

LK Control Unit ETO2

DESIGN

LK Control Unit ETO2 is meant to be used primarily as LK Snow melting must be controlled intermittently. The equipment consists of LK Control Unit ETO2, LK Ground sensor ETOG and LK Pipe sensor ETF.

LK Control Unit ETO2 offers the following:

- Energy-efficient control of the snow melting system.
- Simple menu navigation.
- Clear background-lit display.
- Alarm relay.

Note!

The control unit can, depending on how it is set, either maintain/regulate the flow temperature to the snow melting system or only generate start/stop signals to the external control equipment. The instruction is divided into two different chapters depending on the function desired. If the unit should maintain/regulate the flow temperature, follow the instructions *Assembly instruction, Maintaining the flow temperature*. If the unit should send start/stop signals to external control equipment, follow the instructions below.

ASSEMBLY INSTRUCTION, START/STOP OF EXTERNAL CONTROL EQUIPMENT (BMS)

The following instruction is applicable when LK Control unit ETO2 must send start/stop signals to the external control equipment. The control unit and sensor must only be installed by an authorized electrician.



Function

When the ground sensor detects moisture while the ground temperature is so low that there is a freezing hazard, the control unit starts snow melting via the external control equipment. When the ground sensor is dry, the snow melting is shut off. The unit can be programmed to maintain the heating activated for the desired time even if the ground sensor is dry.

1. Install the control unit indoors either directly on the wall or on the DIN rail.
2. Start/stop signal to the property's BMS is drawn from the pump inlet in the LK Control unit ETO2 terminals 3, 4. (NOTE! Potential-free contact).
3. Connect the LK Ground sensor ETOG according to the instruction under the heading
4. Pump and actuator are not connected to the LK Control unit ETO2 in this case.
5. Connect the power supply, see the circuit diagram.
6. Adjust the control unit, see the heading *Adjustment to start/stop of external control equipment*.

Adjustment to start/stop of external control equipment.

First time the control unit is charged, it must be adjusted to the snow melting system. The adjustment is done with the unit's multifunction button (MF-button). Turn until the right menu is shown on the display, confirm by pressing the button once.

Note!

For the following description to be correct, it is important that the unit is not powered up earlier. If this has been done, the unit needs to be reset, see REINSTALL in the table under the heading *Settings*.

1. Select Celsius degrees, confirm by pressing the MF button.
2. Select Sensor ETOG, confirm by pressing the MF button.
3. Set Sensor 2* to OFF, confirm by pressing the MF button.
4. Set Outdoor sensor to OFF, confirm by pressing the MF button.
5. Set Application to ELECTRIC 1-zone, confirm by pressing the MF button.
6. The unit changes to normal view and the system is now ready for operation.

* Read more about sensor 2 under the heading *Ground sensor*.

ASSEMBLY INSTRUCTION, MAINTAINING THE FLOW TEMPERATURE.

The following instruction is applicable for when LK Control Unit ETO2 is to maintain/regulate the feed temperature to the snow melting system.

The control unit and sensor may only be installed by an authorized electrician.

Function

When the ground sensor detects moisture, and the ground temperature is so low that there is a freezing hazard, the control unit starts snow melting by activating the control valve via the motor/actuator. The control unit keeps the flow temperature constant to the desired level with the help of a flow sensor (LK Pipe sensor ETF).

The unit can also control the start/stop function of the circulation pump in the snow melting system. When the ground sensor is dry, the snow melting is shut off. The unit can be programmed to maintain the heating activated for the desired time even if the ground sensor is dry.

1. Install the control unit indoors either directly on the wall or on the DIN rail.
2. Connect the LK Ground sensor, see the circuit diagram under the heading *LK Ground sensor*.
3. Connect the LK Pipe sensor, see the circuit diagram under the heading *LK Pipe sensor*.
4. Connect the actuator, see the circuit diagram under the heading *Actuator*.
5. Connect the system's circulation pump, see the circuit diagram under the heading *Pump relay*.
6. Connect the power supply, see the circuit diagram and the heading *Supply voltage*.
7. Adjust the control unit, see the heading *Adjustment, Maintain the flow temperature*.

