GEBWELL

Installation and maintenance manual

G-Power® Easy 2-100 small substation

Table of contents

1. District heating in general

District heating is the most popular form of heating in Finland. It is used in nearly all cities and urban areas. Some 2.7 million Finns live in houses with district heating. District heating accounts for around 50% of the heating market. District heating is used in more than 95% of multi-storey residential buildings and the majority of public and commercial buildings in Finland.

District heating is produced in each area with the most inexpensive fuels. Natural gas provides the main fuel for district heating where it is available, whereas the largest coastal cities use coal and the peat areas primarily use peat.

District heating is available throughout the year, 24 hours a day. Moreover, the temperature of the hot water produced with district heating remains even, constant and plentiful.

District heating keeps the environment clean and adds to the comfort of living. District heating also saves energy and is environmentally friendly. Optimal savings are achieved through combined heat and electricity production, which has a fuel efficiency of 80 to 90%. When electricity is produced separately, only 40 to 50% of the fuel's energy can be utilised. Due to the efficiency of combined production, the environmental emissions remain approximately 30% lower than in the separate production of electricity and heat (source: Energia Oy).

2. Gebwell G-Power Easy – content of the delivery

The G-Power Easy district heating substation is packed in a cardboard box which includes the following:

- G-Power Easy district heating substation
- Accessory bag
- Instruction manual

3. G-Power Easy district heating substation

G-Power Easy district heating substations are designed for connecting single-family houses to district heating. G-Power Easy is suitable for houses without domestic hot water circulation, and especially suitable for renovation projects with radiator heating. In case of installations with underfloor heating, a pump stop thermostat must be added to the substation.

District heating, inlet

Piping to transfer the heat from the energy company to the consumer's district heating substation.

District heating, return

Piping to transfer the heat from the consumer's district heating substation back to the energy company.

Heating, supply

Piping to transfer the heated water from the heat exchanger to the radiators, underfloor heating or air supply unit.

Heating, supply water temperature sensor – TE2A

The supply water temperature sensor is the part in the control or measurement equipment for measuring the temperature of the supply water. The temperature sensor is on the surface of the pipe, and it produces the measurement values for the controller.

Heating, return

Piping to transfer the water returning from the radiators, underfloor heating and air supply unit to the heat

exchanger.

Heating circuit filling

Valve for filling the radiator, underfloor heating and air heating circuit. Fill the network by opening both consecutive shut-off valves until the network has reached the correct pressure value. When the network is full, close both filling shut-off valves.

Record the filling date. If you need to fill the network repeatedly, either the network has leaks or the pre-charge pressure of the expansion tank has decreased.

Heating circuit pressure gauge

The heating circuit pressure gauge measures the static pressure in the network.

Heating, safety valve

The safety valve prevents the pressure in the heating circuit from rising too high. It is a spring-loaded valve whose opening pressure is 2.5 bar. We recommend that you check the valve for proper operation yearly.

Heating, circulation pump – P2

The heating circulation pump circulates water in the heating circuit. The pump is of the wet motor structure.

The installation technician selects the pump pressure according to the site plan to achieve the desired circulation. The pump must be stopped if there is no pressure in the network. Stopping the pump for the summer is not recommended. See also the attached circulation pump instruction manual.

Control valves – TV1 and TV2

The internally-powered domestic hot water control valve (TV1) controls the district heating water flow in the domestic hot water heat exchanger. The control works on the absorption principle, transferring the pressure corresponding to the temperature of the substance measured to the temperature sensor. The pressure, conducted via a capillary tube, is converted to regulation power in the control valve push cylinder (TV1).

The heating control valve (TV2) controls the heating supply water temperature according to the signals from the controller.

Adjusting the heating circuit heating curve

Heating curve adjustment instructions

Unless otherwise specified, the delivered substation is set for radiator heating.

If the values must be adjusted for underfloor heating, the value for supply water maximum temperature must be decreased:

- "H1 CONTROL CIRCUIT" →
- "H1 SETTINGS" →
- "SUPPLY WATER MAXIMUM LIMIT" →
- "ENTER VALUE" →
- "APPROVE THE VALUE BY PRESSING THE CONTROL KNOB".

For underfloor heating, set the supply water maximum limit to +42°C.

In the main menu, select "H1 CONTROL CIRCUIT" → "H1 HEATING CURVE".
The values below are factory settings and must be adjusted for each building, if necessary.

