

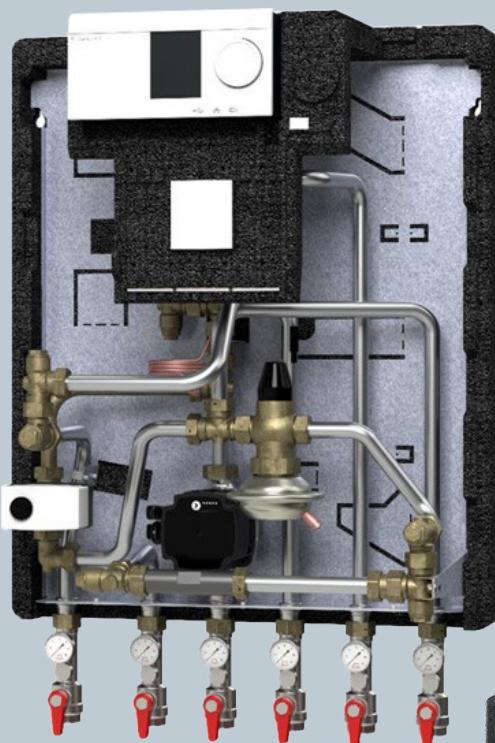
Instructions for installation and use

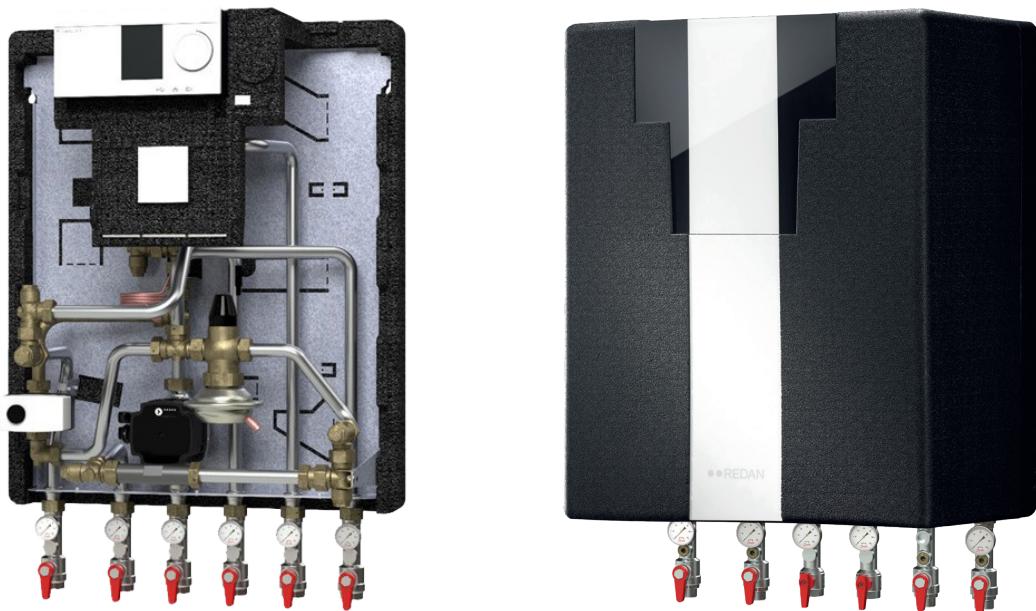
# Direct, fully insulated district heating substation Se-Solo HWP

District heating substation for direct heating, with mixing loop and primary connection for domestic hot water cylinder

**Se-Solo  
HWP**

Fully insulated  
for very low heat  
losses.





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## 2. INSTALLATION INSTRUCTIONS, SAFETY AND HANDLING

### Instructions

Please read these instructions carefully before installing and commissioning this substation. The manufacturer accepts no liability for loss or damage resulting from failure to comply with these instructions for use. Read and follow these instructions carefully to prevent the risk of physical injury and/or damage to property. Exceeding the recommended operating parameters considerably increases the risk of personal injury and/or damage to property. Installation, commissioning and maintenance must be carried out by qualified and authorized personnel in compliance with the local safety regulations.

Once the station has been installed and is operating, there is *normally* no need to alter the settings or other functions. The district heating substation is very reliable and easy to operate.

### Energy source

The substation is primarily designed for connection to district heating. Alternative energy sources can be used if the operating conditions are equivalent to district heating at all times.

### Application

The substation is designed only to operate with water and other heating media may not be used.

The substation is to be connected to the household piping in a frost-free room, where the temperature does not exceed 50 °C and the relative humidity is not higher than 80%. The substation must not be covered, bricked in or otherwise cut off from access.

### Choise of materials

Only use materials, that comply with local regulations.

### Corrosion protection

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

All pipes are made of min. AISI 304 (heating) and min. AISI 316 (domestic water) stainless steel as well as brass. Components for domestic water, however, primarily in dezincification-resistant brass. Heat exchangers are made of stainless steel and are copper-soldered or steel-soldered. Surfaces in contact with water can be subject to two problems, limescale formation and corrosion.

The nature of the water will be of great importance in this context, where the pH value, chlorides, gases, etc., have a decisive effect on how much lime is deposited and how aggressive the water is.

The temperature also has a great influence in this context. For example the corrosion rate increases by a factor of 2 to 3 for every 10° C temperature rise.

With knowledge of the chemical water composition and operating conditions of a heating system, the risk of scaling and corrosion can be assessed. Based on that, recommendations can be made to avoid scaling and/or corrosion problems in the components.

*See item 16, page 20 for more detailed Guidelines for Water Quality in Danfoss brazed heat exchangers and recommended Chloride concentration to avoid Stress Corrosion Cracking.*

### Safety valve(s)

Installation of safety valve(s) must always be in compliance with local regulations.

### Noise level.

≤ 55 dB.

### Storage

Before installation, the units must be stored in a dry, heated (i.e. frost-free) room.

(Relative humidity max. 80% and storage temperature 5-70 °C).

The units must not be stacked higher than the limit at the factory (max. 8 layers) Units supplied in cardboard packaging must be lifted using the handles incorporated in the packaging. Units must be placed on pallets for transport/moving across large distances.

As far as possible, do not lift the substation by the pipes. Lifting by the pipes may cause leaks. REMEMBER to retighten.



### Connection

It must be possible to cut off all energy sources to the unit - including electrical connections - at all times. The unit must be connected to an electrical equalizer connection.

### Warning! Hot surfaces

Parts of the substation may be very hot and can cause burn injuries. Be very careful when you are in the immediate vicinity of the substation.

### Warning of high pressure and high temperature

The maximum supply temperature in the district heating network can be up to 90°C and the max. operating pressure is 16 bar. This may result in a risk of scalding from touching the substation and from outflow of the medium (water/steam). Exceeding the substation design data and operating parameters for pressure and temperature carries an appreciable risk of personal injury and/or damage to property.

### Emergencies

In the event of fire, leaks or other hazards, immediately shut off all sources of energy to the substation, if possible and call for appropriate assistance.

If the domestic hot water is discoloured or malodorous, shut off all ball valves on the substation, notify all users and call for professional assistance immediately.

### Warning of damage during transport

On reception of the substation, and before installing it, check for any evidence of damage during transport.

The substation must be handled and moved with the greatest care and attention.

### IMPORTANT - Tightening of connections

Before adding water to the system, ALL pipe connections MUST be retightened, as vibrations during transport may have caused leaks. Once the substation has been filled and the system has been put into operation, ALL pipe connections MUST be tightened once more.

**(Do not overtighten! - See page 8, Test and Connections)**



### Handling

We recommend that you wear suitable safety footwear while handling and installing the substation.