Adjustment, maintain the flow temperature.

First time the control unit is charged, it must be adjusted to the snow melting system. The adjustment is done with the unit's multifunction button (MF-button). Turn until the right menu is shown on the display, confirm by pressing the button once.

Note!

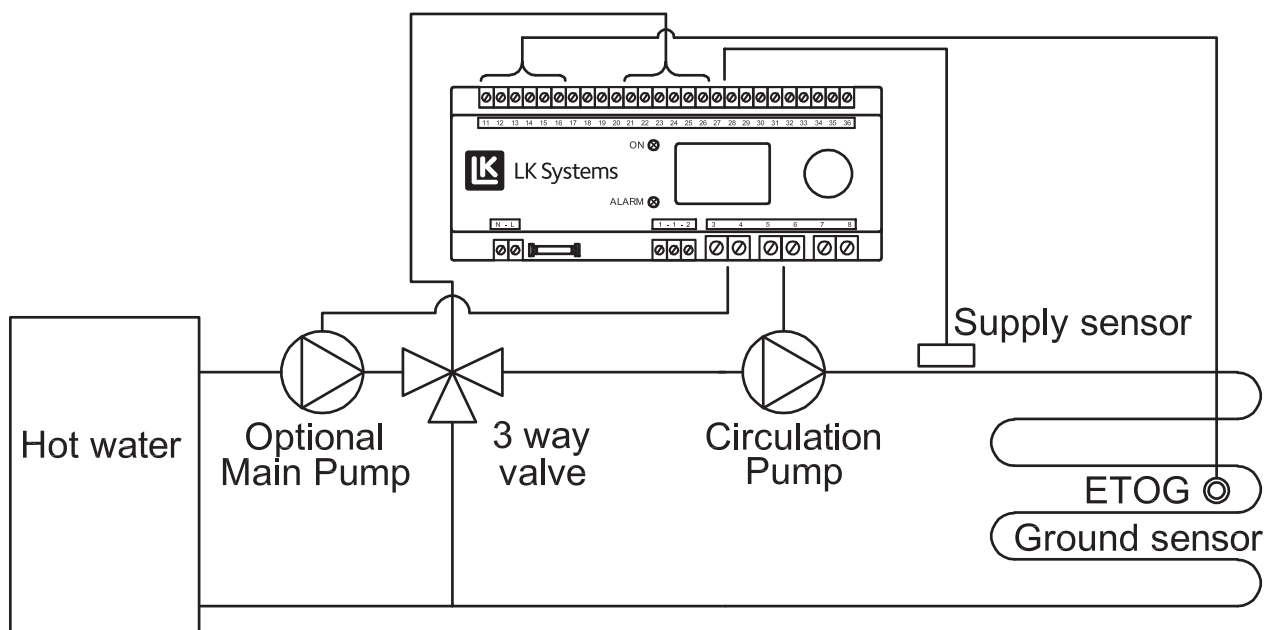
For the following description to be correct, it is important that the unit is not powered up earlier. If this has been done, the unit needs to be reset, see REINSTALL in the table under *Settings*.

1. Select Celsius degrees, confirm by pressing the MF button.
2. Select Sensor ETOG, confirm by pressing the MF button.
3. Set Sensor 2* to OFF, confirm by pressing the MF button.
4. Set Outdoor sensor to OFF, confirm by pressing the MF button.
5. Set Application to Water based, confirm by pressing the MF button.
6. The unit changes to normal view and the

system is now ready for operation.

7. Check that MY Water is set to 5 degrees, see the heading *Settings*.
8. Before the system is started, the maximum temperature value must be controlled, see the heading *Settings/MAX WATER*.

* Read more about sensor 2 under the heading *Ground sensor*.



Principle drawing, control via 3-way valve.