Outdoor temperature (°C)	Radiator heating (°C)	Underfloor heating (°C)
–20	+58	+33
–10	+46	+30
0	+33	+27
+10	+20	+23
+20	+18	+20

Summer shut-off valve

Unnecessary heating of the building in the summer can be avoided by closing the heating system's summer shut-off valve. The shut-off valve stops the district heating flow in the heat exchanger for heating.

Expansion tank

The expansion tank evens out the effects of the changes in water volume. It ensures that there is a sufficient amount of water also in the topmost circuits of the heating circuit.

The expansion tank is divided into a water space and gas space by a rubber diaphragm. The gas space is filled with nitrogen gas. When an expansion tank comes from the factory, its pre-charge pressure can be anywhere from 0.5 to 2.5 bar. The pre-charge pressure of each expansion tank must be checked and set according to the characteristics of the building's heating system.

Use the table on the next page to check the correct expansion tank pre-charge pressure for the building in question, based on the number of storeys. Set the pre-charge pressure according to the table before pressurising the heating system.

When measuring the pre-charge pressure, the water side of the expansion tank must be free of pressure. If you check the pre-charge pressure before connecting the expansion tank to the heating circuit, or if the expansion tank is disconnected from the heating circuit for the duration of the check, use the "*pre-charge pressure without static pressure"* value in the table.

The pre-charge pressure can be checked when the expansion tank is connected to a filled heating system. In such a case, free expansion in the heating system must be ensured when checking the pre-charge pressure. Open a valve at the highest point of the heating system for the duration of the check. Use the "*pre-charge pressure, with static pressure taken into account*" value in the table for setting the expansion tank pre-charge pressure.

The table below shows the expansion tank pre-charge pressure, cold water filling pressure and heating system minimum operating pressure by the number of storeys of the building:

Number of storeys	**1**	**2**	**3**
Static head of the building, H_{st} (m)	0	3	6
Heating system static pressure, P_{st} (bar)	0	0.3	0.6
Expansion tank pre-charge pressure without static pressure (bar)	0.5	0.3	0.3
Expansion tank pre-charge pressure, with static pressure considered, P_e (bar)	0.5	0.6	0.9
Cold water filling pressure (bar)	0.8	0.9	1.2
Heating system minimum operating pressure, P_{min} (bar)	1.0	1.1	1.4
Heating system maximum operating pressure, P_{max} (bar)	2.0	2.0	2.0
Safety valve opening pressure, P_{sv} (bar)	2.5	2.5	2.5

Heating system pressure

Set the pressure in the water side of the heating system after setting the expansion tank pressure.

If the heating system is filled for the first time, use the "*cold water filling pressure (bar)*" value in the table. The heating system pressure increases as the temperature of the heating circuit increases. Check the final pressure when the heating system reaches its normal operating temperature.

The heating system pressure varies between summer and winter as the temperature of the heating circuit varies. In the summer, when the operating temperature of the heating system is at its lowest, the pressure must be at least the "*heating system minimum operating pressure*" value specified in the table. In the winter, when the operating temperature of the heating system is at is highest, the pressure must not exceed the "*heating system maximum operating pressure*" value specified in the table.

Domestic hot water pipe

Pipe to transfer the domestic hot water to the points of consumption in the building.

Domestic hot water temperature sensor – TE1A

In the G-Power 2/100 Easy district heating substation equipped with an internally powered domestic hot water control valve, this temperature sensor is located in the domestic hot water pipe, right at the heat exchanger coupling end.

Cold water pipe

Pipe to transfer the domestic cold water to the domestic hot water heat exchanger for heating.

Cold water supply valve

A valve group that includes a safety valve, pressure gauge, shut-off valve and non-return valve. Can be used for stopping the domestic hot water.
The pressure gauge can be used for checking the cold-water network pressure. The safety valve opening pressure is 10 bar.

Controllers and pumps

See the user instructions delivered with the substation.

ACCESSORIES

Underfloor heating overheat protection (pump stop thermostat) – TS2

This overheat protection protects the underfloor heating by stopping the circulation pump in case of, for example, controller malfunction.
Pump P2 restarts when the thermostat temperature decreases to approximately 6°C below the setting. In a underfloor heating circuit, the setting for the thermostat is 55°C.

