Instructions

HW 22
District heating substation for indirect heating and domestic hot water systems

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### Instructions

**HW 22 - district heating substation for indirect HE and DHW**

#### Safety notes

- **The following instructions refer to the standard design of the HW 22 substation. Special versions of substations are available on request.**

  To avoid injury of persons and damages to the device, it is absolutely necessary to read and observe these instructions carefully.

  Necessary assembly, start-up and maintenance work must be performed by qualified and authorized personnel only.

  Please comply with the instructions of the system manufacturer or system operator.

  Unused connections and shut-off valves must be sealed with a plug. The plugs can be removed by an authorized service technician only.

  **Warning of high pressure and temperature**

  The maximum temperature of the flow medium in a substation is 120 °C.

  The maximum operating pressure of the substation is 16 bar.

  Be aware of the installation's permissible system pressure and temperature.

  The risk of persons being injured and equipment damaged increases considerably if the recommended permissible operating parameters are exceeded.

  The installation of substation is equipped with safety valves.

  **Warning of hot surface**

  The substation has got hot surfaces, which can cause skin burns. Please be extremely cautious in close proximity to the substation.

  **Warning of transport damage**

  Before installation of substation, please make sure that the substation has not been damaged during transport.

  **Sound level**

  ≤ 55 dB

  **Corrosion protection**

  All pipes and components are made of stainless steel and brass.

  The maximum chloride compounds of the medium should not exceed 300 mg/l.

  The risk of equipment corrosion increases considerably if the recommended permissible chloride compounds are exceeded.

#### Delivery

- The HW 22 substation is delivered without cover as a standard.

- Optional substation equipment:
  - electronic temperature controller
  - or self-acting thermostatic controller on DHW,
  - white-lacquered steel sheet cover.

#### Transport and storage

- If the substation is stored before installation in a warehouse or any other room, make sure that the place is dry and heated.

- During transport of the substation to an installation place it is recommended to lift it with special straps attached to the bottom (by substation support construction).
Mounting

The substation must be installed and connected by authorized service personnel. Installation must be in compliance with the local standards and regulations. Keep adequate space around the substation for mounting and maintenance purposes.

Prior to the HW 22 installation all substation pipes and connections should be cleaned and rinsed.

Due to vibrations during transport all connections must be checked and tightened before the substation is installed.

**Heat meter assembly, fitting piece**

Substation is equipped with a fitting piece for insertion of heat meter.

**Assembly of heat meter:**

Loosen nuts of fitting piece, remove fitting piece and replace with heat meter.

Mount the heat meter according to the medium flow direction. After each mounting of heat meter remember to check all threaded connections.

**Pipes connections**

Internal installation and district heating* pipes connections must be made by means of threaded or welded connections.

**Connections:**

1. District heating (DH) return
2. District heating (DH) supply
3. Circulation DHW
4. Domestic cold water (DCW)
5. Domestic hot water (DHW)
6. Heating (HE) return
7. Heating (HE) supply

**Connection sizes:**

- DH: G 1” (int. thread)
- DCW + DHW + HE: G 1” (int. thread)
- Circulation: G 1” (int. thread)

**Dimensions (mm):**

- Without cover: H 1100 x W 720 x D 360
- With cover: H 1100 x W 740 x D 400

*District heating (DH) - In the following DH is specified as the heat source for the substations. However, also other heat sources such as an oil or gas boiler or solar heating etc. could be used as the primary supply for the fitted substations, enabling the Danfoss Redan substations to be used in numerous schemes with different energy sources, depending on the local operating conditions. In order to simplify we have decided to use DH as designation for the primary supply.
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**HW 22 - district heating substation for indirect HE and DHW**

### Electrical connection

**Standard substation:**
Connect pump to main supply (1x230 V) according to local standards.

**Substation equipped with electronic controller:**
The electronic controller is electronically connected to the actuator, sensors and the pump, ending up in a CEE-plug connection for main supply (1x230V) and earth grounding.

### Filling, start-up

Prior to the HW 22 installation all its pipes and connections should be cleaned and rinsed.

Before starting-up, check if:
- pipes are connected according to the circuit diagram,
- release valves are shut-off,
- threaded connections are tightened.

The heat exchanger must be filled with water so that the pressure slowly reaches the working pressure.

After that the shut-off valves should be opened and the operation of the heat exchanger must be observed (e.g. temperatures, pressure, thermal expansion, leakages). If the heat exchanger operates unproblematically, it can be taken into continuous use.

All Danfoss heat exchangers and substations have been pressure tested prior to delivery.

### Control

1. **Differential pressure controller**
The differential pressure controller reduces the fluctuating pressure in the district heating network to a small and invariable operating pressure in the substation. The differential pressure controller is preset from factory and should not be adjusted afterwards. If a later adjustment of the differential pressure is necessary, please refer to producer instructions for differential pressure controller. The required room temperature is controlled on your radiator thermostats (fixed setting throughout the year). It is recommended that all radiators are opened a bit in each room.

