LK Snow melting

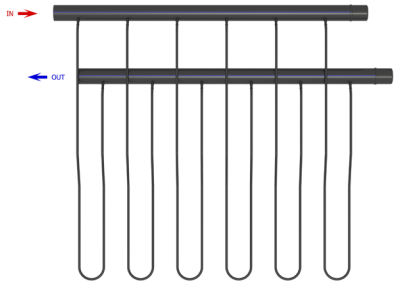
General

LK Snow melting is a pipe system aimed at keeping roads, squares, driving ramps, traffic areas, bridges, loading platforms, etc. free of snow and ice. Ground components in the snow melting system are manifolds, pipes and control units. LK has extensive knowledge due to wide experience in snow melting.

Manifolds

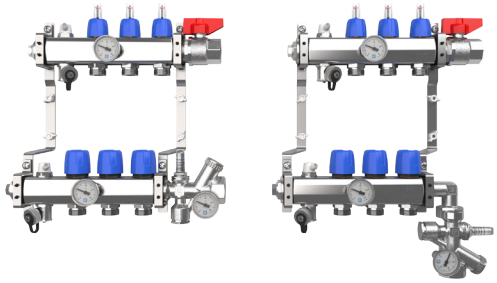
There are four different types of manifolds, LK ground manifold PEH, LK Manifold RF, LK Manifold Q Max G50 and LK Installation Chamber.

LK Snow melting manifold PEH is manufactured of PEH, PN10 and specially built for each project. Usually, the PEH manifold is placed under the ground, but in some systems the manifold is also placed indoors on walls. To the LK Snow melting manifold PEH, LK heating pipe 25 x 2.3 is connected with either clamping coupling, press coupling or electric welding sleeve. Normally, the electric welding sleeve is used, as this connection is best suited for placing under the ground.



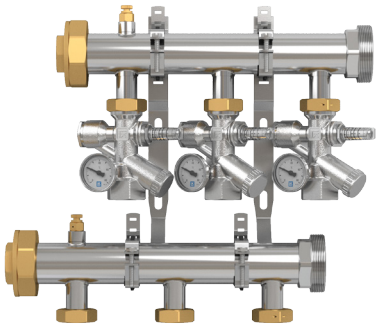
LK Snow melting manifold is suited to each project

LK Manifold RF is used in smaller systems (up to 150 m²), the manifold must be placed indoors. To the LK Manifold RF LK heating pipe 20 x 2 is connected using a clamping coupling or press connection coupling.



LK Manifold RF with affixed adjustment valves LK OptiFlow EVO II straight and angled design respectively.

LK Manifold Qmax 2" is suitable to use in systems up to 300 m². Qmax manifold must be placed indoors. LK heating pipe 25 x 2.3 is connected or LK heating pipe 20 x 2 is connected to the manifold. Coils from one and the same manifold must be equally long to get an optimum heat distribution without the need to install throttle valves. In case the coils cannot be kept equally long, the manifold must be supplemented with OptiFlow EVO II mounted for each coil.



LK Manifold Qmax 2" with affixed adjustment valves LK OptiFlow Evo II for each snow melting circuit.

LK Installation Chamber

LK installation Chamber is manufactured of rotation cast PE The chamber is available in two sizes, 800 mm and 1200 mm. The chamber is specially adapted based on each object's pre-requisites and can, for instance, be provided with LK OptiFlow Evo II for regulation of the circuit flows and with LK ball valves for closing off individual circuits for maintenance or work on the streets/areas where snow melting is installed without affecting the entire area. The chamber is supplied with a cover classified according to EN124/DIN1989 (green area); covers with a higher class are available as options.

LK Installation Chamber

Pipes

There are two different pipe dim. for the system.

LK Snow melting pipe of the dimension 25 x 2.3 is the pipe that is commonly used for snow melting. The pipe is not provided with an oxygen barrier, therefore the snow melting system must be separated from other heating systems with a heat exchanger. There are three different connection types for connecting the snow melting pipe: clamping coupling, press coupling or electric welding sleeve. Electric welding sleeve is only used for prefabricated manifolds in PEH.