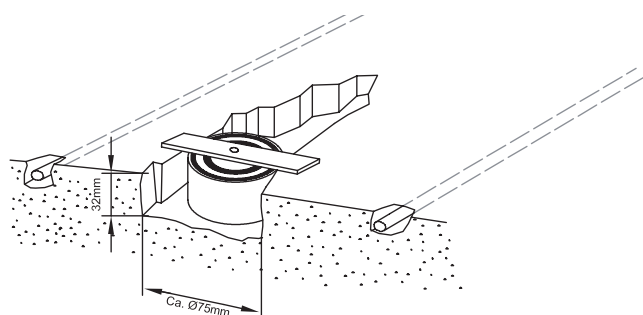
LK GROUND SENSOR ETOG

Function

LK Ground sensor ETOG detects both temperature and moisture. Usually, it is enough to connect one LK Ground sensor ETOG to the control unit but in some cases, two ground sensors may be required to achieve a satisfactory function, for example a ground area that stretches around the building and thereby extends to both North and South locations.

Placement in the ground.

1. LK Ground sensor ETOG must be placed in the ground within the heated area, where snow/ice is suspected to remain for the longest duration. The sensor is placed in between two pipes
2. Prepare the assembly by drawing one electric pipe to the place where the sensor is to be installed. Place a wooden block or another "template" instead of the sensor until the ground surface is ready.
3. Then install the sensor at the top of the ground surface using the delivered metal plate template. Make sure that the sensor is horizontal with the ground. **NOTE! Make sure that the sensor is installed with the right side up. (The screw hole in the sensor should be upwards).**
4. Seal with concrete around the sensor so that it is fixed in the correct position.



Placement of the LK Ground sensor ETOG in the ground.

Connection

On delivery, the sensor is provided with a 10 meter connection cable which is possible to extend up to 200 m. Use an installation cable with at least 6 pcs of 1,5 mm² threads. The cable should be shielded and must not be installed in parallel with current cables as this can lead to signal disturbance.



The ground sensor must be installed by an authorized electrician in accordance with applicable regulations.

The connection is carried out according to the circuit diagram and below table:

Terminal number in the control unit	Cable color, LK Ground sensor 1
11	Brown
12	Green
13	Grey
14	Pink
15	Yellow
16	White

Connection of additional LK Ground sensor (Sensor 2)

In case two ground sensors are required, sensor number two is connected according to the circuit diagram and the table below.

Terminal number in the control unit	Cable color, LK Ground sensor 2
11	Brown
12	Green
17	Grey
18	Pink
19	Yellow
20	White

When the extra sensor is installed, it must be activated in the control unit for it to work. The activation is done when the control unit is adjusted to the LK Snow melting. Follow the instruction under the heading *Adjustment, Maintain the flow temperature* and *Adjustment to start/stop of external control equipment*, but set Sensor 2 to ON (point 3 in the instruction).

Calibration of the ground sensor

If necessary, the temperature value for the ground sensor can be calibrated according to the instructions below:

1. Disconnect the sensor cables that are connected to terminals 11 and 12. (Feed to heat element).
2. Wait for a few hours until the sensor and the ground attain the same temperature.
3. Measure the actual ground temperature with the external measuring equipment, compare with the value that is shown on the display.
4. Set the OFFSET temperature for the current sensor.
5. Connect the sensor cables to terminals 11 and 12. (Feed to heat element).

Note!

The temperature displayed for the ground sensor is always the ground temperature (core temperature in the sensor).

LK PIPE SENSOR ETF



Function

LK Pipe sensor measures the temperature of the snow melting system's supply pipe in order for the control unit to be able to maintain/regulate the supply temperature at the set level. The pipe sensor is connected when the control unit must regulate/control the supply temperature.

Assembly on pipes

Assemble the sensor to a suitable location on the supply pipe, using the mounting strap supplied. Clean the surface properly so that good contact is attained. If necessary, the sensor body can be insulated to avoid incorrect measurement data.

Connection the LK Pipe sensor, supply

The sensor intended to measure the supply temperature is connected according to the circuit diagram and the table below.

