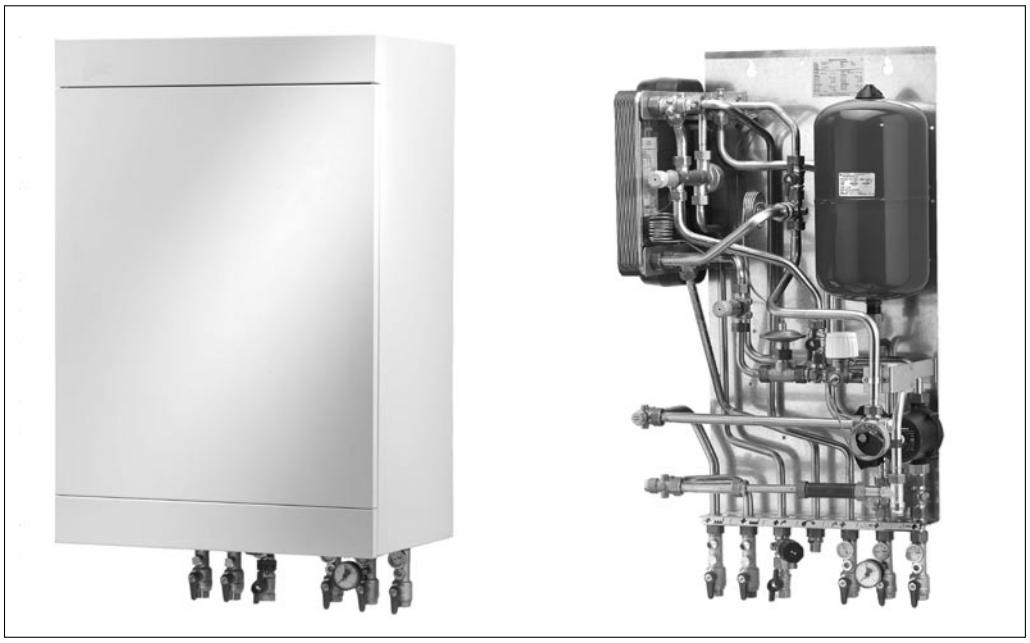
Instructions

Akva Lux VX
District heating substation for indirect heating and domestic hot water systems

Akva Lux VX



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Safety notes

Following instructions refer to the standard design of the Akva Lux VX 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 90 °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 substation installation must be 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.

Delivery

The Akva Lux VX substation is delivered with anthracite grey-lacquered frame and with slightly curved front panels in either brushed or white-lacquered stainless steel as a standard.

Optional substation equipment:
- flexible fitting piece for heat meter, 1" instead of ¾" connections,
- additional fitting piece for heat meter in DH flow,
- electronic temperature controller instead of self-acting thermostatic controller,
- thermostat with safety monitor (STW) for floor heating (available only with electronic control),
- without cover, or frame and front panels,
- with white-lacquered steel sheet cover.

Standard delivery:
The substation is equipped with by-pass control as a standard, but it is also prepared for DHW circulation control. Switching to DHW circulation control is possible from a constructional point of view, requiring no extra components.

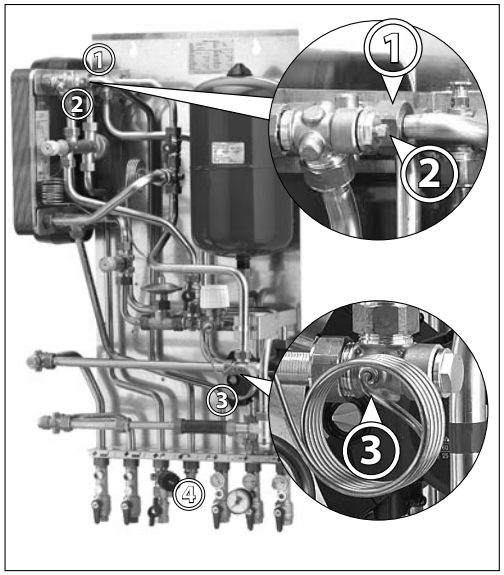
Remember circulation pump and non-return valve assembly (this is not part of the delivery and must be fitted remotely on site).

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.
Allow for adequate space around the substation for mounting and maintenance purposes.

Prior to the Akva Lux VX 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.