**NOTE:** Interventions/rework on our components results in loss of warranty.

## 2. INSTALLATION INSTRUCTIONS, SAFETY AND HANDLING

### Reach

All products of the Akva Lux II Triiiple series comply with the provisions of the REACH regulation.

We are therefore obliged to inform our customers about the presence of substances according to the SVHC candidate list, if they are present. We hereby inform you: This product contains brass parts containing lead (CAS 7439-92-1) in a concentration above 1% (w/w).

### Potential equalization / grounding

Equipotential bonding is understood as all measures for eliminating electrical potential differences (contact voltages), which can occur between eg two pipelines. Equipotential bonding is an important measure for protection against electric shock. Equipotential bonding reduces corrosion in the heat exchanger, instantaneous water heaters, district heating stations and plumbing installations. Equipotential bonding should be in accordance with the provisions 60364-4-41: 2007 and IEC 60364-5-54: 2011. Binding point is marked with a grounding symbol on the bottom right corner of the mounting plate and there is a hole in the mounting plate and a label with grounding symbol.

### Disposal

Dispose of the packaging in accordance with the local regulations for disposal of used packaging materials.

The substation is made of materials that cannot be disposed of together with household waste.

Close all energy sources and disconnect all connection pipes. Disconnect and dismantle the product for disposal in accordance with the applicable local regulations for the disposal of the individual components.

### 3. GETTING STARTED - QUICK GUIDE FOR EASY START-UP

#### Mounting

The substation must be installed and connected by authorized service personnel only.

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

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

Connect the substation to the household piping in accordance with the labelling at the bottom and/or in accordance with the instructions in this manual.

*GETTING STARTED is a quick guide and some details in connection with installation and commissioning may require additional information, which can be found elsewhere in this instruction manual.*

#### GETTING STARTED Se-Solo HWP

1. Mount the substation on a solid wall using two sturdy bolts (max. 8 mm), screws, expansion bolts or similar.

2. Tighten all pipe connections, as they may have loosened during transport and handling.

3. Mount the district heating meter (see page 8).

4. On systems that feature a safety valve, establish a drain connection in compliance with the applicable legislation.

5. Open the ball valve and heat up the system.

6. Check the substation and the household piping thoroughly for leaks.

7. Pressure test the entire system for leaks in accordance with the applicable regulations.

8. Connect pump and automatic components, if any, to the electricity supply, but do not switch on the power.

9. Heat the system and vent the radiator circuit/heating side thoroughly on the radiators and the air valve, if any.

10. Connection

Now switch on the pump and automatic components, if any.

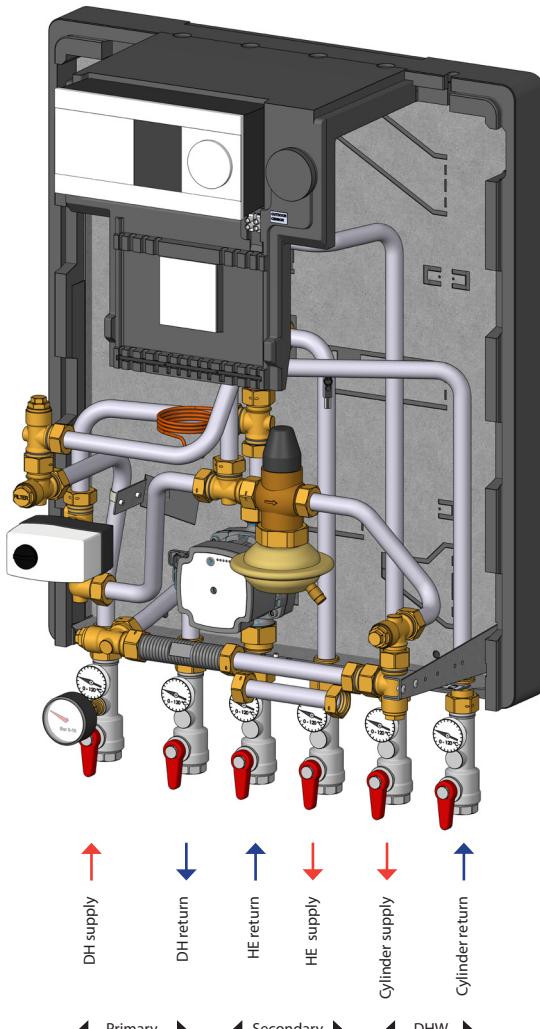
11. Finish by adjusting the substation in accordance with the instruction manuals and remember to fill out the Commissioning Certificate page 20.

#### Note!

**Heating and cooling the substation may cause leaks. Therefore it may be necessary to retighten the connections in the period after commissioning.**

#### Note!

**Never lift the station by its front insulation cover!**



## 4. DESCRIPTION / MAIN COMPONENTS / CONNECTIONS

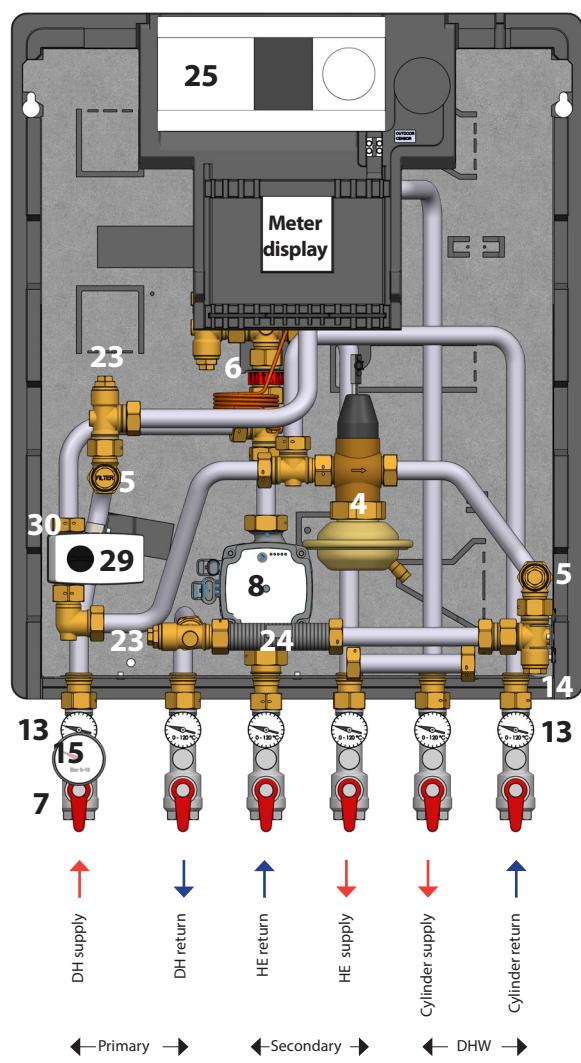
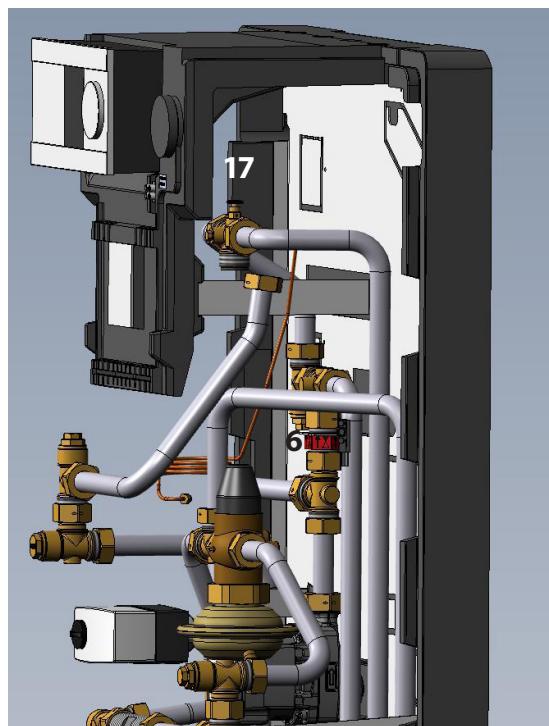
### Description

District heating substation for direct heating with mixing loop for single-family, semi-detached and terraced houses as well as flats. With one heating circuit and with connection pipes for cylinder on primary side. Designed for wall-mounting. The heating temperature is controlled by an electronic temperature controller Danfoss ECL with an outdoor temperature sensor.

