISD channels	ISD channel <No.>	Start minimum heating time?		49

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				Stop heating?		69
				Start moisture measurement?		69
				Sensor temperature		69
				Last moisture measurement		52
				Remaining inhibition time moisture		58
		Restart				70
		Factory settings				70
		Setup exp. channel (connect only one device!)				70

* Only displayed if the following condition is met:

1: Gateway communication active (*Server communication active* = “Yes”)

Settings

Operating mode

Single Unit: Operation | Installer → Config. modules
System: Operation | Installer → Config. modules → ISD channel
Multi Channel: Operation → ISD channels → ISD channel <No.>
Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the operating mode for the ice detector or the selected ice detection channel.

For further information on the operating modes, also refer to **Operating mode**, page 8.

Factory setting: Temp.→Moisture,
possible settings: Off, Temp.→Moisture, T→Moi+BaseTemp (not in the “Single Unit” configuration), Temperature, Emergency op.

Upper temperature limit

Single Unit: Operation | Installer → Config. modules
System: Operation | Installer → Config. modules → ISD channel
Multi Channel: Operation → ISD channels → ISD channel <No.>
Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the upper temperature limit (activation temperature) valid for the ice detector or the selected ice detection channel. Below this temperature the moisture measurement will be activated. Also refer to **Activation temperature**, page 9.

Factory setting: +3 °C, possible settings: -3 to +5°C

Settings

Moisture threshold

Single Unit: Operation | Installer → Config. modules
System: Operation | Installer → Config. modules → ISD channel
Multi Channel: Operation → ISD channels → ISD channel <No.>
Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the moisture threshold for the ice detector or the selected ice detection channel. A setting of 0.5 is very sensitive, i. e. the heating may react if the sensor is completely dry. A setting of 9.5 is very insensitive, i. e. the heating only reacts if a large amount of moisture has accumulated. Also refer to **Moisture threshold**, page 9.

Factory setting: 5.0, possible settings: 0.5 to 9.5

Minimum heating time

Single Unit: Operation | Installer → Config. modules
System: Operation | Installer → Config. modules → ISD channel
Multi Channel: Operation → ISD channels → ISD channel <No.>
Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the minimum heating time for the ice detector or the selected ice detection channel. The minimum heating time is started once moisture is detected in standby mode. Also refer to **Minimum heating time**, page 10.

Factory setting: 90 min, possible settings: 30 to 600 min

Start minimum heating time?

Single Unit: Operation | Installer → Service → ISD channel
System: Operation | Installer → Service → ISD channel
Multi Channel: Operation → ISD channels → ISD channel <No.>
Installer → Service → ISD channels → ISD channel <No.>

One-time activation of the heating for the duration of the minimum heating time.

Factory setting: No, possible settings: No, Yes

Week program

System: Operation

Week programs 1-4

Multi Channel: Operation → System

Adjustment of a week/time program for a zone. The week program applies to ice detection channels assigned to the respective zone. In the "System" application one week program is available. In the "Multi Channel" application one week program per zone can be used. 16 switching points can be defined for each week program.

With a week program, the control mode of the zone is time-controlled. Each day of the week can be defined individually or together with other weekdays in a time grid of 15 minutes.

Factory setting control mode: Channel
Possible settings control mode: Channel, Channel+preHeat, Off

For detailed adjustment instructions refer to page 71, for further information refer to **Week programs**, page 12.

Settings

Holiday program

System: Operation
Multi Channel: Operation → System

Adjustment of a holiday program effective for the entire system that overrides all week programs of the existing zones.

For detailed adjustment instructions refer to page 72, for further information refer to **Week programs**, page 12.

Registered channels

Multi Channel: Information → System | Installer → Information → System

Display of channel numbers of the registered channels within a multi channel configuration.

Only for registered ice detection channels a selection option is shown in the corresponding menus of the Multi Channel user interface under → *ISD channel <No.>*.

For further information about ice detection channels and their registration, refer to **Ice detection channel**, page 7.

Effective outside temperature

System: Information → System | Installer → Information → System
Multi Channel: Information → System | Installer → Information → System

Display of the effective outside temperature in °C. The effective outside temperature is the weighted average of the outside temperature of the last few hours (weather forecast data and sensor measurements).

Due to the averaging (time factor adjustable via "ground characteristic"), this temperature may deviate from the real outside temperature. The effective outside temperature serves as the basis for activating the pre-heating control mode or the base temperature mode.