Control change from by-pass to circulation

- Loosen the nut (1) on back T-piece between DHW heat exchanger and PT°C controller and remove the blind plate.
- Remove the conical screw (2) (4 mm) on front T-piece between DHW heat exchanger and PT°C controller.
- Loosen and move capillary tube together with union nut from pos. 3 to 2.
- Screw the conical screw from pos. 2 (4 mm) on to the muff at pos. 3.
- Connect DHW circulation system with substation pipe - pos. 4 – remember pump assembly and non-return valve mounting in the DHW circulation system (not part of the delivery).

The pump must pump water in direction towards the substation.

Heat meter assembly, flexible fitting piece

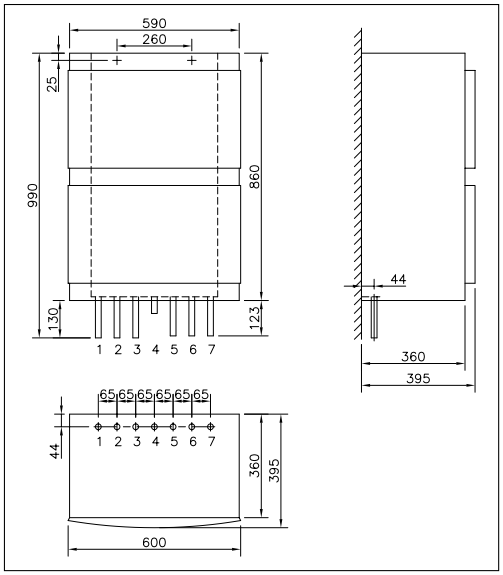
The substation is equipped with a flexible fitting piece for insertion of heat meter. Possible insertion length ranges from 110 to 190 mm.

Assembly of heat meter:

Loosen nuts of fitting piece, remove fitting piece and replace with heat meter (size 110 mm). If heat meter size exceeds 110 mm loosen nut in the middle of the flexible pipe. Adjust size of flexible pipe according to actual heat meter size and insert heat meter. Tighten up the nut in the middle of the flexible pipe.

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

Pipes connections



Internal installation and district heating* pipe connections must be made by means of flange, thread or welding connections.

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

Connections sizes:

DH:	G¾" (ext. thread)
DCW + DHW + HE:	G¾" (int. thread)
DHW circ.:	R½" (ext. thread)

* 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.

Electrical connection

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

Substation equipped with electronic controller:
The electronic controller is electrically 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 Akva Lux VX 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,
- thread and flange 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 in accordance with the dimensioning basis, 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. The required room temperature is controlled on your radiator thermostats (fixed setting throughout the year). It is recommended that all radiators are opened a little in each room.

2. HE temperature control
The temperature of the heating supply is controlled by the thermostat.
The temperature of the heating flow is indicated by thermometer mounted in secondary side.

Approximate thermostat scale setting:

1 = 20 °C	4 = 50 °C
2 = 30 °C	5 = 60 °C
3 = 40 °C	6 = 70 °C

The room temperature is controlled by radiator thermostats. It is recommended to set the minimum thermostat setting in each room.

The control of substations equipped with electronic controller with outdoor temperature sensor, should be done 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 the HE supply should be closed (ball-valve placed on vertical pipe beside expansion vessel).
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 the HE supply must be shut.

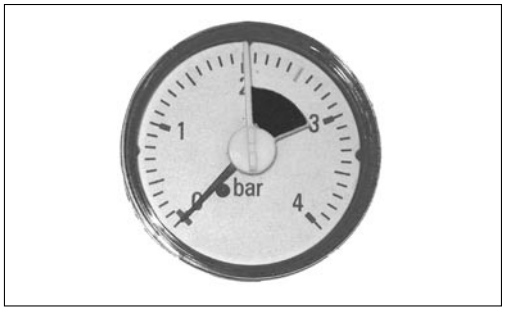
Winter season, substation start-up
- open shut-off valves,
- set the pump at highest speed of rotation before start-up,
- switch-off the pump and vent the installation after the radiators have been warmed,
- set the pump at lowest speed of rotation in consideration of electricity consumption and heating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