LK Heating pipes 20 x 2 is use for smaller systems (up to 300 $m^{2)}$.. The pipe is provided with an oxygen barrier and is normally connected to existing heat sources with an intermediate heat exchanger. Usually, the heat exchanger is always required to antifreeze the snow melting system. The pipe is connected, using a clamping coupling, to LK Manifold RF or LK Manifold Qmax 2".

Control Unit

LK control unit he ET02 is used to control the system optimally, as regards operational economics and operation time, in systems with intermittent operation. The equipment consists of a complete control unit with a ground sensor. The equipment can either send start/stop signal to external equipment such as a pump, valve or a BMS. Alternatively, the control unit can be used to start/stop a pump as well as maintain the flow temperature through the control valve actuation. By mainaining the flow temperature, the unit is supplemented with LK pipe sensor ETF, for more information, see separate information LK Control unit ETO2.

Connection to heat source

Since the antifreeze heating medium must always be used in LK Snow melting system, the connection of the system to the existing heat sources is made with an intermediate heat exchanger.

Influencing factors during the design

- The amount and intensity of snowfall
- Air temperature
- Speed of the wind
- Open area or area surrounded by buildings
- Radiation losses
- Time factor for the melting of snow
- Laying principle

The above mentioned factors work together in different ways depending on the circumstances. The intensity of the snowfall is seldom large at low temperatures rather is the most at zero point. When it snows, the radiation losses from ground level are low, so a snow cover builds up quickly that screens the radiation. A ground surface, which is screened also works favourably as the impact of the wind declines and the radiation losses reduce. Due to known parameters, the system is thus designed with regard to the flow, temperature, pressure drop and c/c distance on the piping.

Continuous operation

In case of continuous operation, the system is connected when the winter starts, or when it is otherwise considered appropriate. Connection can be made automatically or manually. Continuous operation gives, seen on the whole, longer operation time than intermittent operation, therefore the system must not be oversized with regard to the energy cost. Due to access to waste heat, continuous operation can be chosen. Continuous operation provides a heat buffer in the ground, which can melt snow relatively quickly without having to increase the power.

Intermittent operation

In case of intermittent operation, the system is controlled by a sensor installed under the ground that measures temperature and precipitation, and connects to snow melting, if necessary. After thawing, the heating is disconnected automatically. This principle entails that the ground can be frozen when the snowfall begins, and so a relatively high power is required to melt the snow.

Ground insulation

Insulation has little impact in case of a continuous operation. Insulation in case of intermittent operation enables the heating course to go faster as the downward losses are reduced. The pipes must be laid at a distance from the insulation so that the heat transfer does not worsen. Beware of the water run-off when insulation is used.

Dimensioning of the insulation and design of ground construction when insulation is used in the construction must be performed by an expert.

Piping

For all piping, snow melting strips are recommended so that the design c/c distance and trench depth are achieved, alternatively separate with great care when laying so that the pipes are in the right location If internally the pipes are laid with the wrong c/c distance and depth, the idea of a careful dimensioning disappears, and moreover the system performance is affected.

Run-off

Roadway inlets must be available within the heated area for functioning of the melted water run-off.

Temperature

LK Snow melting pipes 25 x 2.3

- Continuous operational temp. max. 50 °C
- Max working pressure 6 bar

LK Heating pipe 20 x 2

- Continuous operational temp. max. 60 °C
- Max working pressure 6 bar

District heating

A possible alternative to heat supply is utilising heat content in the district heating return circuit through the heat exchanger. Most district heating suppliers apply a float tax with a bonus scale for the cooling rate. Prerequisites must be studied from case to case.