Pre-heating demand

System: Information → System | Installer → Information → System
Multi Channel: Information → System | Installer → Information → System

Display of the heating demand in % in the pre-heating mode. The effective outside temperature is used to assess whether pre-heating is necessary (e. g. in case of announced snowfall or black ice). For further information refer to **Pre-heating mode**, page 13.

Control mode

System: Information → System | Installer → Information
Multi Channel: Information → Zones → Zone <No.> | Installer → Information → Zones → Zone <No.>

Display of the currently effective control mode of the zone. Also refer to “Week program” and **Week programs**, page 12.

Channel state

Single Unit: Information | Installer → Information
System: Information → ISD channel | Installer → Information → ISD channel
Multi Channel: Information → ISD channels → ISD channel <No.>
Installer → Information → ISD channels → ISD channel <No.>

Display of the current state of the ice detection channel.

Possible states are: Reset, StartUp, Deactivated, Ready, Active, Heating min.time, Heating on demand, Add. heating, Temp. operation, Emerg. operation, Error, Err./Heating on.

Settings

Heating output

Single Unit: Information | Installer → Information
System: Information → ISD channel | Installer → Information → ISD channel
Multi Channel: Information → ISD channels → ISD channel <No.>
Installer → Information → ISD channels → ISD channel <No.>

Display of the switching state of the relay output of the heating circuit. If the state is "On", the downstream heating is active.

Temperature heating area

Single Unit: Information | Installer → Information
System: Information → ISD channel | Installer → Information → ISD channel
Multi Channel: Information → ISD channels → ISD channel <No.>
Installer → Information → ISD channels → ISD channel <No.>

Display of the temperature in the heating area in °C. Usually this value corresponds to the current sensor temperature. However, during the sensor inhibition time after a measurement the temperature from before the last measurement will be displayed.

Last moisture measurement

Single Unit: Information | Installer → Information | Installer → Service → ISD channel
System: Information → ISD channel | Installer → Information → ISD channel
Installer → Service → ISD channel
Multi Channel: Information → ISD channels → ISD channel <No.>
Installer → Information → ISD channels → ISD channel <No.>
Installer → Service → ISD channels → ISD channel <No.>

Display of the last measured moisture value. The higher the value, the more moisture was on the sensor surface during the measurement. Also refer to **Moisture measurement**, page 9.

Possible values: undefined, 0.0 to 10.0.

Remaining heating time

Single Unit: Information | Installer → Information
System: Information → ISD channel | Installer → Information → ISD channel
Multi Channel: Information → ISD channels → ISD channel <No.>
Installer → Information → ISD channels → ISD channel <No.>

Display of the remaining heating time including the post heating time in minutes, i. e. the time until the heating is switched off.

Operating time

Single Unit: Information | Installer → Information
System: Information → ISD channel | Installer → Information → ISD channel
Multi Channel: Information → ISD channels → ISD channel <No.>
Installer → Information → ISD channels → ISD channel <No.>

Display of the operating hours of the heating circuit accumulated since the last reset of the counter. This counter can be compared to the trip meter in a car. The counter can be reset at a specific point in time (e.g. before the winter) in order to be checked at a later point in time (e.g. at the end of the winter in order to find out how many operating hours have accumulated during the winter).

Settings

Energy consumption

Single Unit: Information | Installer → Information
System: Information → ISD channel | Installer → Information → ISD channel
Multi Channel: Information → ISD channels → ISD channel <No.>
Installer → Information → ISD channels → ISD channel <No.>

Display of the heating energy consumed since the last reset of the operating time counter. This value is the product of the heating performance and the value of the resettable operating time counter (in kWh).

Server

System: Information | Installer → Information | Installer → Config. modules
Multi Channel: Information | Installer → Information | Installer → Config. modules

For details refer to *Installation and Operation Instructions: Gateway Internet*.

Condition for display: Gateway communication active

Serial number

Information → Device data | Installer → Information

Display of the ten-digit serial number of the device.

Version

Information → Device data | Installer → Information

Display of the software version and build number (four digits).

Set passwords

Information

Possibility to set up password protection.

For a detailed description refer to **Password protection**, page 73.

Factory setting: 0000 for levels 1, 2 and 3

Date/Time

System: Setup → Date/Time | Installer → Startup → Date/Time
Multi Channel: Setup → Date/Time | Installer → Startup → Date/Time

Adjustment of the date and the time.