2. **HE temperature control**
The temperature of the heating supply is controlled automatically with weather compensation. The required room temperature is controlled on your radiator thermostats. It is recommended that all radiator thermostats are set on minimum setting in each room.

**Weather compensation**
The HE temperature is controlled by weather controller with settings card, controlling circulation pump and actuator operation of indirect flow. Weather controller is also equipped with an outdoor temperature sensor and sensors of HE flow. The controller is ready from factory to control of selected HE system. It is possible to make own settings/to insert set value for daily usage both in basic configuration and in extended service settings. Additional control should be made in accordance with producer instructions for the mounted controller.
3. Operation in summer and winter season, circulation pump, substation start-up, maintenance

**Summer season, circulation pump**
In summer season the circulation pump should be switched off and simultaneously the shut-off valve of HE supply should be closed (ball-valve placed on HE supply, first connection to your right). It is recommended to start-up the circulation pump (for a few minutes) once a month during the summer period; the shut-off valve of HE supply must be shut.

**Winter season, substation start-up**
- open shut-off valves,
- set the pump at highest speed of rotation before start-up,
- switch-off the pump and vent the installation after the radiators have been warmed,
- set the pump at lowest speed of rotation in consideration of electricity consumption and heating comfort.

Normally the change-over switch is set in the centre position (default), however for systems with floor-heating or one-pipe systems it may be necessary to turn the change-over switch upwards (clockwise).

Higher speed of rotation is used only if the heating requirement increases.

4. HE manometer
The HE manometer indicates the pressure value in HE system.
The pressure during operation should be 1-1.5 bar.
If the pressure drops below 1 bar, water must be added to the system.
The operating pressure should never exceed 1.5 bar.

5. Expansion vessel (not part of the delivery)
Expansion vessels are designed for operation in self-contained heating and cooling systems. When water in the system is heated it will expand and the task of the expansion vessel is to accommodate the increased volume of water, as well as to limit the pressure increase to defined maximum value.
During decrease in temperature the task of the expansion vessel is to ensure pressure compensation by supplying previously accommodated water to the installation.
For information about regulation or maintenance please refer to instructions for installed expansion vessel.
6. DHW temperature control
The DHW temperature can be controlled by self-acting thermostatic valve(s) or electronic controller.

Self-acting thermostatic controller
The DHW temperature can be controlled by self-acting thermostatic valve, which closes on rising temperature.

Setting changes:
Turning the setting knob counterclockwise increases the temperature, turning it clockwise reduces the temperature. The scale is graduated with reference values, i.e. the temperature cannot be read from the scale, but must be read from a thermometer placed near the sensor in the medium to be temperature-controlled.

Approximate termostat scale settings:
1 = 20 °C
2 = 35 °C
3 = 50 °C
4 = 60 °C
5 = 70 °C

Electronic temperature controller
The DHW temperature can be controlled by electronic controller, controlling DHW circulation pump and actuator operation of indirect flow. Electronic controller is also equipped with a sensor of DHW flow. The controller is ready from factory to control of selected DHW system. It is possible to make own settings/to insert set value for daily usage both in basic configuration and in extended service settings.

The control of substations equipped with electronic controller should be done in accordance with producer instructions for the mounted controller.

7. Safety valve
The safety valve’s task is to protect the substation from pressures exceeding the permissible pressure. The blow-off pipe of the safety valve must not be closed. The blow-off pipe outlet should be placed so that it provides safety relief and it is possible to observe water dropping from the safety valve. It is advisable to check the operation of the safety valve by turning the valve head into the indicated direction, every six months.

8. Filters
Filters should frequently be cleaned from sediments by authorized personnel, according to producer’s instructions and dependent on the substation’s operating conditions.
Maintenance

It is necessary to check and maintain the substation on a regular basis in order to keep it in good operating condition.

The frequency of the maintenance and service inspections should be according to system manufacturer specifications and local legislation. However, maintenance inspections should take place at least twice each year (before and after the heating season).

In addition to the check of the substation as to its functionality, it is also recommended to check if the following system parameters are compliant with the requirements of the system manufacturer and local regulations:
- no leakages,
- correct temperatures in the distribution network,
- stable district heating supply and return temperatures,
- correct cooling of the district heating supply,
- DHW temperature (requested temperature should be in accordance with the local regulations),
- pressure drops in filtering and water conditioning plants (filters, sludgers etc.),
- pressure drops in the heat exchangers (primary and secondary side of heat exchangers).

The substation operator should consider the above parameters and prepare written maintenance reports.