Heating medium

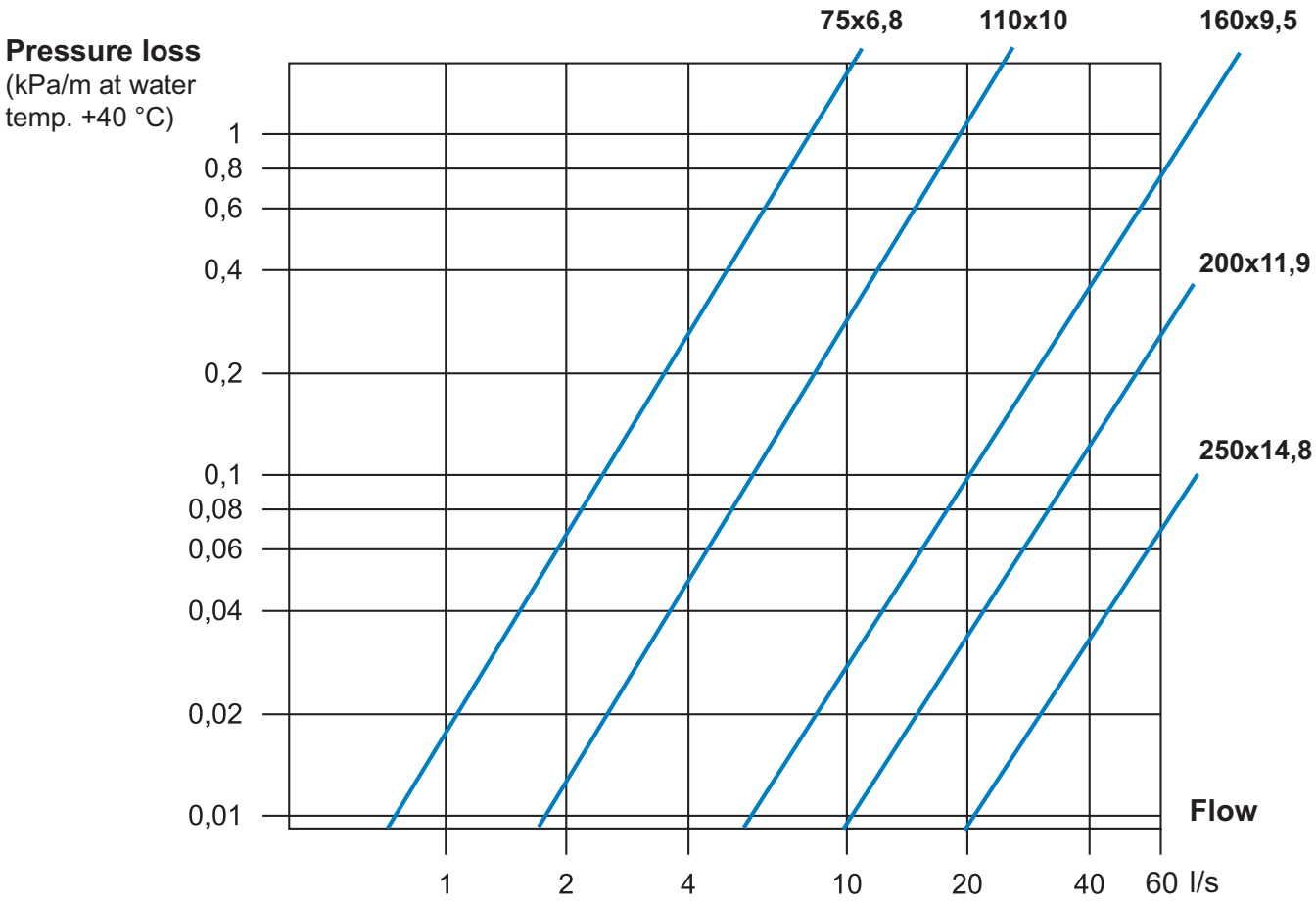
Antifreeze heating medium must always be used. Follow the respective supplier's instructions carefully.