If the device is initially installed and commissioned or if it has been cut off from the power for some time, it must be checked if date and time are correct. If necessary, they need to be set manually. (The power reserve bridges short power cuts of up to half a day.)

If there is an internet connection, the device receives the date and time from the internet.

Type of summertime

System: Setup → Date/Time | Installer → Startup → Date/Time
Multi Channel: Setup → Date/Time | Installer → Startup → Date/Time

Setting of the automatic summer time adjustment.

Factory setting: Europe, possible settings: Off, Europe

Language

Setup

Adjustment of the menu language.

Factory setting: German, possible settings: German, English

Settings

Contrast

Setup → Display

Adjustment of the contrast of the display.

Brightness menu

Setup → Display

Adjustment of the brightness of the display when the menu is displayed.

Brightness idle

Setup → Display

Adjustment of the brightness of the display in idle mode.

Application

Installer → Startup

Adjustment of the application. This setting adapts the functions of the 1873 and its menu to the configuration in which it is used. Refer to **Application** on page 7.

Factory setting: Single Unit, possible settings: Single Unit, System, Multi Channel

Sensor type

Single Unit:	Installer → Startup | Installer → Config. modules
System:	Installer → Startup | Installer → Config. modules → ISD channel
Multi Channel:	Installer → Startup → ISD channels → ISD channel <Nr.> Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the type of combi sensor connected to the respective ice detection channel.

The sensor type must be set for each ice detection channel during commissioning. If the "to be defined" setting is maintained, an error message with an alarm will be displayed.

Factory setting: to be defined, settings: to be defined, 3354, 3356, 3355

Server communication active

System: Installer → Startup
Multi Channel: Installer → Startup

In case of a System or Multi Channel configuration without Internet Gateway, the communication to the TAV Server can be deactivated here. In this case, no error message appears in the idle display.

Factory setting: Yes, possible settings: No, Yes

Error code

Single Unit: Installer → Information
System: Installer → Information → ISD channel
Multi Channel: Installer → Information → ISD channels → ISD channel <No.>

Display of the current error code of the ice detection channel.

For a description of the individual codes, refer to **Error codes and alarm messages** from page 74 onwards.

Remaining inhibition time moisture

Single Unit: Installer → Information | Installer → Service → ISD channel
System: Installer → Information → ISD channel | Installer → Service → ISD channel
Multi Channel: Installer → Information → ISD channels → ISD channel <No.>
Installer → Service → ISD channels → ISD channel <No.>

Display of the remaining inhibition time of the sensor in minutes. During a moisture measurement the sensor is heated up and has to cool down again for up to 30 minutes before taking the next measurement. The remaining inhibition time shows when the next measurement can start at the earliest.

Zone number

Multi Channel: Installer → Information → ISD channels → ISD channel <No.>
Information → ISD channels → ISD channel <No.>

Display of the number of the zone in which the channel is registered. Also refer to **Zone**, page 12.

Operating time total

Single Unit: Installer → Information
System: Installer → Information → ISD channel
Multi Channel: Installer → Information → ISD channels → ISD channel <No.>

Display of the total operating hours a heating circuit has accumulated since the device has last been reset to its factory settings.

Energy consumption total

Single Unit: Installer → Information
System: Installer → Information → ISD channel
Multi Channel: Installer → Information → ISD channels → ISD channel <No.>

Display of the total heating energy used since the device has last been reset to its factory settings. This value is the product of the heating performance and the value of the resettable operating time counter (in kWh).

State

System: Installer → Information → Heat demand
Multi Channel: Installer → Information → Heat demand

Display of state of the heat demand determination.

For further information refer to **Messages of heat demand determination** on page 79.

Status OAT measurement series

System: Installer → Information → Heat demand
Multi Channel: Installer → Information → Heat demand

Display of the status of the measured outside temperature.

For further information refer to **Messages of heat demand determination** on page 79.

Status weather series

System: Installer → Information → Heat demand
Multi Channel: Installer → Information → Heat demand

Display of the status of the weather forecast data.

Settings

For further information refer to **Messages of heat demand determination** on page 79.

Outside temp. measured

System: Installer → Information → Heat demand
Multi Channel: Installer → Information → Heat demand

Display of the currently measured outside temperature in °C.

Outside temp. effective

System: Installer → Information → Heat demand
Multi Channel: Installer → Information → Heat demand

Display of the effective outside temperature in °C. The effective outside temperature is the weighted average of the outside temperature of the last few hours (weather forecast data and sensor measurements).