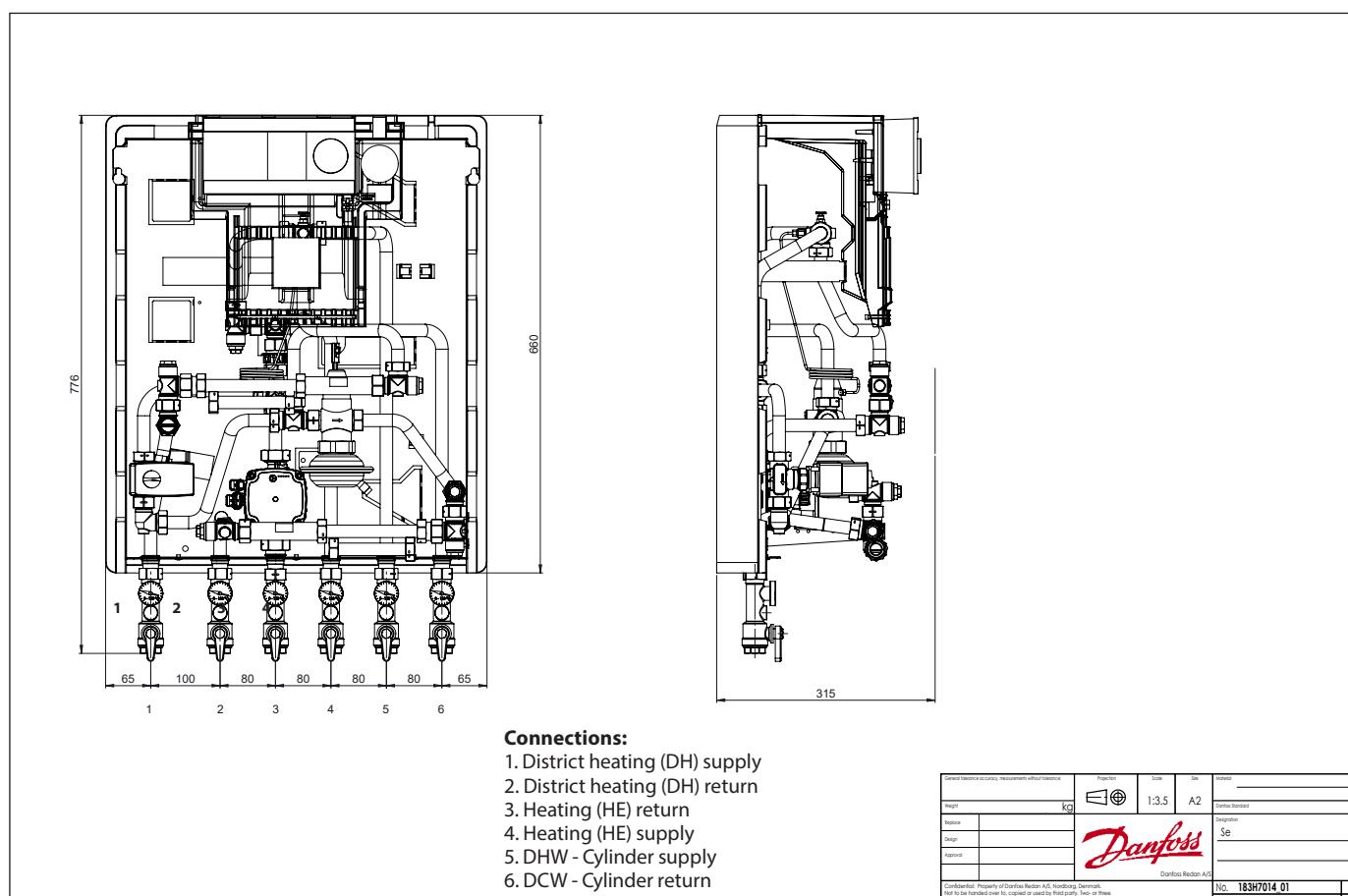
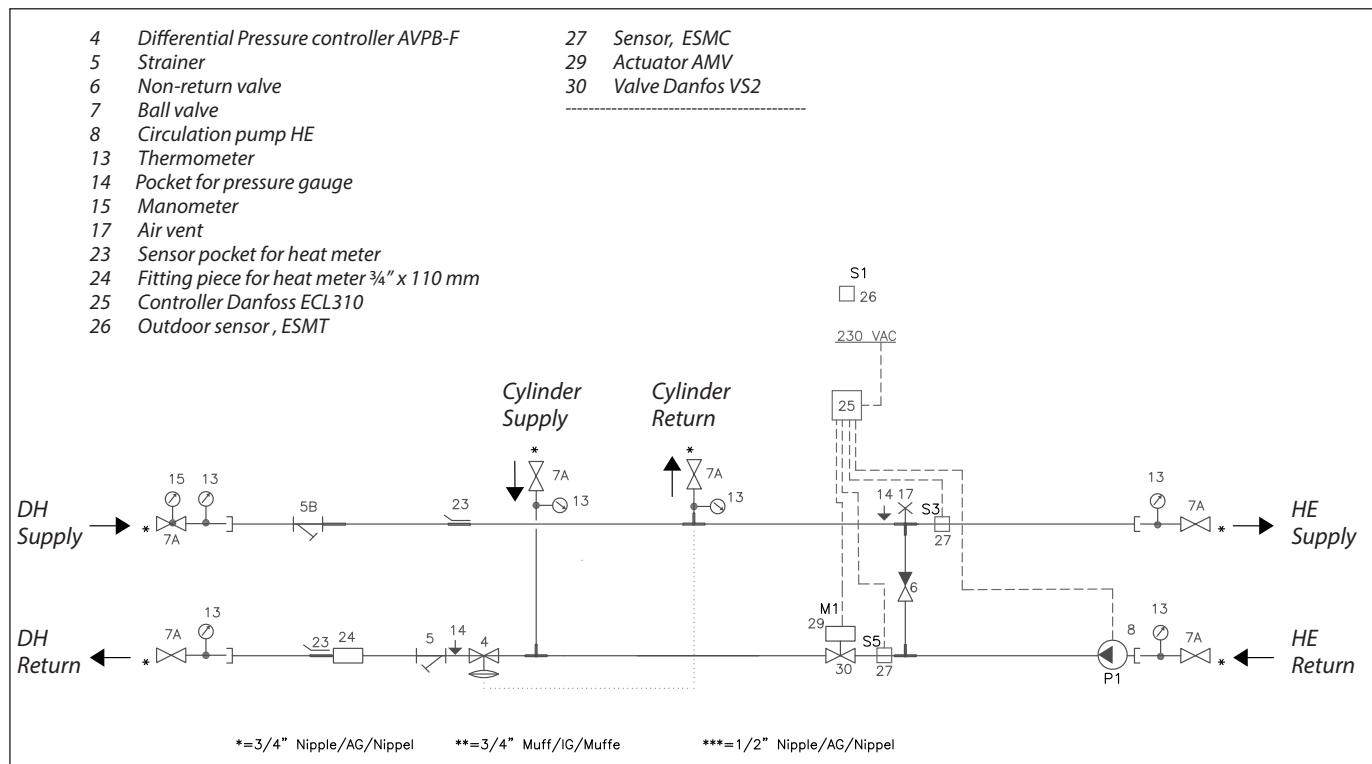
The substation is supplied with mixing circuit. The task of the mixing circuit is to ensure a correct supply temperature for the heating circuit (to protect the heating circuit against too high temperatures) and to ensure, that the return water is cooled down to the required temperature before it flows back to the district heating plant. The mixing circuit temperature is controlled by an electronic temperature controller Danfoss ECL.