Pressure drop diagram

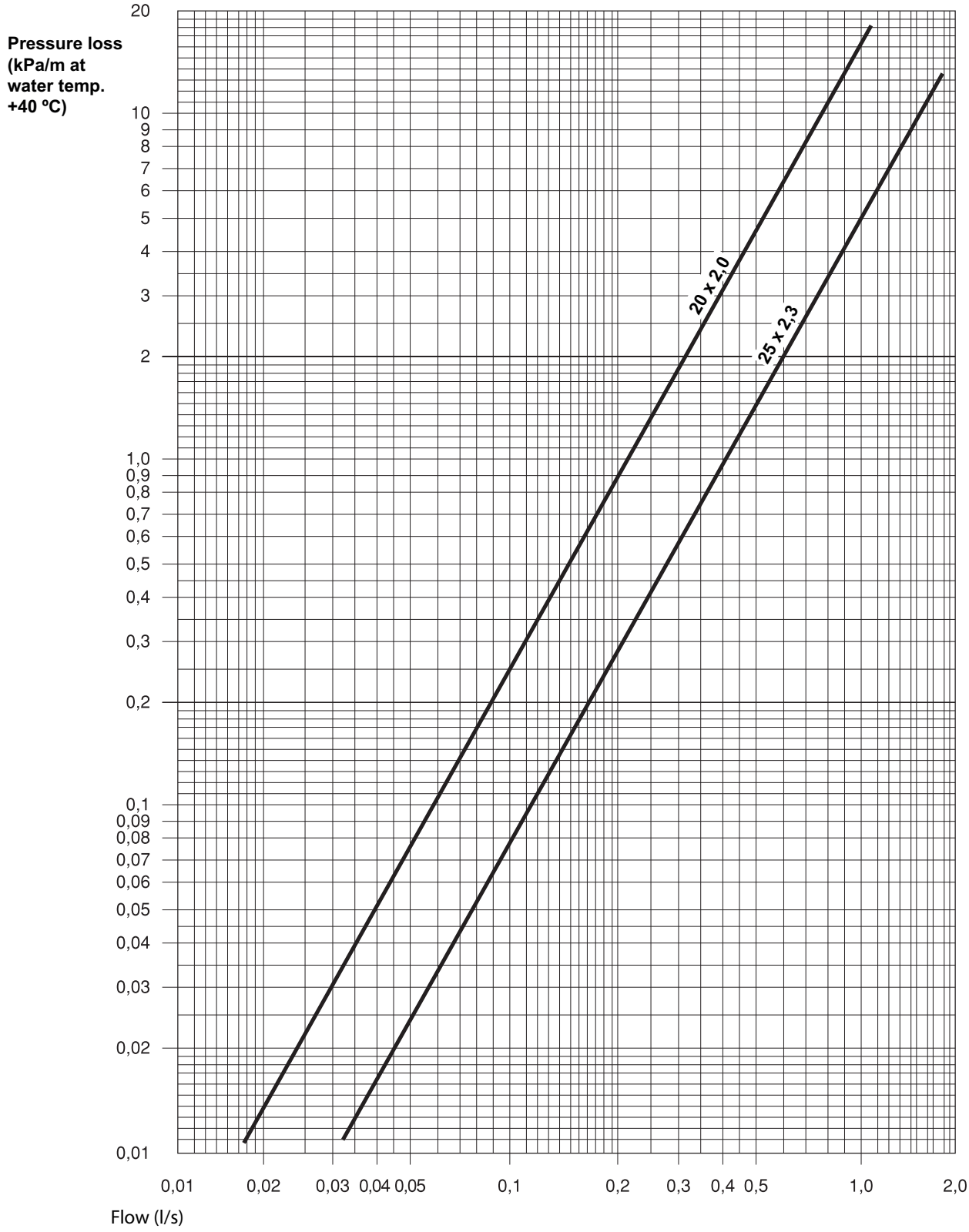
The diagrams below are based on Colebrook's formula with surface roughness k = 0.005 mm and water temperature +40 ° C. The diagrams refer to water and must therefore be compensated depending on the type and amount of frost protection. When mixing antifreeze, the capacity of the heating circuit for the heating medium reduces and therefore the fluid flow must be increased to provide the original estimated effect.

Example: 30% ethylene glycol mixture means that the flow must be increase by about 20% compared to pure water.