Due to the averaging (time factor adjustable via "ground characteristic"), this temperature may deviate from the real outside temperature. The effective outside temperature serves as the basis for activating the preheating control mode or the base temperature mode.

Alarm delay

Single Unit: Installer → Config. modules
System: Installer → Config. modules → System
Multi Channel: Installer → Config. modules → System

Adjustment of the alarm delay. An alarm will only be passed on if this time has passed. Also refer to **Alarm management**, page 14.

Factory setting: 60 min, possible settings: 0 to 300 min

Alarm relay inverted

Single Unit: Installer → Config. modules
System: Installer → Config. modules → System
Multi Channel: Installer → Config. modules → System

Adjustment of the alarm relay's operating mode.

Usually the relay will be activated in case of an alarm, i.e. in case of an error the relay will be deactivated and an error will be signalled. In case of inverted function, the relay is activated if there is no error. Also refer to **Alarm relay**, page 14.

Factory setting: No, possible settings: No, Yes

Delete registered channel

Multi Channel: Installer → Config. modules → System

Possibility to delete a registered ice detection channel.

It is only possible to delete a registered channel (e.g. when changing the channel number) by resetting the 1873 to its factory settings or by using this menu item and specifying the channel number. Also refer to **Zone**, page 12.

Factory setting: -, possible settings: 2 .. 8

Time control

Multi Channel: Installer → Config. modules → Zones → Zone <No.>

Possibility to activate the use of a week program for the respective zone. Also refer to **Week programs**, page 12.

Factory setting: No, possible settings: No, Yes

Settings

Channel coupling

Multi Channel: Installer → Config. modules → Zones → Zone <No.>

Adjustment of channel coupling. If the coupling is active, the minimum heating time will be activated for all channels in a zone as soon as moisture is detected in one of the channels. Also refer to **Channel coupling**, page 12.

Factory setting: No, possible settings: No, Yes

Lower temperature limit

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the lower temperature limit for the channel. Also refer to **Switch-off temperature**, page 10.

Factory setting: -15 °C, possible settings: -30 to -5°C

Follow up time

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the follow up time. This is the time during which the heating will continue to be active even if the regular heating time has run out and the moisture value is again below the defined moisture threshold. Also refer to **Follow up time**, page 10.

Factory setting: 0 min, possible settings: 0-180 min

Base temperature

System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the target value for the ground temperature in the base temperature mode. As soon as the outside temperature falls below the defined upper temperature limit, the heating is switched on in order to keep the ground temperature on the defined base temperature level.

For further information on the base temperature mode also refer to **Base temperature mode**, page 11.

Factory setting: -5 °C, possible settings: -15 to +5°C

Zone number

Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Definition to which zone this ice detection channel belongs. If the value is 0, the channel will not be assigned to any zone. Also refer to **Zone**, page 12.

Factory setting: 0, possible settings: 1 to 4

Heating performance

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the heating performance for mathematical assessment of the used heating energy (operating hour counter multiplied by heating performance equals heating energy).

Factory setting: 0 W, possible settings: 0 to 100000 W

Settings

PWM interval time

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the time interval for the pre-heating and emergency mode, during which the control circuit is switched on and off again once.

Note: Do not to set the PWM interval time at a lower value than necessary because a short PWM interval time may have a negative effect on the lifetime of the heating circuit relay.

Factory setting: 60 min, possible settings: 30 to 240 min

Emergency duty cycle

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Adjustment of the duty cycle (i.e. the time during which the heating is switched on in relation to the interval time) of the PWM in emergency operation. For further notes refer to **Emergency mode**, page 11.

Factory setting: 0 %, possible settings: 0 to 100 %

If > 0% considerable energy consumption possible!

OT-Limit preHeating

System: Installer → Config. modules → System
Multi Channel: Installer → Config. modules → System

Adjustment of the switch-off temperature in base temperature mode and pre-heating mode. Below this temperature, the base temperature or pre-heating mode will be deactivated because heating the area might

lead to unfavourable conditions. Otherwise, at very low temperatures, the surface might not be completely heated through. In such a case the thawed ice might freeze again, which would increase the risk of slipperiness. Also refer to **Pre-heating mode**, page 13 and **Base temperature mode**, page 11.

Factory setting: -20 °C, possible settings: -30 to 0 °C

Check OT value continuously

System: Installer → Config. modules → System
Multi Channel: Installer → Config. modules → System

Activation of a continuous monitoring of the outside temperature (OT). If no outside temperature value is transmitted via the connected sensor or the weather forecast, an alarm is triggered, even if the OT value is currently no required by the base temperature mode or the pre-heating mode.