### Se-Solo HWP - Main components

- 4 Differential pressure controller, AVPB-F
- 5 Strainer
- 6 Non-return valve
- 7 Ball valve
- 8 Pump
- 13 Thermometer
- 14 Pocket for pressure gauge
- 15 Manometer
- 17 Air valve
- 23 Sensor pocket for heat meter
- 24 Fitting piece for heat meter 3/4" x 110 mm
- 25 Controller Danfoss ECL310
- 29 Danfoss actuator AMV
- 30 Control valve, VS2



## 5. DIAGRAM & DIMENSIONAL SKETCH, EXAMPLE - Se-SOLO HWP



## 6. GENERAL, MOUNTING OF HEAT METER AND SAFETY VALVES

### General

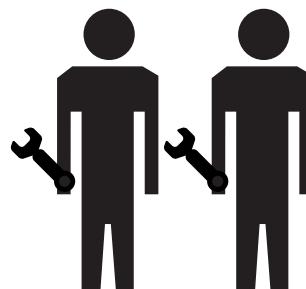
The installation, connection and maintenance of the substation must be performed by qualified and authorised personnel.

Installation must always be performed in accordance with the applicable legislation and in compliance with these instructions.

The substation must be installed so that it is freely accessible and can be maintained without unnecessary disruption. Lift the substation by its mounting plate/rear section and secure it to a solid wall using 4 sturdy bolts (max. 8 mm), screws or expansion bolts positioned in the four keyholes.

Before commissioning, rinse all the pipes in the household piping system thoroughly to remove any impurities, and check and clean the dirt strainers in the substation.

Connect the substation to the household piping in accordance with the labelling at the bottom and/or in accordance with the instructions in this manual.



### For fully insulated systems

The insulation front panel on the Se Solo HWP substations can be removed without using tools. Take hold of the air duct in the top and bottom of the front insulation section and pull carefully forward until the front insulation section releases from the rear section. Then pull gently until the front section is free from the components.

### Test and connections

Before filling the system with water, retighten all the pipe connections because vibrations and shocks during transport and handling may have caused leaks. Once the system has been filled with water, tighten all the pipe connections once more before performing pressure test for leaks. After heating of the system, check all the connections and retighten if necessary.

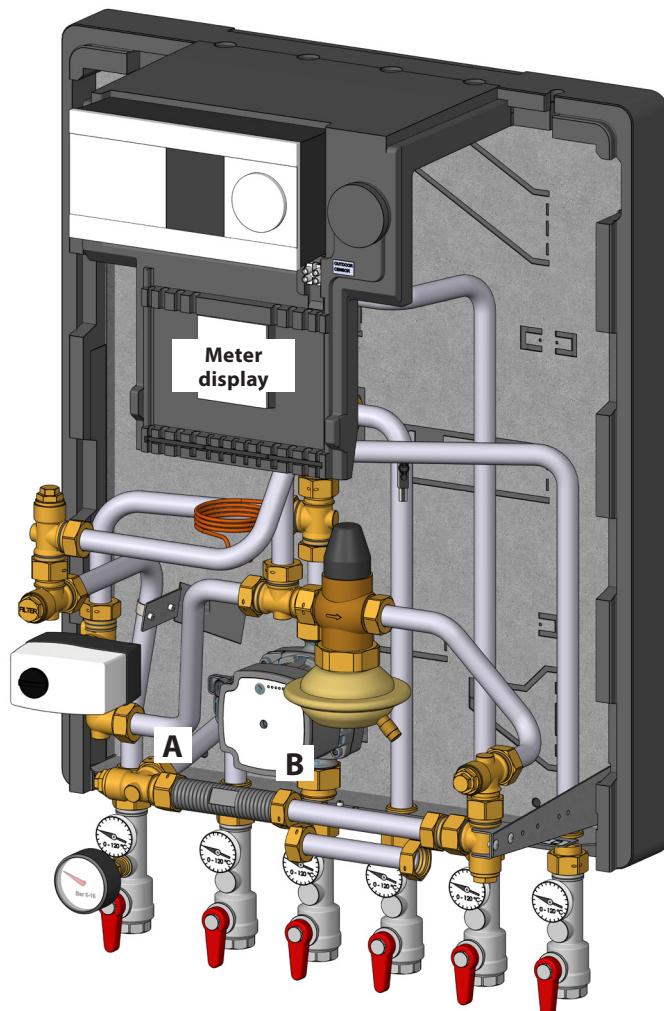
Please note that the connections may feature EPDM rubber gaskets! Therefore, it is important that you **DO NOT OVERTIGHTEN** the union nuts. Overtightening may result in leaks. Leaks caused by overtightening or failure to retighten connections are not covered by the warranty.

### Heat meter, fitting pieces.

The substation is equipped with fitting pieces for heat meter on the district heating return line. (Measurement: 3/4" x 110 mm).

### Fitting of heat meters

- Close the four ball valves on the district heating and the heating sides.
- Loosen the union nuts at both ends of the fitting piece (A + B) and remove it.
- Fit the heat meter, - remember to insert gaskets.
- Mount sensor, - remember to insert gaskets.
- Mount temperature sensors in sensorpockets (according to heat meter instructions).
- After mounting of heat meter remember to check and tighten all pipe connections before commissioning the substation.



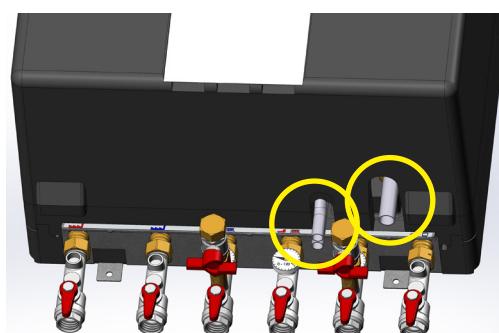
### Meter display (reading unit)

The meter reading unit is placed on the console together with the ECL regulator, as shown in the photo to the right, so that reading of the meter can be done without removing the insulation cover.

### Safety valve(s), if any

Always lead the blow-off pipe from the safety valve to a drain in accordance with applicable legislation.

The insulation cover is be prepared for this and blow-off pipe from the safety valves are led through the slit in the insulating cover as shown in the photo to the right.



## 7. ADJUSTMENT AND COMMISSIONING

### General information

PLEASE NOTE! Some models may have a slightly different appearance, but the control function is in principle the same as described below.

### Commissioning

Commission the substation in accordance with the instruction manual.

### Filling the system / operating pressure

Fill the unit with water according to the instructions on page 16. If the pressure drops below 1 bar, water must be added to the system.

The operating pressure should never exceed 1.5 bar.  
(The safety valve opens at 2,5 bar).