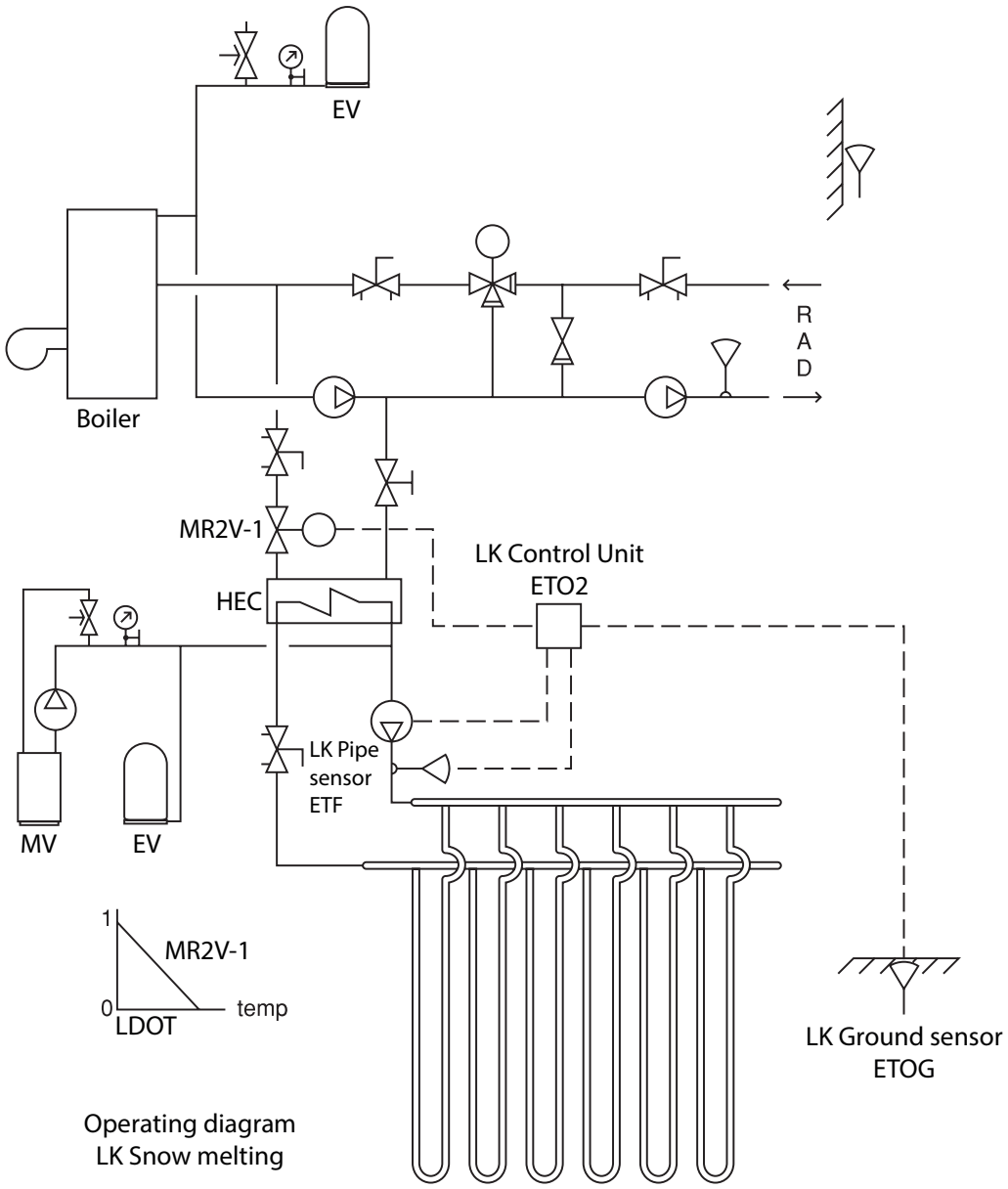
Pressure drop diagram for snow melting manifolds PEH PN 10