Factory setting: No, possible settings: No, Yes

Emergency mode with error temperature

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Possibility to define for each channel if an emergency mode is to run if there is an error in the temperature measurement. For further notes relating to the emergency mode refer to **Emergency mode**, page 11.

Factory setting: No, possible settings: No, Yes

If “Yes” and Emergency duty cycle > 0% considerable energy consumption is possible!

Settings

Blocking protection active

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Activation of a pump blocking protection for water-based heating systems. If the blocking protection is active, the relay for the pump will be switched on once a day for 40 seconds.

Factory setting: No, possible settings: No, Yes

Monitoring heating output active

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

The device constantly monitors the output of the heating circuit (heating output). If there is no sufficient load at the output, for example when connecting a building control system or a contactor to switch the load, there may be a misinterpretation. In this case the error "E x2xx" is displayed and an alarm is raised. This can be avoided if you deactivate the monitoring of the heating output by setting this menu item to „No“.

Factory setting: Yes, possible settings: No, Yes

Operating time: Reset counters

Single Unit: Installer → Config. modules
System: Installer → Config. modules → ISD channel
Multi Channel: Installer → Config. modules → ISD channels → ISD channel <No.>

Possibility to reset the operating hour counter. Press OK to reset the erasable counter of the selected ISD channel.

Pre-heating start temperature

System: Installer → Config. modules → Heat demand
Multi Channel: Installer → Config. modules → Heat demand

Adjustment of the start temperature in the pre-heating mode. This value is part of the characteristic curve used to calculate the percentage duty cycle of the heating (PWM value). Also refer to **Pre-heating mode**, page 13.

Factory setting: -5 °C, possible settings: -10 to 0 °C

Pre-heating start value

System: Installer → Config. modules → Heat demand
Multi Channel: Installer → Config. modules → Heat demand

Adjustment of the start value in the pre-heating mode. This value is part of the characteristic curve used to calculate the percentage duty cycle of the heating (PWM value). Also refer to **Pre-heating mode**, page 13.

Factory setting: 10 %, possible settings: 0 to 30 %

Pre-heating end temperature

System: Installer → Config. modules → Heat demand
Multi Channel: Installer → Config. modules → Heat demand

Adjustment of the end temperature of the pre-heating mode. This value is part of the characteristic curve used to calculate the percentage duty cycle of the heating (PWM value). Also refer to **Pre-heating mode**, page 13.

Factory setting: -20 °C, possible settings: -30 to -10 °C

Settings

Ground characteristic

System: Installer → Config. modules → Heat demand
Multi Channel: Installer → Config. modules → Heat demand

Adjustment of the ground characteristic of the open space. This time constant defines the duration that the ground needs to follow an outside temperature jump to 2/3. Also refer to **Weather sensor and weather forecast**, page 14.

If this is set to "Off" the influence of the ground characteristic on the effective outside temperature will no longer be considered.

Factory setting: 2 h, possible settings: Off, 1 to 24 h

Heat-up characteristic

System: Installer → Config. modules → Heat demand
Multi Channel: Installer → Config. modules → Heat demand

Adjustment of the time characteristic of the heating process in the open space. This value defines the planning horizon for which a weather forecast influences the current heating of the ground. The more inert the combination Heating+Ground is, the higher should be the setting for this value. Also refer to **Weather sensor and weather forecast**, page 14.

If this is set to "Off" the influence of the heat-up characteristic will no longer be considered.

Factory setting: 2 h, possible settings: Off, 1 to 16 h

LAN setup

System: Installer → Config. modules
Multi Channel: Installer → Config. modules

For details refer to *Installation and Operation Instructions: Gateway Internet*.

Condition for display: Gateway communication active.

Stop heating?

Single Unit: Installer → Service → ISD channel
System: Installer → Service → ISD channel
Multi Channel: Installer → Service → ISD channels → ISD channel <No.>

Possibility to switch off the heating during an ongoing minimum heating time.

Factory setting: No, possible settings: No, Yes

Start moisture measurement?

Single Unit: Installer → Service → ISD channel
System: Installer → Service → ISD channel
Multi Channel: Installer → Service → ISD channels → ISD channel <No.>

Activation of a moisture test measurement for the combi sensor allocated to the ice detection channel, independent from the current ground temperature. Also refer to **Moisture measurement**, page 9.