Service inspections by authorized personnel are usually more precise (complex) than user maintenance inspections and the intervals between them are longer.
**Troubleshooting DHW**

If operating disturbances occur, the following basic features should be checked before carrying out actual troubleshooting:
- the installation is connected to electricity
- pump and automatic controls (does not apply to all units)
- the strainer on the district heating supply pipe is clean
- the supply temperature of the district heating is at the normal level (summer, at least 60 °C; winter, at least 70 °C)
- the differential pressure is higher than or equal to the normal (local) differential pressure in the district heating network - if in doubt, ask the district heating plant.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Solution</th>
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<tbody>
<tr>
<td>Insufficient pressure on the hot water</td>
<td>Lime scale precipitation in plate heat exchanger for DHW (poor cooling at high load) Strainer in cold water meter clogged.</td>
<td>[ Replace plate heat exchanger. ] Clean strainer - possibly in consultation with the water supply co.</td>
</tr>
<tr>
<td>Long wait for DHW</td>
<td>Circulation pump out of operation.</td>
<td>Check whether the pump is running - whether the pump is receiving power. Check that there is no air in the pump housing - see pump manual.</td>
</tr>
<tr>
<td>No hot water</td>
<td>Strainer in district heating supply clogged. Defective thermostat - possibly dirt in the valve housing. Defective actuator - possibly dirt in the valve housing. Automatic controls wrongly set or defective - possibly power failure.</td>
<td>[ Clean strainer. ] Check the operation of the thermostat - clean the valve seat if required. Check the operation of the actuator - clean the valve seat if required. Check that the setting of the controller is correct - see separate instructions. Check the power supply. Temporary setting of motor to “manual” control - see instructions on automatic controls.</td>
</tr>
<tr>
<td>Temperature too low</td>
<td>As above. Non-return valve on the circulation line defective (leads to mixing - and the circulation water pipes are getting cold during tapping).</td>
<td>As above. Replace non-return valve.</td>
</tr>
<tr>
<td>Temperature too high</td>
<td>Thermostat defective - possibly dirt in the valve housing.</td>
<td>[ Check the operation of the thermostat - clean the valve seat if required. ] Check the operation of the actuator - clean the valve seat if required. Check that the controller has been correctly set - see separate instructions.</td>
</tr>
<tr>
<td>Variation in temperature</td>
<td>The non-return valve on the circulation line is defective (leads to mixing and the circulation water pipes get cold during tapping).</td>
<td>[ Replace non-return valve. ]</td>
</tr>
<tr>
<td>Declining temperature during draining</td>
<td>Automatic controls wrongly set.</td>
<td>[ Check that the controller has been correctly set - see separate instructions. Replace plate heat exchanger. ]</td>
</tr>
</tbody>
</table>
## Troubleshooting

If operating disturbances occur, the following basic features should be checked before carrying out actual trouble shooting:
- the substation is connected to electricity,
- the strainer on the district heating supply pipe is clean,
- the supply temperature of the district heating is at the normal level (summer, at least 60 °C - winter, at least 70 °C),
- the differential pressure is higher than or equal to the normal (local) differential pressure in the district heating network – if in doubt, ask the district heating plant,
- there is pressure on the system.

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<td>No heat</td>
<td>Strainer clogged on DH or HE side (radiator circuit). The filter in the district heating meter clogged. Defective or unadjusted differential pressure controller.</td>
<td>Clean the gate/strainer.</td>
</tr>
<tr>
<td></td>
<td>Sensor defective – or possibly dirt in the valve housing. Automatic controls, if any, wrongly set or defective - possibly power failure.</td>
<td>Clean the filter (after consulting the district heating plant).</td>
</tr>
<tr>
<td></td>
<td>The pump out of operation.</td>
<td>Check the operation of the differential pressure controller – clean the valve seat if required.</td>
</tr>
<tr>
<td></td>
<td>The pump is set at too low speed of rotation. Pressure drop - the manometer on the radiator circuit shows lower than recommended operating pressure. Air pockets in the system.</td>
<td>Check the operation of the controller and the actuator.</td>
</tr>
<tr>
<td>Uneven heat distribution.</td>
<td>Air pockets in the system.</td>
<td>Check if the setting of the controller is correct – see separate instructions.</td>
</tr>
<tr>
<td>DH supply</td>
<td>Wrong setting of thermostat or of automatic controls, if any. Defective regulator. The regulator does not react as it should in accordance with the instructions. Defective sensor on self-acting thermostat.</td>
<td>Check the power supply. Temporary setting of motor to “manual” control – see instructions on automatic controls.</td>
</tr>
<tr>
<td>temperature too high.</td>
<td></td>
<td>Check if the pump is receiving power and that it runs. Check if there is no air trapped in the pump housing - see pump manual.</td>
</tr>
<tr>
<td>DH supply</td>
<td>Wrong setting of automatic controls, if any. Defective controller. The controller does not react as it should in accordance with the instructions. Defective sensor on self-acting thermostat. Wrong placement/fitting of outdoor temperature sensor. Strainer clogged.</td>
<td>Set the pump at higher speed of rotation.</td>
</tr>
<tr>
<td>temperature too low.</td>
<td></td>
<td>Fill the system with water and check the functioning of the pressure expansion vessel if required.</td>
</tr>
<tr>
<td>Poor cooling</td>
<td>Too small heating surface/too small radiators in relation to the total heating requirement of the building. Poor utilization of existing heating surface.</td>
<td>Air the installation thoroughly.</td>
</tr>
<tr>
<td></td>
<td>The system is single-pipe.</td>
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If the problem cannot be solved, or if doubt exists about how to proceed, contact the district heating plant.
Instructions

HW 22 - district heating substation for indirect HE and DHW