Pressure drop diagram for snow melting pipes



Connection to gas or oil boiler



Operating diagram
LK Snow melting

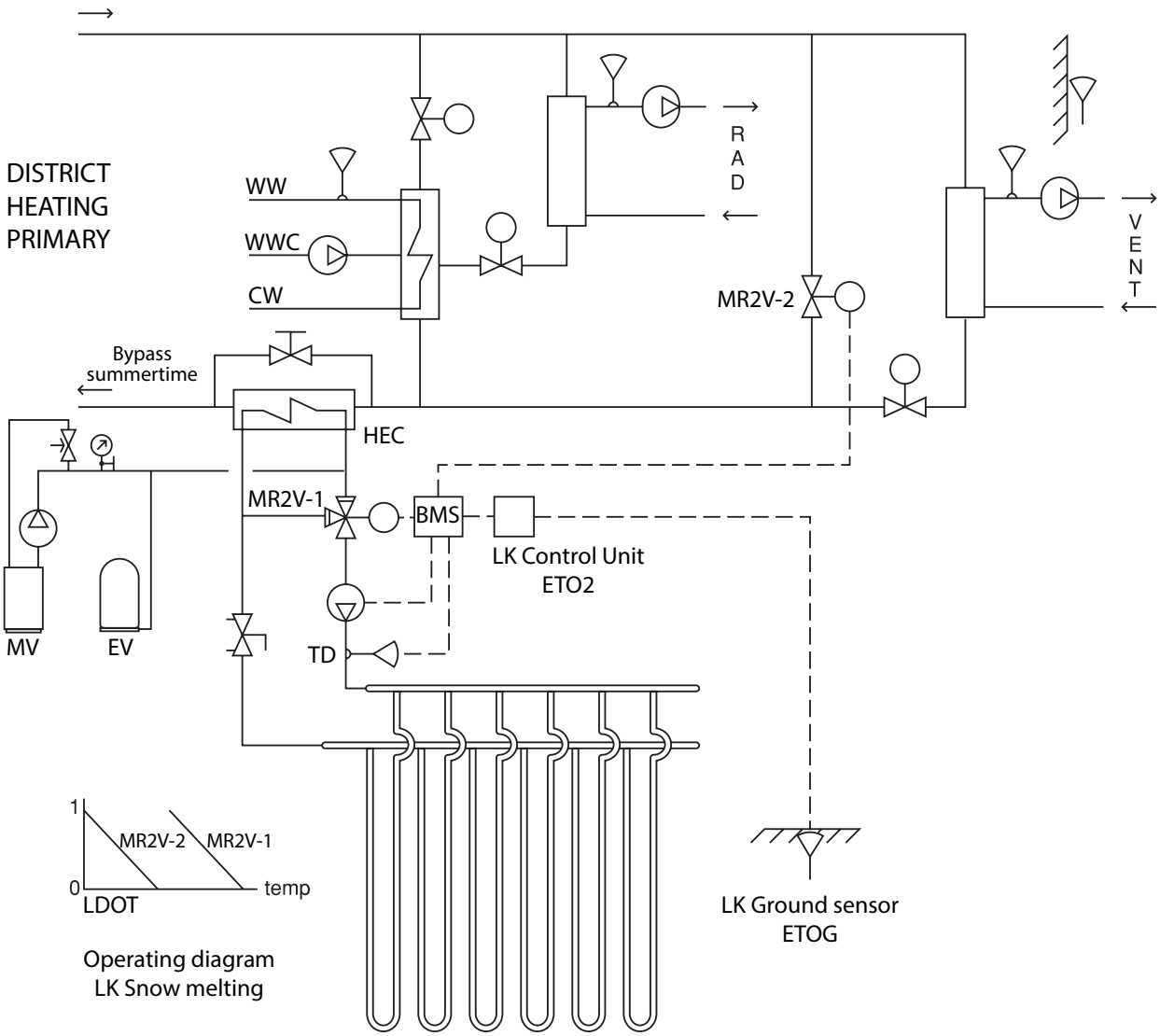
Function

LK Ground sensor ETOG controls or disables the snow melting system via the LK Control Unit ETO2. LK Control unit ETO2 maintains the flow temperature via the impact of 0 to 10 voltage actuator (not LK item).

Control function

LK Pipe sensor ETF regulates control valve SV1 via LK control unit ETO2 so that a constant flow temperature is obtained.

Connection to the 2-step connected heat exchanger



Operating diagram
LK Snow melting

Function

LK Ground sensor ETOG controls or disables the snow melting system via the LK Control Unit ETO2. Control equipment type DUC or conventional control function unit for snow melting system integrated with the property's other control and regulator equipments and not included in the LK product range.