Factory setting: No, possible settings: No, Yes

Sensor temperature

Single Unit: Installer → Service → ISD channel
System: Installer → Service → ISD channel
Multi Channel: Installer → Service → ISD channels → ISD channel <No.>

Display of the current combi sensor temperature in °C. During the measurement this value can be up to 20 °C above the current ambient temperature of the sensor.

Settings

Restart

Installer → Service

Possibility to restart the device without cutting the power. This function is only available for the 1873. The devices connected via TGN are not restarted.

Factory settings

Installer → Service

Possibility to reset the device to its factory settings. This function is only available for the 1873. The devices connected via TGN are not reset.

Setup exp. channel (connect only one device!)

Multi Channel: Installer → Service

Allocation of the ice detection channels for the 1875-ESM. Only channels 2 to 8 can be assigned to the 1875-ESM, since channel 1 is always reserved for the 1873-ESM.

When configuring a Multi Channel system with more than two channels, **only one** 1875-ESM at a time may be connected to the 1873-ESM via TGN and configured. Once the configuration for one device has been completed it can be disconnected from the TGN bus and the next device can be connected and configured. Only after channel configuration of each individual 1875-ESM is finished, all 1875-ESMs can be switched together to the TGN bus.

Factory setting: 2, possible settings: 2 to 8

Operation in detail

Week program

System: Operation → Week program
Multi Channel: Operation → System → Week programs

If the "System" application has been selected, a week program may be set for the ice and snow detection system. If the "Multi Channel" application has been defined, four week programs may be set for the whole system. 16 switching points can be defined for each week program.

In the following the change of the week program in the "System" application is described as an example.

Week program 1		
Entry	1	2
Switching time	00:00	20:00
Control mode	Channel + preHeat	Channel
Relevant days	Mon Tue Wed Thu Fri Sat Sun	Mon Tue Wed Thu Fri Sat Sun

Individual change of the week program:

1. Select *Menu* → *Operation* → *Week program*.
2. Press >>.
3. Use the plus or minus button (+ or -) to select the entry that is to be changed, for example Entry 1.
4. Press *Act* in order to update the entry.
5. Press *Edit*.
6. Make the desired changes in time and control mode using the plus or minus button (+ or -) and the arrow button >.
7. Use the the arrow button > and the plus or minus button (+ or -) to make the desired changes to the weekdays. The plus button activates the switching point on this day (the initial letters of the weekday are displayed). The minus button deactivates the switching point on this day: a "–" is displayed instead of the letters.
8. Press *Save*.

Holiday program

System: Operation → Holiday program
Multi Channel: Operation → System → Holiday program

By means of the holiday program a control mode ("Channel", "Channel+preHeat" or “Off”) can be selected. The holiday program overrides the active week program. This means it disables the current week program. After the holiday time the week program which was in use before will be active again.

Note:
If you want to terminate the holiday function prematurely, change the end day into a date in the past.

Setting the holiday function:

1. Select the menu item *Holiday program*.
2. The Start of holiday window is displayed.
3. Press *Chng* and set the desired starting time using the arrow button > and the plus or minus button (+ or -). Press *Save*.
4. Press Arrow down ⬇. The window End of holiday is displayed.
5. Press *Chng* and use the arrow button > and the plus or minus button (+ or -) to set the desired end time. Press *Save*.
6. Press *Arrow down* ⬇. The window *Control mode holiday* is displayed.
7. Press *Chng* and select the desired control mode for the holiday time using the plus or minus buttons (+ or -). Press *Save*.
8. The holiday function is now active. On the defined start day the desired control mode will be switched on. It will be switched off again at the end of the defined end day.

Password protection

Information → Set passwords

Passwords can be set for three menu levels (Level 0, *Information*, is always available without restriction). This is useful, for example, to ensure that only qualified installation staff configure the control device. The password consists of four digits and may be different for each of the three levels.

Password protection of the menu items:

Information	Level 0
Operation	Password level 1
Setup	Password level 2
Installer	Password level 3

A higher-level password is also valid for the lower levels. This means that someone who has access to a higher level will automatically also be able to access the levels below, even if he or she does not know the lower-level passwords.

In case a password has been forgotten or is no longer available for any other reason (such as change of installation technician) all passwords can be deleted with the help of a super password in order to regain access. In the retail partner's area on the tekmar website, the device's serial number can be entered and the super password retrieved. Please contact the tekmar technical service in case of problems.