Differential pressure controller

The differential pressure controller ensures a constant pressure difference for the heating and domestic hot water control valves. It is factory adjusted to a setting of 120 kPa, which is six revolutions downwards from the topmost position of the regulating wheel. One revolution (360°) of the regulating wheel corresponds to a 10 kPa change in the pressure difference setting. If a higher-pressure difference is desired, rotate the regulating wheel clockwise, and correspondingly, rotate the regulating wheel anticlockwise for a lower pressure difference.

District heating accessory kit

The district heating accessory kit is integrated into the substation. The kit includes pressure gauges, thermometers and shut-off valves.

The district heating input and return pressures can be seen on the pressure gauges. The thermometers show the district heating input and return temperatures. During usage, the pressure gauge shut-off valves must be kept closed; open the valves only when you want to check the district heating input or return pressure.

4. Installing the G-Power Easy district heating substation

The district heating substation is to be installed in a single-family house technical room that has a floor drain.

The minimum space requirements of the equipment and heat energy meter must be checked from the **heating company.**

Leave 800 mm of free space in front of the heat energy meter and the main distribution board. Do not place any pipes above the main distribution board.

Things to note before any installation work is performed

Only a contractor who is approved by the energy company can carry out district heating connections. The heating piping of the substation can be connected from above, below, or both above and below.

Installing the G-Power Easy district heating substation on a wall

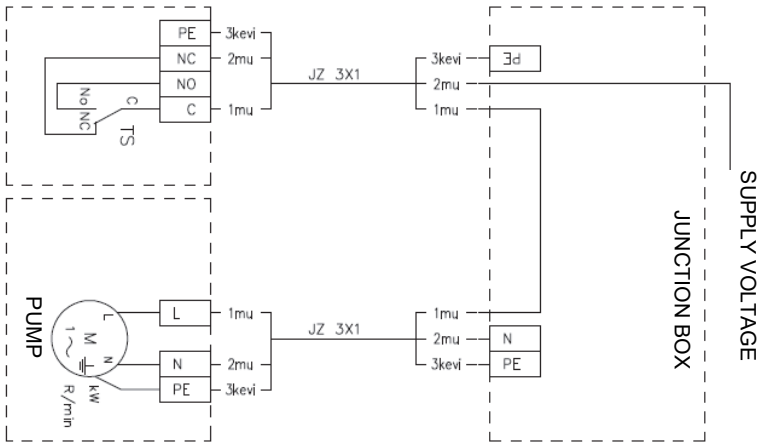
Mark the places for the screws and attach the screws so that approximately 10 mm of each screw remains visible. Hang the G-Power Easy district heating substation on the screws and then fully tighten the screws. Remember to lift the substation correctly. The G-Power Easy district heating substation is now ready to be connected to the networks.

5. Electrification

Ensure that all the electrical parts are in faultless condition and are firmly fixed to the substation and piping. Once the pipework is finished and the water has been connected, an electrician is not necessarily needed for the start-up of the G-Power Easy single-family house substation.
If you are uncertain, ask an electrician to perform the following operations:

- Install the outdoor temperature sensor to the north wall of the building at a height of approximately 3 m. The sensor measures the current outside temperature (do not install the sensor near ventilation windows).
- The outdoor temperature sensor includes a wire and a plug. Connect the outdoor temperature sensor plug to the connector in the control box that is marked with the decal “outdoor temperature sensor wire”.
- Check that all the pipes are filled with water and that the air has been bled out of them.
- Connect the power supply plug of the controller power supply unit and circulation pump P2 to a grounded wall socket with 10A/230V fuses.
- Switch on the controller. See “User instructions for controllers”.

For underfloor heating, connect a pump stop thermostat (TS2) to the heating supply pipe. The pump stop thermostat is an accessory. Connect the thermostat using a junction box as shown in the figure. Attach the sensor on the heating supply pipe as far as possible from the heat exchanger. The minimum distance is 1 m. Set the temperature to, for example, 55°C.



6. Things to note

Differential pressure in the district heating circuit

The differential pressure generated by the district heating circuit pumps enables the circulation of district heating water in the district heating circuit and in each customer’s district heating equipment. The district heating circuit pressure and differential pressure can vary. For example, the pressure and differential pressure values are usually higher in the winter than in the summer.

Customer’s district heating equipment is usually designed for a differential pressure of 60 kPa (0.6 bar).