Terminal number	LK Pipe sensor, supply
27	Electrical conductor, any color*
28	Electrical conductor, any color*

**The sensor has no polarity*

Connection LK Pipe sensor, return

The unit is delivered with a built-in 10 kOhm resistor between terminals 29 and 30, which means that the unit believes the return temperature to be constant at approx. 30 degrees. Only in cases where a system must have a high readiness for snow melting, such as a helipad or ambulance intake, the resistor is replaced by the LK Pipe sensor for measuring the return temperature. With a return temperature sensor installed, the control unit will start the snow melting when the return temperature is below the set value.

The sensor to measure the return temperature is connected according to the circuit diagram and the table below.

Note!

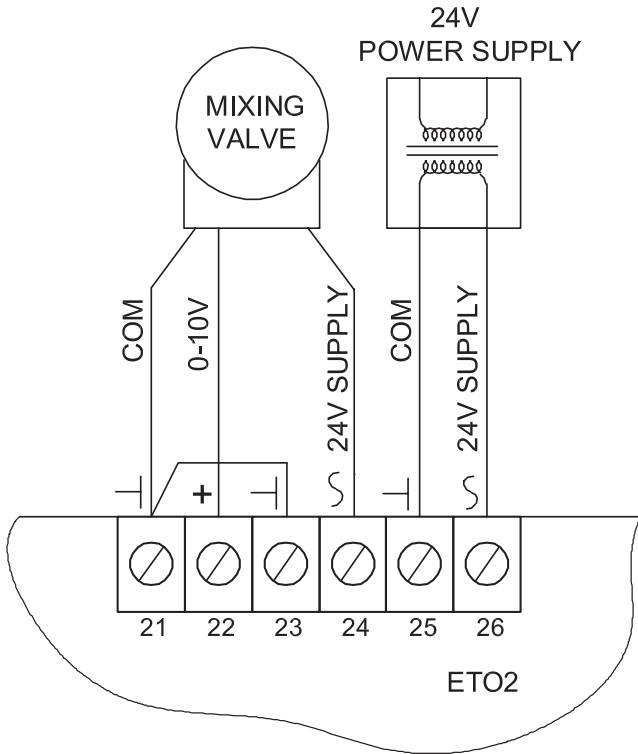
A sensor installed as shown below means a strong increase in the system's energy consumption. Unless the system has access to waste heat/free heat, carefully consider installing this.

Terminal number	LK Pipe sensor, return
29	Electrical conductor, any color*
30	Electrical conductor, any color*

**The sensor has no polarity*

ACTUATOR

LK Control unit ETO2 sends control signals to impact the 0-10 V actuator (24 V AC 0-10 V, not LK item). The actuator is connected according to the table below.



Principle drawing, connection of 0-10 V actuator.

Terminal number	Connect to:
21	COM on actuator
22	Control signal (0-10 V)
23	Strapped to terminal 21
24	24 V AC feed to actuator
25, 26	Transformer 24 V AC

PUMP RELAY

The control unit is equipped with three potential-free relays (not powered), which if necessary, can start/stop the system's primary/secondary pumps or be used to start/stop the external control equipment. Connection is made according to the circuit diagram.

Depending on how the device has been set, the relays have different functions, see table below.

Selected mode	Application*	Function relay
Start/stop of BMS	Electric mode 1 zone	Relays 1, 2 and 3 energized at the same time
Start/stop of BMS	Electric mode 2 zone	Relay 1 is energized where zone 1 is active. Relay 2 is energized where zone 2 is active.
Maintain flow temperature	Water based	Relay 1 and relay 2 are energized at the same time. Relay 3 is unaffected.

* See the heading adjustment below

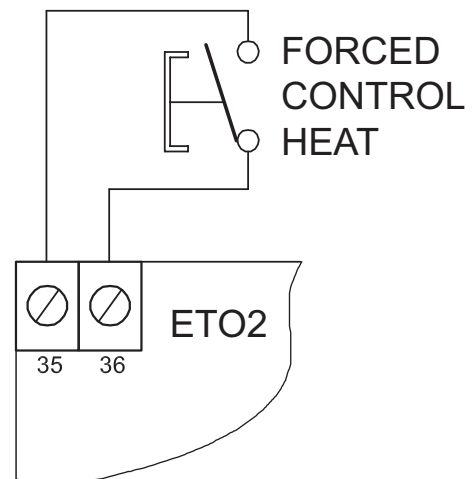
CONNECTION OF SUPPLY VOLTAGE

Connection of supply voltage is carried out according to the circuit diagram.