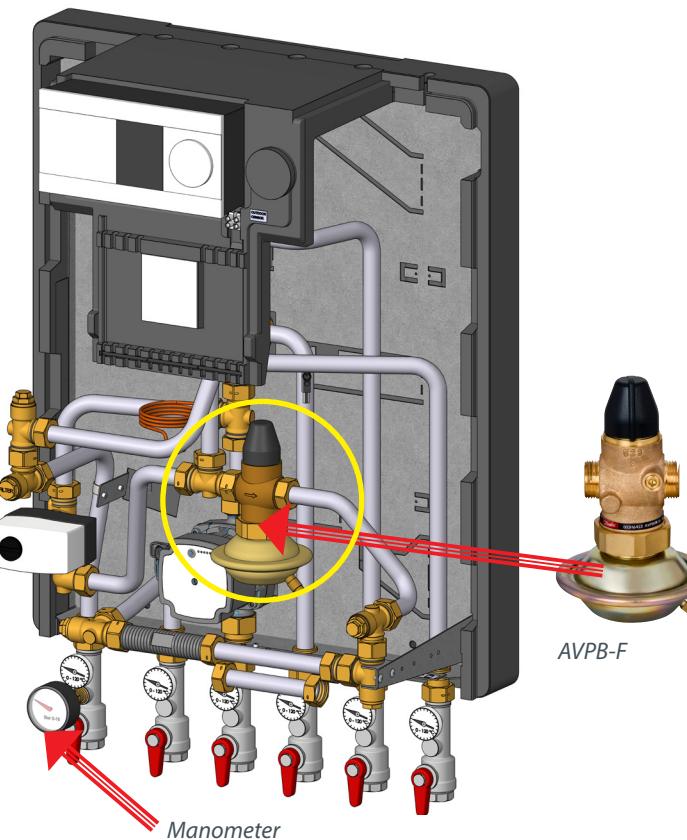
The pressure is read on the manometer.

If system pressure drops dramatically within a short time, heating system should be examined for leakage, - this includes checking the factory set pressure of the expansion vessel, which is normally 0,5 bar.

### Differential pressure controller

The differential pressure controller reduces the high, fluctuating pressure in the district heating network to a constant operating pressure.

Se-Solo HPW is supplied with a AVPB-F differential pressure controller, which is preset from factory and should not be adjusted afterwards. The controller has a control valve with adjustable flow restrictor and flow setting is being done by the adjustment of the flow restrictor position. We suggest that you contact your local plumber for assistance.



## 8. ELECTRICAL CONNECTION

### Electrical connection

The electrical connection of the substation must be performed by a qualified and authorised electrician in compliance with all applicable rules and regulations.

The station should be connected to a 230 V AC power supply.

The power supply / connection must be carried out in accordance with the applicable regulations and instructions.

The station must be wired and connected to an external main switch so that it can be disconnected during maintenance, cleaning and repairs or in the event of an emergency.

**Do not forget** to establish potential equalization.

The Se-Solo HWP are delivered with Danfoss ECL Comfort 310 controllers from factory.

The actuator and sensors are mounted in the station. The controller is built into the console at the top of the station.

The station is wired and tested in the factory.

Electrical connections between the controller, pump(s), sensor and actuator(s) are made.

### Mounting of outdoor temperature sensor (ESMT)

The outdoor temperature sensor is delivered separately and must be mounted on site according to the enclosed illustrations.

The outdoor sensor is always to be mounted on the coldest side of the property, where it is less likely exposed to direct sunshine (normally the north side of the property).

The sensor must not be exposed to the morning sun, and should not be placed above windows, doors, air vents or other heat sources, and not under balconies and roof eaves.

Mounting height approx. 2.5 m above ground.

Temperature range: -50 to 50° C.

### Electrical connections

The cables can be connected to the sensor in any order.

Connection cable: 2 x 0.4 - 1.5 mm<sup>2</sup>

For ECL 310:

Connect the cable ends to ECL controller in common ground terminal and in terminal 29.

### Access to ECL base part

Access to the base part for connection of outdoor sensor or the like is obtained by pulling the lock (pin) down with a screwdriver until a yellow line is visible on the lock. Then, the front piece can easily be removed. Lock by pressing the lock (pin) up.

### Controller ECL Comfort 310

Supply voltage:	230 V a.c. - 50 Hz
Voltage range:	207 to 244 V a.c. (IEC 60038)
Power consumption:	5 VA
Load on relay outputs:	4(2) A - 230 V a.c
Load on triac outputs:	0,2 A - 230 V a.c.

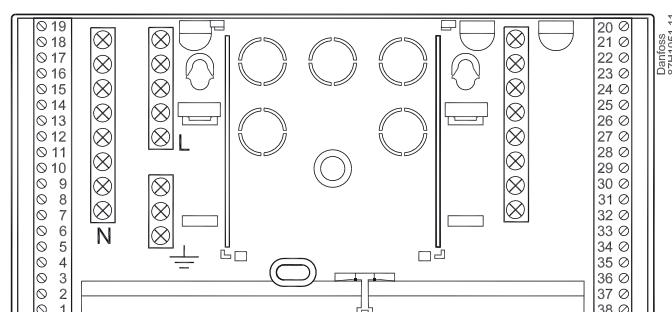
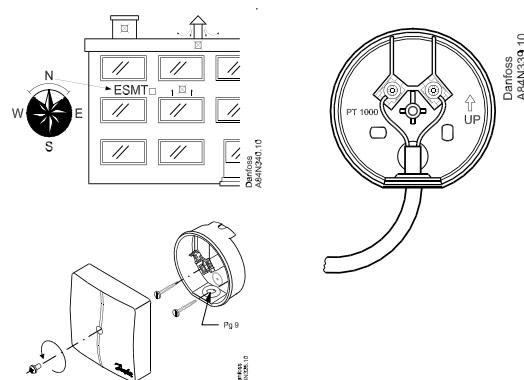
### Actuator AMV 150 / AMV 13

Supply voltage:	230 V a.c. - 50 Hz
Power consumption:	2 / 8 VA
For further information please see enclosed instruction manual.	

### Pumpe UPM3 AUTO

Supply voltage:	230 V a.c. - 50 Hz
Protection class:	IP44
Power consumption:	Max. 52 Watt

For further information please refer to the enclosed instructions for the circulation pumps.



## 9. HEATING CIRCUIT, DANFOSS ECL 310 AUTOMATICS

### Weather-compensated control of the heating circuit

#### Danfoss ECL 310

The temperature for the heating circuit is controlled electronically by the Danfoss ECL controller. The supply temperature is calculated by the controller on basis of the outdoor temperature.

The ECL Comfort controller is loaded with a selected application by means of an ECL Application Key (Plug-&-Play). The Application Key contains information about application, languages and factory settings. Various applications can be loaded by means of the ECL Application Key, and it is possible to update the controller with new application software.

The controller is factory preset to turn off the heating automatically in the summer period. The controller settings can be changed in accordance with the enclosed producer instructions for the mounted controller.

The controller is pre-programmed (normally) with the following factory settings:

- Language = English,
- Operating mode of the controller = Comfort "Sun" Symbol,
- Application type = A230

Motor speed and motor protection is set and the controller is functional is functionally tested, so it's ready for use.

#### Start-up of ECL 310 (easy start-up)

When the outside temperature sensor is properly installed and electrically connected to the controller as described in the instructions on page 15, proceed as follows:

1. Connect the controller and switch it on,
2. Choose 'MENU' in any circuit - Confirm and turn the dial and choose 'Common controller settings' in the circuit selector at the top right corner in the display.  
(You navigate in the controller by turning the dial left or right to the desired position. The position indicator in the display ( ) will always show you where you are).
3. Turn dial to select time and date,  
Push the dial to confirm the selection
4. Select time and date,
5. The controller is now ready for use. Set heat curve and temp. max. according to the procedure described below.