If the differential pressure in the district heating circuit is high (> 2 bar), we recommend that a differential pressure controller is used.

Sound engineering practice

According to the Finnish Pressure Equipment Act 1144/2016, pressure equipment that is not subject to the essential safety requirements referred to in section 14 of the Act due to its characteristics shall be designed and manufactured in accordance with the sound engineering practice of a Member State in the European Union.

Pressure equipment designed or manufactured in accordance with the sound engineering practice shall not bear the CE mark referred to in section 17 of the Act.

G-Power 2-100 Easy is designed and manufactured in accordance with the sound engineering practice.

7. General warranty terms

1) Scope and issuer of warranty

The warranty applies to district heating substations and heat exchangers supplied by Gebwell Oy for use in district heating. This warranty is granted on the condition that the G-Power district heating substation is registered on Gebwell Oy's website: https://www.gebwell.fi/kaukolammonjakokeskuksen-rekisterointi/.

2) Validity of the warranty

The warranty is valid from the date of delivery as follows:

- District heating substation components, 24 months
- Piping parts and connectors, 24 months
- Heat exchangers, 60 months

The warranty applies to district heating substations and plate heat exchangers in use in Finland. The warranty is not voided by changes in ownership whereby the equipment remains in use in Finland. Extended warranty or a new warranty period is not issued for repaired or replacement products.

3) Warranty content

Gebwell Oy is responsible for ensuring that the usability and quality of the goods remain normal for the duration of the warranty. If this is not the case, the goods contain a defect covered by the warranty. However, Gebwell Oy is not liable for the defect if it can be demonstrated that the deterioration in the quality of goods or abnormal usability is likely due to:

- negligent or improper installation (e.g. insufficient support for piping, improper operating environment)
- exceeding the permitted maximum pressure (pressure shocks)
- external strain (temperature, mechanical strain, etc.)
- repairs by a maintenance company other than one approved by Gebwell Oy
- poor quality of circulating water, i.e. if the water does not meet the reference value recommendations given in report KK3/1988 by Finnish Energy or requirements issued in Resolutions 953/1994 and 74/1994 of the Ministry of Social Affairs and Health (on water hardness, aggressiveness, etc.)

Gebwell Oy is not liable for any indirect costs caused by possible damages.

4) Notification of defect

The customer must notify Gebwell Oy of the defect within 14 days of the time that it has detected or should have detected the defect.

5) Correcting the defect

Insofar as the defect falls within the scope of these warranty terms, Gebwell Oy is responsible for correcting the defect or providing a replacement product free of defects within a reasonable period of time after receiving the notification of defect.

6) Rights of the customer after expiry of the warranty.