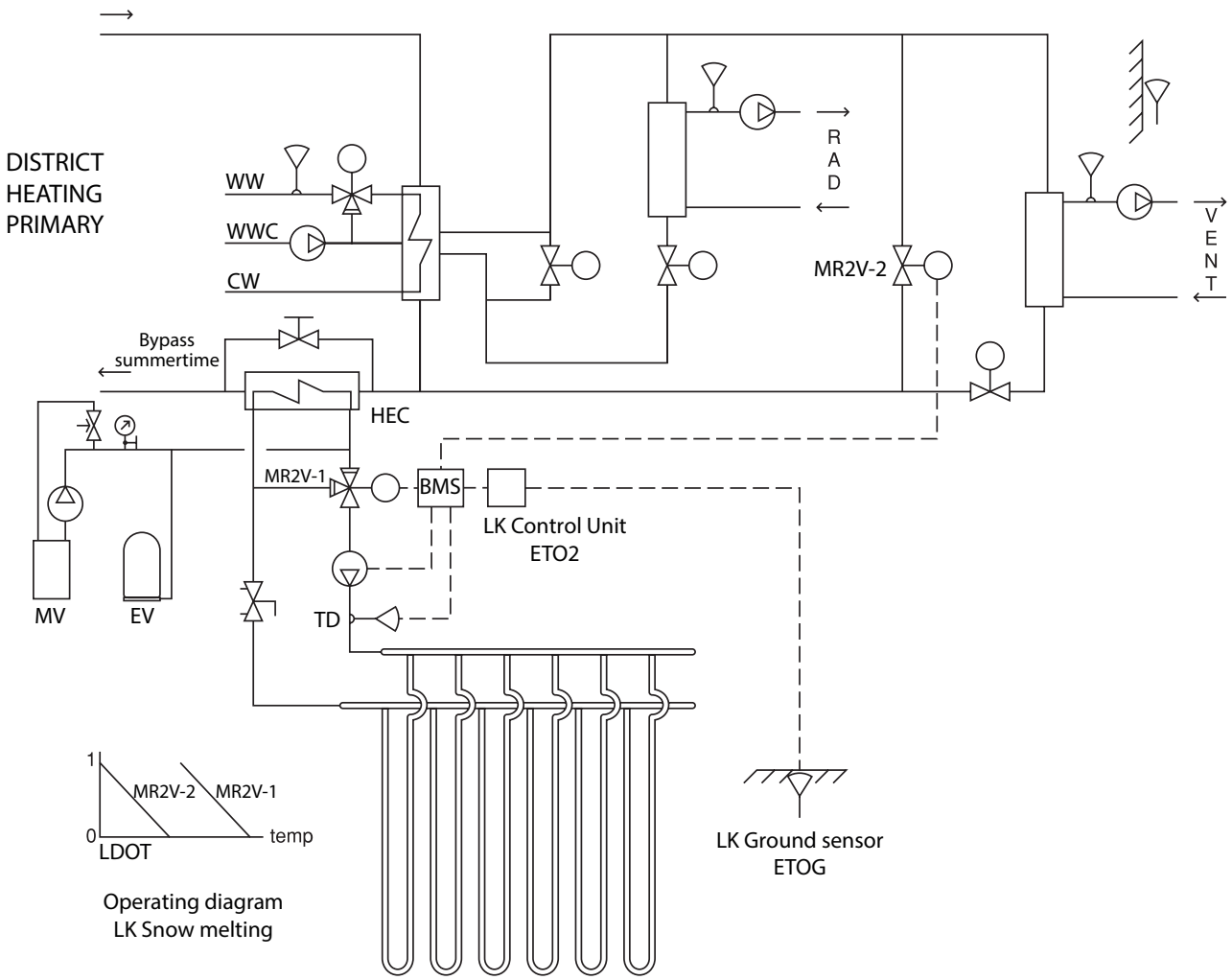
Control function

Temperature sensor GT controls the control valve SV1 and SV2 in sequence through the control function unit RC or BMS, so that a constant flow temperature is obtained. Pumps for heat carriers must be in continuous operation or switched off 24 hours during winters. Pump motions must take place during the summer.

Heat exchanger bypass

The isolation valve must be open during the summer.

Connection to the 3-step connected heat exchanger



Function

LK Ground sensor ETOG controls or disables the snow melting system via the LK Control Unit ETO2. Control equipment type BMS or conventional control function unit for snow melting system integrated with the property's other control and regulator equipments and not included in the LK product range.

Control function

Temperature sensor GT controls the control valve SV1 and SV2 in sequence through the control function unit RC or BMS, so that a constant flow temperature is obtained. Pumps for heat carriers must be in continuous operation or switched off 24 hours during winters. Pump motions must take place during the summer.

Heat exchanger bypass

The isolation valve must be open during the summer.