#### Setting / change of factory settings:

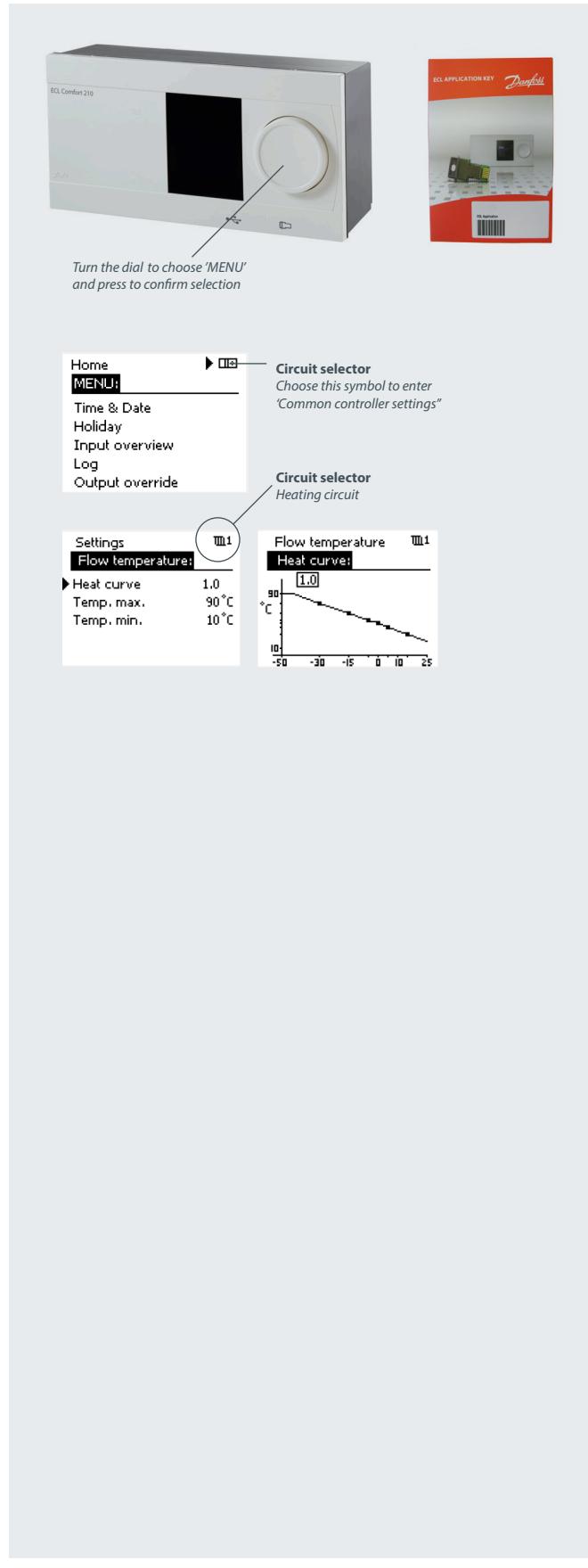
6. Choose 'MENU' in any circuit - Confirm and turn the dial and choose 'Heating circuit' in the circuit selector at the top right corner in the display (radiator symbol),
7. Then turn the dial and choose 'Settings' and confirm by pushing the dial. Then choose 'Flow temperature' and here you set 'Heat curve' (value), according to the actual system type, including "Temp. max.",
8. Typical setting ranges:

Heating circuit	one-string	two-string	Floor heating
Temp. max.	70-90°C	55-65°C	35-40°C
Heat curve	1,0 - 1,75	0,8 - 1,0	0,1 - 0,5

**Note:** in systems that feature only floor heating the max. supply temperature must be changed according to the above mentioned information.

If increased heat demand occurs during the heating period, the controller settings can be changed

[See ECL Application Key Box with ECL Comfort 210/310 user guide and mounting guide, for further information.](#)



## 10. CONTROL OF HEATING CIRCUIT

For controlling the heating circuit the Se-Solo HWP is supplied with a Danfoss AMV 150 or AMV 13 actuator and a Danfoss two-way motorized control valve VS 2, placed on the primary return flow line. The AMV actuator is electrically wired to the controller from factory.

The actuator has undergone a functional test and is preset from factory.

### AMV 150

In the event of operating disturbances the AMV 150 actuator can be shut off manually by turning the manual override knob on top of the actuator clockwise. Please note that the knob can be "tight" to turn.

### AMV 13

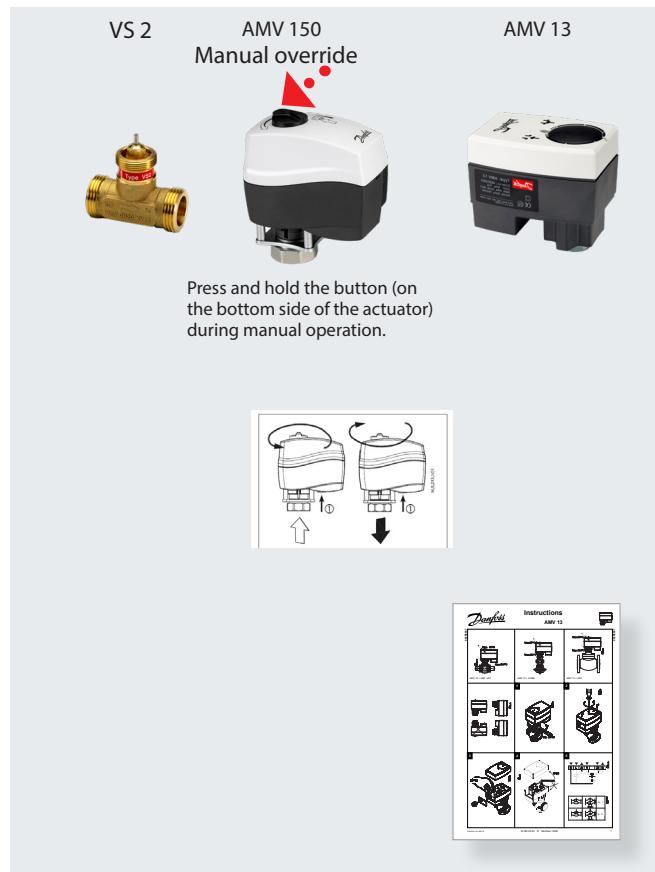
Depending on the selected setting of the safety function, the AMV 13 valve is fully opened or closed when the voltage supply is switched off.

**For additional information see manuals for:**

**Electronic Actuator AMV 150**

**Electronic Actuator AMV 13**

**Danfoss Valve VS 2**



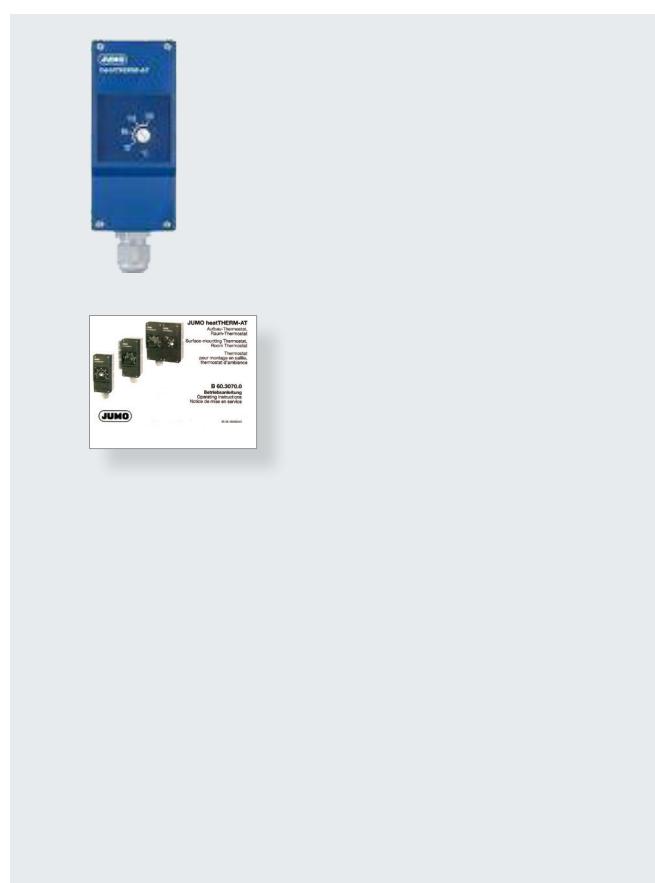
### Safety function, Jumo AT

The heating circuit(s) can be supplied with a safety thermostat Jumo AT for protection against overheating.