Note: A password for a lower level can only be set if all passwords of the higher levels have already been set.

Troubleshooting

Error codes and alarm messages

Single Unit: Installer → Information
System: Installer → Information → ISD channel
Multi Channel: Installer → Information → ISD channels → ISD channel <No.>

In case of an error the alarm relay is activated and an alarm is raised. The corresponding error code is shown on the display in idle mode and can also be found under the above menu items.

In the four-character error value, e.g. “00A2”, several error codes are combined in the individual positions, if need be. These can be determined with the help of the adjacent table:

The example above, “00A2”, can be segmented from right to left into
Position 1 = 2 → code xxx2,
Position 2 = A → code xx2x + code xx8x
Position 3 and 4 = 0 → no errors

Thus the errors xxx2 (configuration error), xx2x (voltage too high) and xx8x (temperature too high) are active.

Display Position 1 - 4	**Codes Position 1 - 4**			
0				
1	1			
2		2		
3	1	2		
4			4	
5	1		4	
6		2	4	
7	1	2	4	
8				8
9	1			8
A		2		8
B	1	2		8
C			4	8
D	1		4	8
E		2	4	8
F	1	2	4	8

Error code	Description	Explanation/measure
E xxx1	internal error	Unforeseen software error, reason cannot be determined. → Restart device.
E xxx2	configuration error of the module	Defined sensor type does not match the measurement values. → Check sensor type/configuration. Note: The error also occurs if the device has not been configured yet or has been reset to its factory settings and the sensor type is still set to "to be defined".
E xxx4	temperature sensor cannot be evaluated	Temperature cannot be measured. → Check sensor connection.
E xxx8	error voltage measurement	Voltage at sensor cannot be measured. → Check sensor connection. If not successful, return device to the tekmar Service to be checked.
E xx1x	error current measurement	Current through sensor cannot be measured or current is too low for the defined sensor type. → Check sensor connection. If not successful, return device to the tekmar Service to be checked.
E xx2x	error current too high in idle mode	Current in idle mode too high, i.e. also outside the measurement cycle current flows through the sensor heating. This indicates an error in the device. → Return device to the tekmar Service to be checked.
E xx4x	error upon start of moisture meas-	Error when moisture measurement is started. Possible reasons: an invalid sensor type is defined, an already started measurement is still

Troubleshooting

Error code	Description	Explanation/measure
	urement	ongoing, the temperature measurement is faulty or the supply voltage is too high. → Set the correct sensor type, wait for the ongoing measurement to finish, check sensor connection.
E xx8x	temperature too high upon start of measurement or during measurement	Temperature at start of measurement (>30 °C) or during the measurement (>55 °C) too high; evaluation impossible. → Wait until the temperature is at a suitable level and repeat measurement then.
E x1xx	moisture could not be determined	Moisture determination during the measurement impossible. → Check connection/resistance values of the sensor. If not successful, the sensor has to be checked (resistance check) either on site or at tekmar.

Error code	Description	Explanation/measure
E x2xx	error heating output	Monitoring of the heating output signals an error, i.e. it may be that the heating element could not be switched on/off. In parallel to the relay in the device there is an electrical circuit which continuously monitors the output (even when switched off). An error occurs if the output is not or incorrectly connected. → Check installation on site: Check whether the heating element or downstream contactor is defective. Check whether the connection terminals are correctly fastened. → If the installation is OK, the internal relay may be defective. In this case, the device must be replaced. → The error message can also occur briefly for a few seconds when the operating status is changed. This is not an error but due to the signal runtime. Note: The output cannot easily be tested with an ohmmeter, as the internal circuit influences the measurement result.

Troubleshooting

Error code	Description	Explanation/measure
E x4xx	error outside temperature	The outside temperature is absolutely necessary for the functioning of the pre-heating or base temperature operation. The outside temperature can either be determined locally via a sensor of the 1873-ESM or from the weather forecast provided by the internet server. If a value for the outside temperature is missing, the pre-heating or base temperature operation cannot be executed. However, the moisture monitoring function remains active. Measures: → Check installation of outside temperature sensor on site → Fix the gateway's internet connection

There are events that can trigger several errors, e. g. an interruption in the sensor. In this case not all errors may be displayed, but only the first error that caused a measurement to terminate.