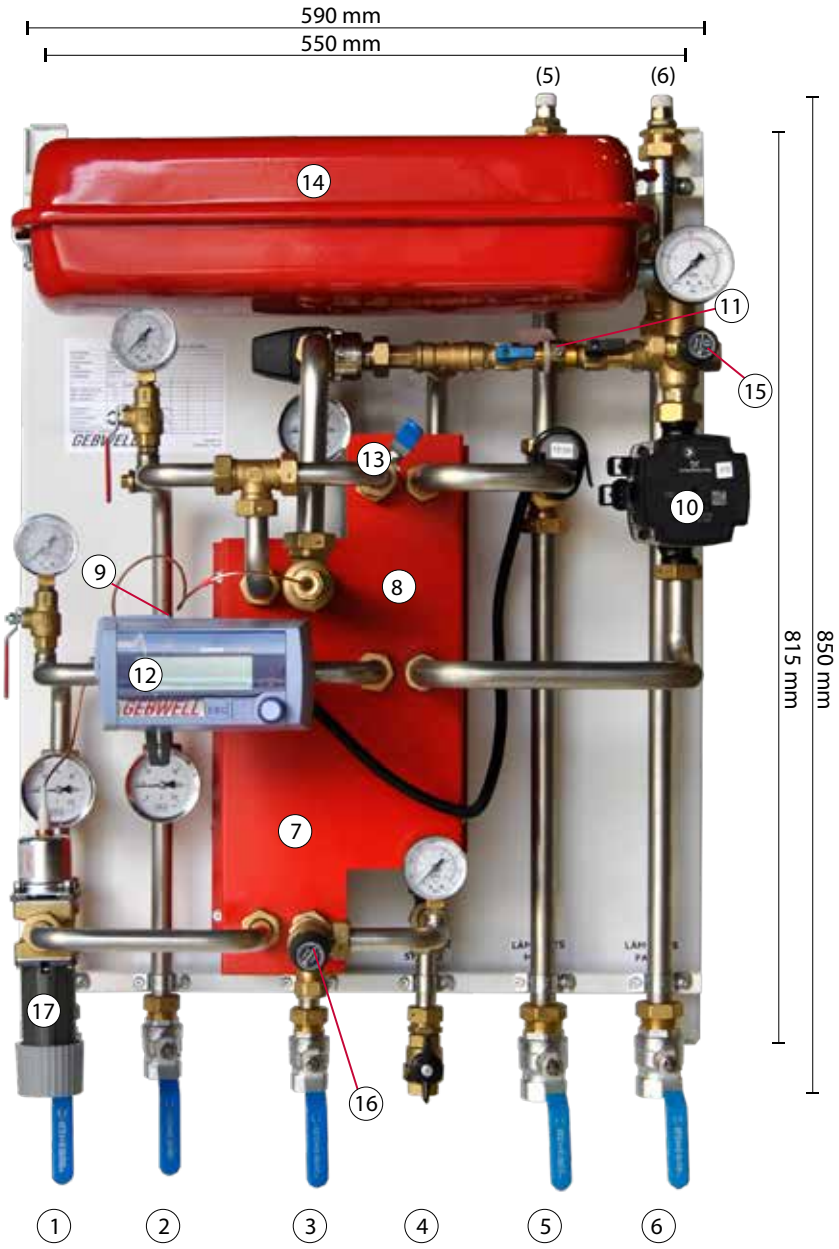
The warranty does not affect the customer's rights under Chapter 5 of the Consumer Protection Act in the event of a defect.

7) Settlement of disputes

The customer has the right to refer disputes arising from these warranty terms to the Consumer Disputes Board. If the dispute over warranty is brought before the court, it shall be heard in the competent district court of the customer's domicile.