REMOTE CONTROL

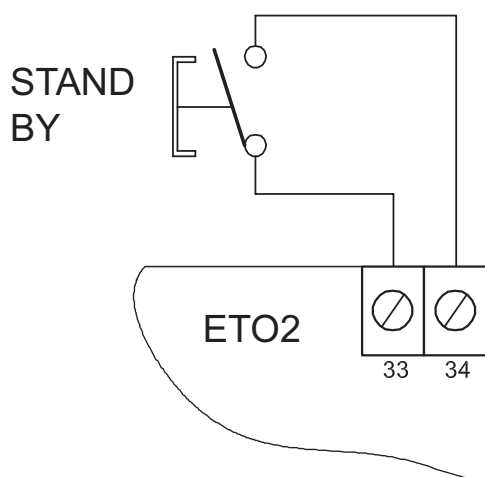
Remote control, forced start

The control unit is equipped with an input to remotely control/force start the system even if there is no "real" need. On activated input (closed contact), the heat is connected and continues until the after heating time reaches value zero. Remote control of forced start is connected between terminals 35 and 36.



Remote control, forced standby

Forced Standby is used when you don't want the unit to start even if there is a need. On activated input (closed contact), a forced standby is activated. The function is connected between terminals 33 and 34.



MENUS/SETTINGS

All menu management and configuration of all settings is done using the multi-function button (MF button). Turn until the right menu is shown on the display, confirm by pressing the button once.

Normal view

When the unit is powered, the display shows a normal view with information on the unit's operation mode. By pressing the MF button once, the display shows more detailed information about the operation mode. See below a list of the information displayed in the normal view.

Display text	Explanation
ZONE 1	ON = Heating activated for zone 1. OFF = Heating deactivated for zone 1.
ZONE 2	ON = Heating activated for zone 2. OFF = Heating deactivated for zone 2.
SENSOR 1	Shows the ground temperature for ground sensor 1. Note! Does not show the air temperature.
SENSOR 2	Shows the ground temperature for ground sensor 1. Note! Does not show the air temperature.
MOIST 1	Moisture status for sensor 1, YES, NO or blank value. Blank value is displayed if the temperature is above the set start value or if the unit is operating in Afterrun mode.
MOIST 2	Moisture status for sensor 2, YES, NO, or blank value. Blank value is displayed if the temperature is above the set start value or if the unit is operating in Afterrun mode.
OUT TEMP	Air temperature outdoors, not used for snow melting.
SUPPLY W.	Temperature of the supply water
RETURN W.	Temperature of the return water.

Settings

Settings are made under the heading **Setup**. The menu becomes accessible by pressing the MF button once, when the unit's display is in normal view. Thereafter, select **SETUP** and confirm with the MF button.

Below is a list of the different menus available under **SETUP** and the options available under the menus.