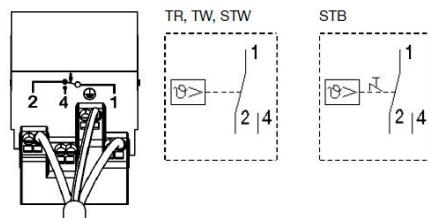
From factory the Jumo AT safety thermostat is pre-wired to the Danfoss ECL controller with a 2 m cable, enabling the thermostat housing to be mounted in any mounting position on the household piping (HE supply) on site.

**For additional information see the enclosed manuals for:**

**Jumo AT**



### Wiring diagrams



## 11. HEATING CIRCUIT, PUMP

### Grundfos Pump UPM3 AUTO

Grundfos UPM3 Auto has 12 optional settings, which can be selected with the push-button. **See fig. 1 - User interface.**

The pump is set from factory to Proportionaldruck Pressure 2.

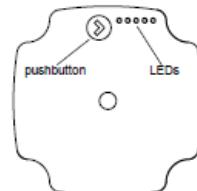


Abb. 1. Bedienfeld mit einer Drucktaste und fünf LED's



The user interface shows:

- \* performance view (during operation)
  - operation status
  - alarm status
- \* settings view (after pressing the button)

During operation, the display shows the performance of the pump. By pressing the button, the display changes status or you can change settings.

The LEDs show the power consumption for the pump. When the pump is running, LED 1 is green. The four yellow LEDs indicate the current power consumption.

**See fig. 2 - Performance view.**

Fig. 2. Performance view

Performance % of $P_1$ max.						
0% (standby)	●					
0 - 25%	●	●				
25 - 50%	●	●	●			
50 - 75%	●	●	●	●		
75 - 100 %	●	●	●	●	●	

## 11. HEATING CIRCUIT, PUMP

Check the pump setting by pressing the button once (one constant pressure). The LEDs will briefly (2 sec.) show the pump setting before changing back to showing the power consumption.

See fig. 3 - Pump setting view.

If the pump setting does not give the desired distribution of heat in the rooms of the house, change the pump setting.

See fig. 3 - Pump setting view.

Before starting the setting, make clear what the display should show for the new setting (see fig. 3).

To change the pump setting, choose the setting you want (see fig. 3), press the button down for more than 2 seconds (less than 10) and the pump switches to setting selection, the LEDs start flashing and display the current setting. Then press the button until the LEDs shows the desired setting. The LEDs flash and when they stop the new setting is saved. The LEDs return to show power consumption.

**Please note** that if the LEDs do not flash after 2 seconds, possibly the pump setting is locked. To unlock, press the button down for more than 10 seconds. LEDs will flash and the pump is unlocked. To lock the pump, repeat the procedure.

For more information, see enclosed Grundfos instructions.



Fig. 3. Pump setting view

Funktion	Application	Pump mode			
		1	2	3	4
PROPORTIONAL PRESSURE AUTO ADAPT	- Two-pipe systems	●			
CONSTANT PRESSURE AUTO ADAPT	- One-pipe systems - Floor heating		●		
PROPORTIONAL PRESSURE 1	- Two-pipe systems <i>small systems</i>	●		●	
PROPORTIONAL PRESSURE 2	- Two-pipe systems <i>middle-sized system</i>	●		●	●
PROPORTIONAL PRESSURE 3	- Two-pipe systems <i>large systems</i>	●		●	●
CONSTANT PRESSURE 1	- One-pipe systems - Floor heating <i>small systems</i>		●	●	
CONSTANT PRESSURE 2	- One-pipe systems - Floor heating <i>middle-sized systems</i>		●	●	●
CONSTANT PRESSURE 3 - MAX.	- Floor heating - One-pipe systems <i>large systems</i>		●	●	●
CONSTANT CURVE 1	- One-pipe systems - Charging systems <i>small systems</i>			●	
CONSTANT CURVE 2	- One-pipe systems - Charging systems <i>middle-sized systems</i>			●	●
CONSTANT CURVE 3 - MAX.	- One-pipe systems - Charging systems - Venting of installation <i>large systems</i>			●	●



### Alarm status

In case the 1st LED is red the pump has detected one or more alarms.

See fig. 4 - Alarm status.

When there is no active alarm anymore the user interface switches back to operation mode shortly and then showing power consumption.

Fig. 4. Alarm status

Function					
Blocked	●				●
Supply voltage low	●			●	
Electrical error	●		●		

## 12. DOMESTIC HOT WATER

### General information

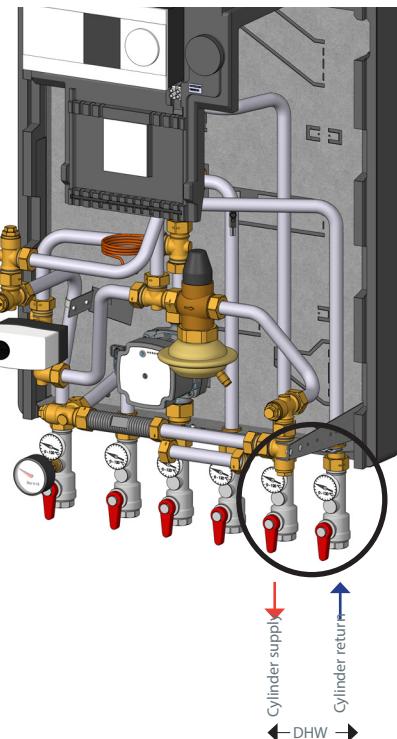
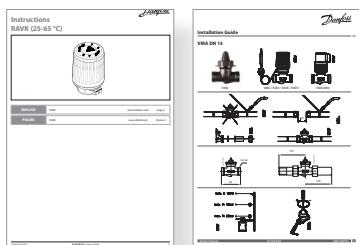
*PLEASE NOTE! Some models may have a slightly different appearance, but the control function is in principle the same as described below.*

#### General

The **Se Solo HWP** is supplied with connection pipes for cylinder on the primary side.

Please note that domestic hot water cylinder control is not included in the standard delivery.

For temperature regulation of the DHW cylinder the **Se Solo HWP** can, as an option, be equipped with a **RAVK self-acting thermostat** and a **2-way valve VMA** - for installation outside the system. The controller closes when the temperature rises.



## 13. MAINTENANCE

### Maintenance work

Is only to be carried out by qualified and authorised personnel.

### Maintenance

The substation requires little monitoring, apart from routine checks and cleaning of strainers. To ensure the best operating conditions regular inspection of the substation and a check of all relevant operating parameters are recommended, for example in connection with meter reading.