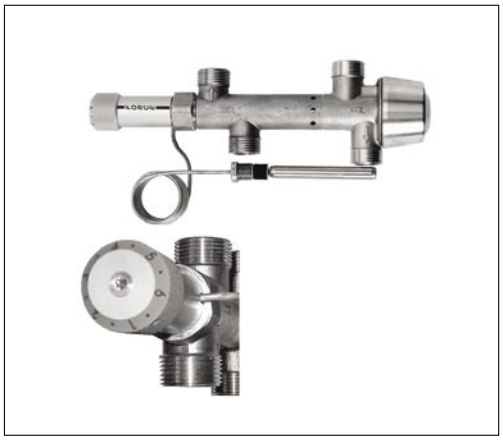
4. Limiting flow controller (DH return)
Additional substation equipment is mounted on district heating company request. Limiting flow controller should be set to the required maximum return temperature, in compliance with the local demands.

Approximate thermostat scale setting:
2 = 25 °C
3 = 50 °C
4 = 60 °C

To ensure sufficient cooling and proper operation the HE return temperature (thermometer indication on secondary return) must be lower than the temperature set on the flow controller.



5. 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.



6. DHW temperature control
The DHW temperature is controlled by turning the controller head to a higher numerical value (warmer) or lower numerical value (colder). The temperature should be set to 45-48 °C at normal use (8-10 l/min). The temperature should never exceed 55 °C to avoid lime scale precipitation in the heat exchanger.

PT°C controller
Approximate PT°C controller settings:
1 = 25 °C
2 = 35 °C
3 = 45 °C
4 = 55 °C
5 = 65 °C
6 = 75 °C

Setting changes:
Set the temperature by turning the controller head.

Thermostatic by-pass (standard)
The substation is equipped with a by-pass thermostat, Danfoss FJVR, which ensures that hot water is available immediately, when tapping starts. It is recommended to set the thermostat in pos.3. If the water temperature rises too slowly it can be necessary to set the thermostat at higher value, however, not higher than in position 4.

DHW circulation (optional)
If the Akva Lux VX substation is connected to the DHW circulation system in the building, the FJVR thermostat will control the circulation water temperature. This ensures that hot water is available at the tap point instantly and without waste of water. It is recommended to set the thermostat in pos. 2-2,5. If the circulation pump is switched off, the thermostat should be closed. In case the Akva Lux VX substation has been delivered with by-pass control, and this must be changed to DHW circulation control , this can be done by performing control change from by-pass to circulation, as described on page 3.

Approximate thermostat scale setting:
1 = 30 °C
2 = 40 °C
3 = 45 °C
4 = 50 °C (max. temp.)

7. Safety valves
The safety valves' task is to protect the substation from pressure exceeding the permissible pressure. The blow-off pipe of the safety valves 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 valves. It is advisable to check the operation of the safety valves by turning the valve head in 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 a good operating condition.

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

In addition to the check of the substation as to its functionality, it is also recommended to make sure that 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 each heat exchanger).

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

Problem		Possible cause		Solution
In general: Does the PT°C controller work incorrectly?	▶	If the quantity of tap water is normal (temperature unimportant), it indicates that the PT°C controller works correctly.	▶	Locate defect in another part of the installation.
In general: Are the operating conditions satisfactory?	▷	The substation requires a DH supply temperature of minimum 60 °C, and a differential pressure during operation according to the information stated in the product sheet for Akva Lux VX.	▷	Contact district heating supplier.
PT°C controller leaking.	▶	One of the two O-rings are defective (it does not influence the PT°C operating). If a non-return valve is installed in the DCW inlet (e.g. in the house service connection or in DCW meter) a safety valve should be mounted between the non-return valve and the DHW plate heat exchanger.	▶	Replace PT°C controller (use new sealing).
DHW tap load too low.	▷	The diaphragm of the PT°C controller is defective.	▷	Replace diaphragm or PT°C controller.
DHW tap load too low; Tap temperature too low; Tap temperature fluctuates.	▶	PT°C controller wrongly adjusted. Strainer in DH supply clogged. Defective non-return valve in thermostatic battery (check if DHW tap temperature is lower than DHW from unit, or close ball valve on DCW inlet for substation). Defective non-return valve in DHW circulation (DHW circulation return pipe is getting cold during tapping of hot water). Lime scale precipitation in the DHW plate heat exchanger (Δt primary too low during DHW tapping),. Dirt in PT°C controller.	▶ ▶ ▶ ▶ ▶	See PT°C controller instruction. Clean strainer. Clean or replace non-return valve. Clean or replace non-return valve. Replace the plate heat exchanger. Clean, see PT°C controller instruction.
DHW temperature too high.	▷	PT°C controller wrongly adjusted Thermostatic element in PT°C controller defective	▷ ▷	See PT°C controller instruction Replace PT°C controller
System with DHW circulation: DHW temperature falls shortly after tapping starts.	▶	By-pass thermostat is defective or wrongly adjusted.	▶	Replace or adjust by-pass thermostat correctly.
DH return water temperature too high while on standby. The plate heat exchanger is cold…	▷	By-pass thermostat is defective or wrongly adjusted.	▷	Replace or adjust by-pass thermostat correctly.
DH return water temperature too high while on standby. The plate heat exchanger is hot…	▶	Dirt (sand, iron splinter or similar) in PT°C controller. Controller does not close after tapping. Noise from flow can often be heard.	▶	Disassemble the controller for cleaning. See back of the page.
DH return temperature too high during hot water tapping (poor cooling).	▷	The DHW temperature is set too high and/or lime scale precipitation in the DHW plate heat exchanger.	▷	Set PT°C controller in the correct position (see PT°C controller instruction) and/ or replace the plate heat exchanger.