Messages of heat demand determination

For the calculation of the heat demand the following states are defined:

- OAT measurement:
  Measurement from the sensor is available (local sensor or wireless sensor, usually only shortly after power-up or if the weather forecast data from the internet have not yet been received)
- OAT now:
  Current single value from the outside temperature measurement
- Weather now:
  Current single value from the weather forecast
- Weather future:
  Time series from the weather forecast with stored values from the past

The possible messages of the two outside temperature sources (OAT measurement series and weather series) are:

- (not in use):
  Source was not needed (e.g. sensor not needed if weather forecast complete)
- No values:
  Source is faulty (sensor defective, no weather forecast)
- Single value:
  Source returns a single value for the current point in time
- Time series:
  Source returns a time series for the past and possibly the future

Outside temperature monitoring

In the active pre-heating mode, an alarm is triggered if there is no valid value for the outside temperature. Depending on the configuration, the connected outside temperature sensor or the correct connection of the (W)LAN Gateway to the internet must be checked.

The parameter “Check OT value continuously” can be set in a way to activate the outside temperature monitoring also if the pre-heating mode is not active.

Heating output monitoring

The device constantly monitors the output of the heating circuit (heating output). If there is no suffi-

cient load at the output, for example when connecting a building control system or a contactor to switch the load, there may be a misinterpretation. In this case the error "E x2xx" is displayed and an alarm is raised. This can be avoided if you deactivate the monitoring of the heating output (menu item: *Installer → Config. modules (...) → Monitoring heating output active*).

Problems with the device

If the controller identifies an internal error, this will be shown via the display and the relay for the switching output 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.

A possible reason for problems with week programs may be a wrong date and time set for the system. If the device is initially installed and commissioned or if it has been cut off from the power for some time, it must be checked if date and time are correct. If necessary, they need to be set manually. If there is an internet connection, the device receives the date and time from the internet. For further information refer to page 55.

Problems with the sensor

The connected sensor is monitored continuously. The emergency operation mode will be automatically activated if the parameter "Emergency mode with error temperature" is set to "Yes" and the parameter “Emergency duty cycle" is greater than 0 %. Alternatively the "Emergency mode" can be manually set as the operating mode.

Note: In the Emergency mode, heating takes place regardless of the prevailing temperatures. Depending on the set control value, this can result in high electricity costs.

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 resistance values of the sensor units.

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.

Technical data

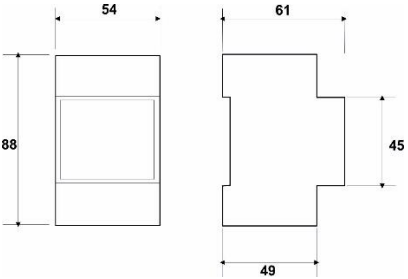
Ice and Snow Detector 1873-ESM/1875-ESM

Moisture sensor/combi sensor:	tekmar Type 3354, 3356 (or 3355 with conversion kit)
Optional temperature sensor (only 1873):	tekmar Series 31, e. g. 3154
Temperature measuring range:	-30 °C to +80 °C
Communication	TGN bus (TGN = "tekmar-Geräte-Netzwerk", tekmar Device Network))
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
Signalling output/alarm relay (only 1873):	- potential-free change-over contact - maximum switching voltage 230 VAC or 30 VDC - rated current 2 A (resistive load) - SELV-compliant with appropriate external wiring - when using supply voltage on-site fuse protection by means of miniature circuit breaker (MCB) required, rated current max. 6 A, tripping characteristic class B
Rated voltage:	230 VAC, 50 Hz
Acceptable voltage range:	195 V to 253 V
Power consumption:	3 W or approx. 11 W during moisture measurement
Connecting terminals:	cage clamp terminals for 2.5 mm², tightening torque ≤ 0.5 Nm

Technical data

Rated surge voltage:	4000 V
Pollution degree:	2 (normal)
Action type:	Type 1.B (Type 1.C when using the alarm relay with 230 VAC)
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
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

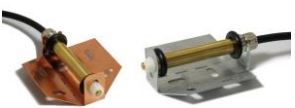
Dimensions



Regulations

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

Available accessories

	Ground sensor 3356 for combined measurement of moisture and temperature values in open areas
	Ground installation socket for sensor 3355/3356
	Gutter sensor 3354 for combined measurement of moisture and temperature values
	Mounting plate for sensor 3354 (copper or zinc)
	Conversion kit for ground sensor 3355 in case of replacement of an old tekmar ice and snow system 1773

	Weather sensor 3115
	Internet Gateway 1880/WLAN-GWI
	Modbus Gateway 1880/D85-GMR

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