Function	Description	Selectable value
FORCE HEAT	Used to force the snow melting to start. Snow melting is activated for the time given under the heading Afterrun .	Select ON or OFF.
SELECT SCALE	Indicates the temperature scale to be used	Select C or F.
SET TEMP 1	For the unit to start, the temperature must be below the given value. (The value refers to ground sensor 1.)	Select between -20 - + 50 °C. Default + 3 °C
SET TEMP 2	For the unit to start, the temperature must be below the given value. (The value refers to ground sensor 2.)	Select between -20 - + 50 °C.
AFTERRUN 1	Indicates how long the unit continues to operate after ground sensor 1 perceives the ground surface as dry.	Select from 0 minutes to 18 hours.
AFTERRUN 2	Indicates how long the unit continues to operate after ground sensor 2 perceives the ground surface as dry.	Select from 0 minutes to 18 hours.
SET TEMP 1	Lowest start temperature for ground sensor 1.	Select between -20 up to the adjusted SET TEMP 1 or OFF (OFF = no limit.)
SET TEMP 2	Lowest start temperature for ground sensor 2.	Select between -20 up to the adjusted SET TEMP 2 or OFF (OFF = no limit.)
OFFSET T1	Used to calibrate ground sensor 1, see Calibration heading.	Select between -5 to + 5 °C
OFFSET T2	Used to calibrate ground sensor 2, see Calibration heading.	Select between -5 to + 5 °C
OFFSET OUT	The function is not used for snow melting.	-
MIN WATER	Indicates the lowest return temperature for the system. On delivery, the unit is provided with a resistor instead of a return temperature sensor. The resistor corresponds to a fixed return temperature of 30 °C.	Select between 0 and 40 °C. Default + 3 °C
MAX WATER	States the highest supply temperature for the system. NOTE! MAX VALUE is 50 °C for LK Snow melting.	Select between 0 and 60 °C.
FACTORY RESET	Reset the unit to factory setting.	Select EXIT or RESET
Sensor Heat Auto	When snow melting is activated, the heat-supply to the sensor is switched off. In case of extreme circumstances, heating of the sensor may occur continuously.	Select Auto or ON
MOIST CTRL	The ground sensor's moisture sensor can be switched off. Then the power on/off of the snow melting is controlled only on the basis of the set temperature. NOTE! When OFF is selected, the energy consumption increases significantly.	Select ON or OFF
SENSITIVITY	The sensor's moisture sensitivity has five settings.	MN, LOW, NORM, HIGH and MAX
REINSTALL	Facilitates re-installation of the unit. CODE is 1202.	-
EXIT	Exit menu setup.	-

ALARM

If an error occurs in the unit, it is indicated with a blinking LED-marked alarm.

Do the following to see the alarm in clear text:

1. Press once on the MF button, select ALARM, confirm with the MF button.
2. The alarm is now shown in clear text, see the table below.

Alarm	Explanation
RETURN TEMP LOW	Too low return temperature
SUPPLY TEMP HIGH	Too high flow temperature
RETURN SENSOR	Defect return sensor
SUPPLY SENSOR	Defect supply sensor
TEMP SENSOR 1	Defect ground sensor 1
TEMP SENSOR 2	Defect ground sensor 2
OUTDOOR SENSOR	Defect outdoor sensor
SENSOR HEATER	Short-circuiting of the heating element in the ground sensor
FROST PROTECT	Frost protection activated due to return temperature being too low

Interruption in the ground sensor

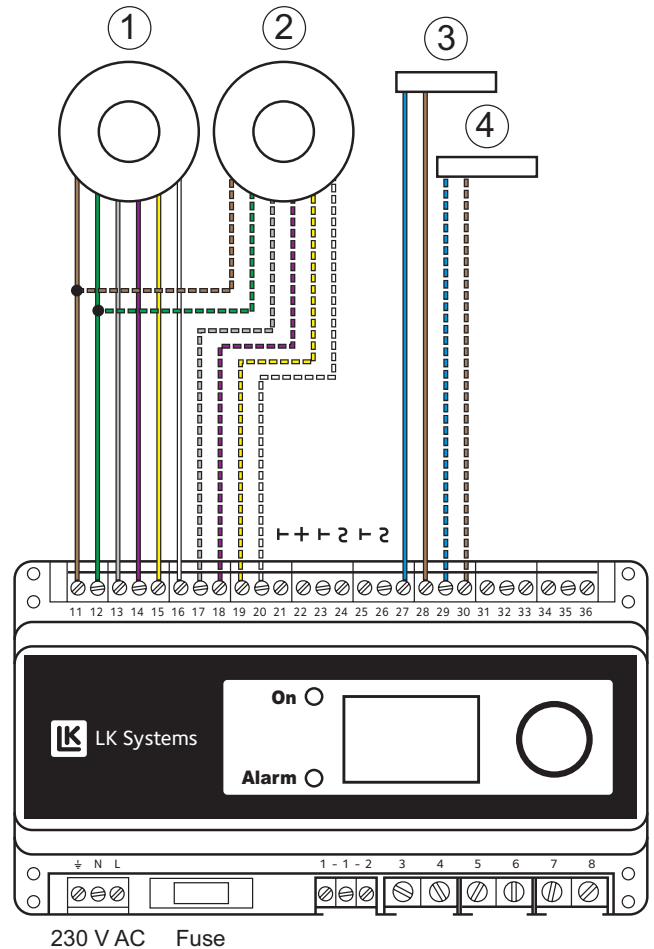
If there is an interruption in the ground sensor, the unit sends an alarm and at the same time, switches off the snow melting system.