Troubleshooting HE

If operating disturbances occur, the following basic features should be checked before carrying out actual troubleshooting:
- the substation is connected to current supply - pump and automatic controls (does not apply to all substations),
- 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 – for guidance),
- the differential pressure is equal to or higher than normal (local) differential pressure in the district heating network – if in doubt, ask the district heating plant,
- there is pressure on the system - check the HE manometer.

Problem		Possible cause		Solution
No heat	▶	Strainer clogged on DH or HE side (radiator circuit).	▶	Clean gate/strainer.
		The strainer in the district heating meter clogged.	▶	Clean the strainer (after consulting the district heating plant).
		Defective or wrongly adjusted differential pressure controller.	▶	Check the functioning of the differential pressure controller – clean the valve seat if required.
		Sensor defective – or possibly dirt in the valve housing.	▶	Check the function of the thermostat - clean the valve seat if required.
		Automatic controls, if any, wrongly set or defective - possibly power failure.	▶	Check if 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.
		Pump out of operation.	▶	Check if the pump is receiving power and that it runs. Check if there is air trapped in the pump housing - see pump manual.
		The pump is set at too low speed of rotation.	▶	Set the pump at higher speed of rotation.
		Pressure drop - the manometer on the radiator circuit shows lower than recommended operating pressure.	▶	Fill water on the system and check the functioning of the pressure expansion vessel if required.
		Air pockets in the system.	▶	Air the installation thoroughly.
Uneven heat distribution.	▷	Air pockets in the system.	▷	Air the installation thoroughly.
Supply temperature too high.	▶	Wrong setting of thermostat or automatic controls, if any.	▶	Adjust automatic controls, - see instructions for automatic controls.
		Defective controller. The controller does not react as it should in accordance with the instructions.	▶	Call automatic controls manufacturer or replace the regulator.
		Defective sensor on self-acting thermostat.	▶	Replace thermostat, - or sensor only.
Supply temperature too low.	▷	Wrong setting of automatic controls, if any.	▷	Adjust automatic controls – see instructions for automatic controls.
		Defective controller. The controller does not react as it should in accordance with the instructions.	▷	Call in automatic controls manufacturer or replace regulator
		Defective sensor on self-acting thermostat.	▷	Replace thermostat - or sensor only.
		Wrong placement/fitting of outdoor temperature sensor.	▷	Place/fit an outdoor temperature sensor correctly.
		Strainer clogged	▷	Clean gate/strainer.
Poor cooling	▶	Too small heating surface/too small radiators in relation to the total heating requirement of the building.	▶	Increase total heating surface.
		Poor utilization of existing heating surface.Defective sensor on self-acting thermostat.	▶	Make sure the heat is distributed evenly across the full heating surface – open all radiators and keep the radiators in the system from heating up at the bottom.
		The system is single-pipe.	▶	It is extremely important too keep the flow temperature to the radiators as low as ever possible, while maintaining a reasonable level of comfort. The system should feature electronic controls as well as return sensors.
		Defective self-acting thermostat on the district heating side.	▶	Replace thermostat - or sensor only.

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