7. Dimensions and components

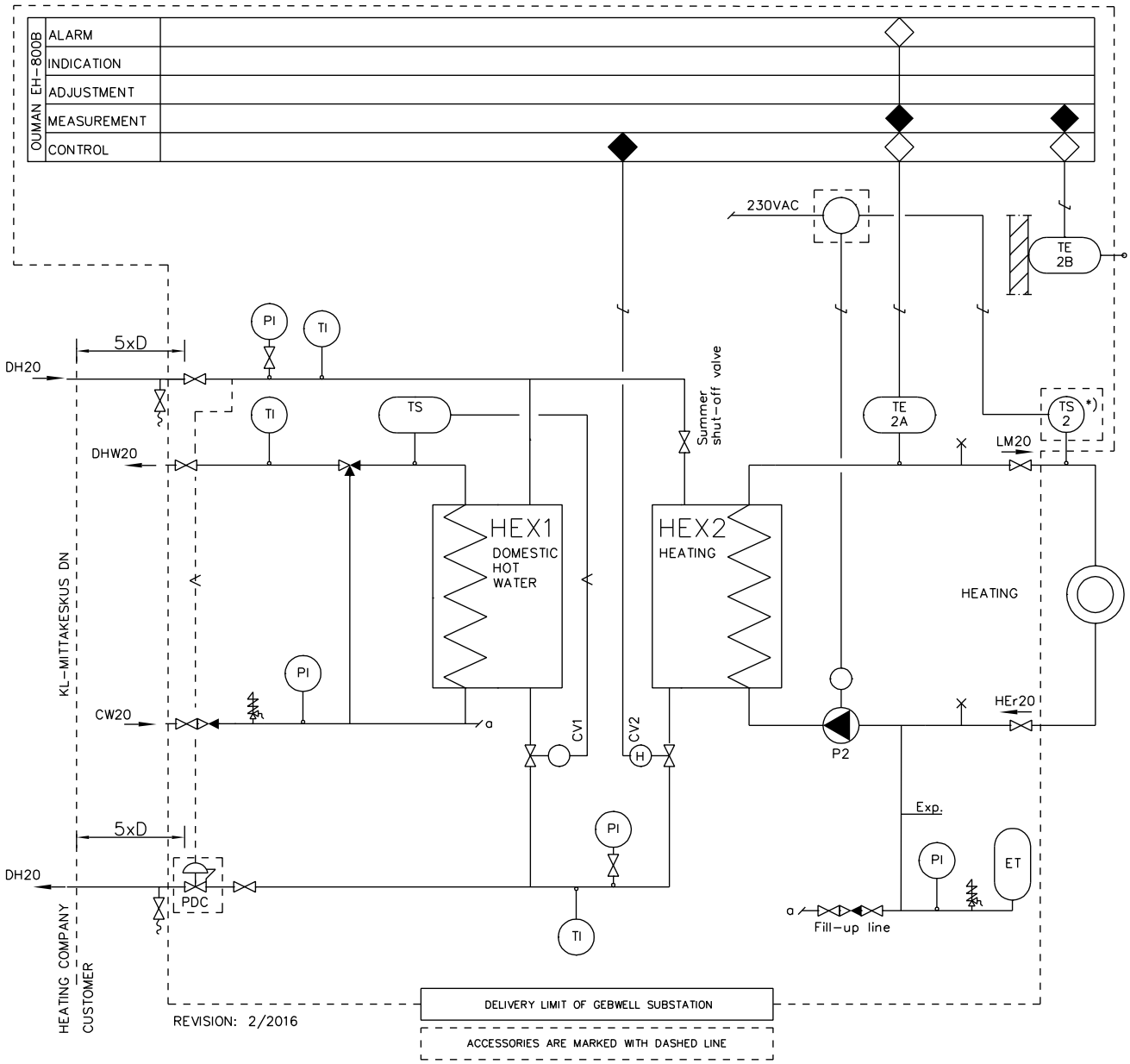
Gebwell G-Power® 2/100 Easy



1	District heating return	10	Heating 1, pump P2
2	District heating supply	11	Heating, filling valve
3	Cold water supply	12	Controller for heating
4	Domestic hot water	13	Heating 1, summer shut-off valve
5	Heating 1 supply	14	Expansion tank for heating circuit
6	Heating 1 return	15	Safety valve for heating DN15/2,5 bar
7	Domestic water heat exchanger HE1	16	Safety valve for domestic hot water DN15/10 bar
8	Heating heat exchanger HE2	17	Internally-powered valve TV1
9	Heating, control valve CV1	*Alternative connection directions shown in brackets*	

GEBWELL CIRCUIT DIAGRAM
SMALL HOUSE G-POWER-2/100 EASY

GEBWELL



DESCRIPTION OF OPERATION

DOMESTIC HOT WATER

AUTOMATIC CONTROL VALVE CV1 CONTROLS THE HOT WATER TEMPERATURE BY MEASURING SENSOR TS. THE SELF-POWERED 3-WAY VALVE IS TO KEEP THE HOT WATER TEMPERATURE AT THE SETTING (+58°C).

HEATING

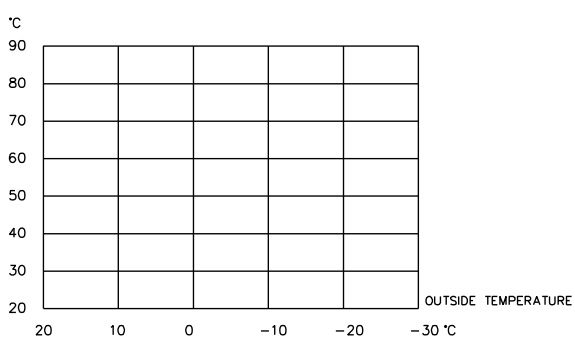
THE CONTROL SYSTEM CONTROLS THE CONTROL VALVE ON CV2 OUTPUT WATER MEASURING SENSOR TE2A AND OUTSIDE SENSOR TE2B BY MEASURING THE OUTPUT WATER TEMPERATURE CONTROL CURVE.

HEATING OVER TEMPERATURE PROTECTION (Optional)

SUPPLY WATER TEMPERATURE LIMIT THERMOSTAT TS2 STOP HEATING PUMP P2, NETWORK SUPPLY WATER TEMPERATURE EXCEEDED LIMIT. THE PUMP WILL RESTART WHEN THE TEMPERATURE DROPS BELOW 8°C.

*) = The thermostat should be installed as far away as possible (min. 2.0m) from the heat exchanger.
The pipe must not be insulated around the thermostat.

HEATING NETWORK OPERATING TEMPERATURES



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