FUNCTION CONTROL

After the connection and adjustment a function control must be performed.

1. Increase SET TEMP to max, see the heading *Menus/settings*.
2. Pour water on the ground sensor.
3. Check that the control unit display shows ON.
4. Reset SET TEMP to the desired value (default + 3 °C).

CIRCUIT DIAGRAM



No.	Sensor
1	LK Ground sensor 1 ETOG
2	LK Ground sensor 2 ETOG, connected only if necessary
3	LK Pipe sensor ETF, supply.
4	LK Pipe sensor ETF, return. Connected only if necessary.

Terminal No./ Symbol	Connected to:	Note
11	LK Ground sensor 1, Brown cable	Where applicable even connected to ground sensor 2, Brown cable.
12	LK Ground sensor 1, Green cable	Where applicable even connected to ground sensor 2, Green cable.
13	LK Ground sensor 1, Grey cable	
14	LK Ground sensor 1, Pink cable	
15	LK Ground sensor 1, Yellow cable	
16	LK Ground sensor 1, White cable	
17	LK Ground sensor 2, Grey cable	NOTE! LK Ground sensor 2 is connected only if needed, see the heading
18	LK Ground sensor 2, Pink cable	NOTE! LK Ground sensor 2 is connected only if needed, see the heading LK Ground sensor ETOG .
19	LK Ground sensor 2, Yellow cable	NOTE! LK Ground sensor 2 is connected only if needed, see the heading LK Ground sensor ETOG .
20	LK Ground sensor 2, White cable	NOTE! LK Ground sensor 2 is connected only if needed, see the heading LK Ground sensor ETOG .
21	Com on actuator	Use 0-10 V actuator with 24 AC supply.
22	Control signal (0-10V)	Use 0-10 V actuator with 24 AC supply.
23	Strapped to terminal 21	
24	24 VAC supply to actuator	Use 0-10 V actuator with 24 AC supply.
25, 26	Transformer 24 V AC	
27	LK Pipe sensor, supply, Blue cable	
28	LK Pipe sensor, supply, Brown cable	
29	LK Pipe sensor, return, Blue cable	NOTE! LK Pipe sensor 2 is connected only if needed, see the heading LK Pipe sensor ETF .
30	LK Pipe sensor, return, Brown cable	NOTE! LK Pipe sensor 2 is connected only if needed, see the heading LK Pipe sensor ETF .
31, 32	Not used	
33, 34	GSM-switch or other remote control	Remote standby, closed contact switches of snow melting in advance.
35, 36	GSM-switch or other remote control	Closed contact forces the unit to start, connected only if needed.
N, L	230 VAC	
1-1, 2	Alarm output	Max. load 5A.
3, 4	Pump or BMS	Potential-free contact, Max. load 16A.
5, 6	Pump or BMS	Potential-free contact, Max. load 16A.
7, 8	Pump or BMS	Potential-free contact, Max. load 16A.

TECHNICAL DATA

LK Control Unit ETO2	
Article number	538 61 76
Dimensions	170 x 162 x 45
Weight	0.5 kg
Cable protection class	IP20
Ambient temperature	0-50 °C

LK Ground sensor ETOG	
Article number	538 61 77
Dimensions	32 mm x Ø 60 mm
Weight	1.0 kg
Cable protection class	IP68
Ambient temperature	-20 - +70 °C
Cable length	10 m
Max cable length for extension	200 m

LK Pipe sensor ETF	
Article number	538 61 78
Dimensions	40 mm x Ø 12 mm
Weight	0.1 kg
Ambient temperature	-20 - + 70 °C
Cable length	2.5 m
Sensor element	NTC 12 k @25 C