### Inspection

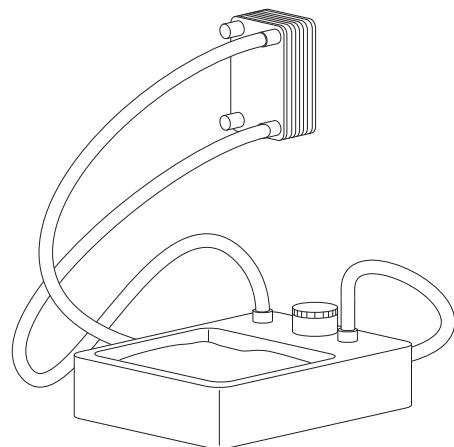
The unit should be checked regularly by authorised personnel. Any necessary maintenance must be performed in accordance with the instructions in this manual and other sets of instructions. During service the dirt strainers are to be cleaned – including the filter on the controller, all pipe connections must be tightened and the safety valve must be function tested by turning the lever.

### Meter reading

We recommend that you read your meter regularly and that you write down the meter read.

### Cooling / Return temperature reading

The cooling, i.e. the temperature difference between district heating supply and district heating return is of great importance for the total heat economy. It is therefore very important to observe the supply and return temperatures.



### Cleaning

All strainers should be checked and cleaned at least once every year, typically in connection with start-up of the heating system.

### Tightening of connections

All threaded and flanged connections should be checked and tightened in connection with meter reading. All threaded and flanged connections should be tightened regularly and especially in connection with start-up after the summer period.

### Venting of system

Always vent the radiators and the substation before the heating season.

### Strainer

Strainers should frequently be cleaned from sediments by authorized personnel, according to producer's instructions and dependent on the substation's operating conditions.



#### Please note

Use of other types of packaging, than the ones, with which the unit is delivered, will lead to the loss of warranty.

## 14. TROUBLESHOOTING HE

### Fundamental

In the event of disruptions to operation, you should fundamentally - before commencing the actual troubleshooting - check whether:

- the substation is connected to electricity.
- the dirt strainer in the district heating supply pipe is clean
- the district heating supply temperature is at its 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. Ask your district heating plant, if in doubt.
- there is pressure on the system.

Problem	Possible cause	Solution
No heat	Strainer clogged in DH or HE circuit (radiator circuit).	Clean strainer(s).
	The filter in the energy meter on DH circuit clogged.	Clean the filter (after consulting the DH plant operator).
	Defective or improperly adjusted differential pressure controller	Check the operation of the differential pressure controller – clean the valve seat if required.
	Defective actuator	Check the functioning of the actuator.
	2-way control valve defective or possibly dirt in the valve housing	Check the functioning of the valve - clean valve seat if required.
	Automatic controls wrongly set or defective - possibly power failure.	Check if the setting of the controller is correct – see separate instructions. Check the power supply.
	Pump out of operation.	Check if the pump is receiving power and that it turns. Check if there is air trapped in the pump housing – see pump manual.
Uneven heat distribution.	The pump is set at too low speed of rotation.	Set the pump at higher speed of rotation.
	Air pockets in the system.	Vent the installation thoroughly.
DH supply temperature too high.	Air pockets in the system.	Vent the installation thoroughly.
	Wrong setting of automatic controls.	Adjust automatic controls, see instructions for automatic controls.
	Defective controller. The controller does not react as it should according to the instructions.	Call in automatic controls manufacturer or replace controller.
DH supply temperature too low.	Wrong setting of automatic controls.	Adjust automatic controls - see instructions for automatic controls.
	Defective controller. The controller does not react as it should according to the instructions.	Call in automatic controls manufacturer or replace controller.
	Wrong placement / fitting of outdoor temperature sensor.	Place / fit outdoor temperature sensor correctly.
	Strainer clogged.	Clean strainer(s).

## 14. TROUBLESHOOTING HE

Poor cooling	Too small heating surface/too small radiators compared to the total heating requirement of the building.	Increase total heating surface.
	Poor utilization of existing heating surface.	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. It is extremely important to keep the supply temperature to the radiators as low as possible, while maintaining a reasonable level of comfort.
	The system is single pipe loop.	It is extremely important to keep the supply temperature to the radiators as low as possible, while maintaining a reasonable level of comfort.

	<b>Disposal</b> This product should be dismantled and its components sorted, if possible, in various groups before recycling or disposal. Always follow the local disposal regulations.
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## 15. COMMISSIONING CERTIFICATE

The substation is the direct link between the district heating supply network and the household piping system. All supply pipes and the pipes in the household piping system must be checked and rinsed before commissioning. Once the system has been filled with water, all pipe connections must be retightened before performing pressure test for leaks. The dirt strainers must be cleaned and the substation must be adjusted in accordance with the instructions in this manual.

It is important to comply with all technical regulations and the applicable legislation in every respect.

Installation and commissioning must only be performed by trained, authorised personnel.

The substation is checked in the factory for leaks before delivery. Leaks are however possible due to vibrations caused by transport, handling and heating of the system and therefore it is important to check all connections and to retighten if necessary before commissioning. Please note that the connections may feature EPDM gaskets! **Therefore it is important that you DO NOT OVER-TIGHTEN the connections.** Over-tightening may result in leaks. Leaks caused by over-tightening or failure to retighten connections are not covered by the warranty.

### To be filled-out by the installer

This substation has been retightened, adjusted and commissioned

on the:

Date/Year

by installer:

Company name (stamp)

## 16. GUIDELINES FOR WATER QUALITY IN DANFOSS BRAZED HEAT EXCHANGERS

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BU HEX - Local Inspection Center Kamnik Slovenia

## Guidelines for water quality in Danfoss brazed heat exchangers with plates of EN 1.4404 ~ AISI 316L

Danfoss has prepared this guideline for the water quality of tap water and district heating water used in plate heat exchangers of stainless steel (EN 1.4404 ~ AISI 316L) brazed with pure copper (Cu), copper -nickel (CuNi) or Stainless Steel (StS). It is important to point out that the water specification is not a guarantee against corrosion, but it must be considered as a tool to avoid the most critical water applications.

Parameter	Unit	Value or concentration	Plate	Brazing material		
			AISI 316L W.Nr. 1.4404	Cu	CuNi	StS
pH		< 6.0	0	-	-	0
		6.0 – 7.5	+	0/-	0	+
		7.5 – 10.5	+	+	+	+
		>10.5	+	0	0	+
Conductivity	μS/cm	<10	+	+	+	+
		10 – 500	+	+	+	+
		500 – 1000	+	0	+	+
		>1000	+	-	0	+
Free Chlorine	mg/l	<0.5	+	+	+	+
		0.5 – 1	0	+	+	+
		1 – 5	-	0	0	0
		>5	-	-	-	-
Ammonia (NH <sub>3</sub> , NH <sub>4</sub> <sup>+</sup> )	mg/l	<2	+	+	+	+
		2 – 20	+	0	0	+
		>20	+	-	-	+
Alkalinity (HCO <sub>3</sub> <sup>-</sup> )	mg/l	<60	+	+	+	+
		60 – 300	+	+	+	+
		>300	+	0	+	+
Sulphate (SO <sub>4</sub> <sup>2-</sup> )	mg/l	<100	+	+	+	+
		100 – 300	+	0/-	0	+
		>300	+	-	-	+
HCO <sub>3</sub> <sup>-</sup> / SO <sub>4</sub> <sup>2-</sup>	mg/l	>1.5	+	+	+	+
		<1.5	+	0/-	0	+
Nitrate (NO <sub>3</sub> )	mg/l	<100	+	+	+	+
		>100	+	0	+	+
Manganese (Mn)	mg/l	<0.1	+	+	+	+
		>0.1	+	0	0	+
Iron (Fe)	mg/l	<0.2	+	+	+	+
		>0.2	+	0	+	+
* Hardness ratio [Ca <sup>2+</sup> , Mg <sup>2+}] / [HCO<sub>3</sub><sup>-</sup>]</sup>	/	0 – 0.3	+	-	-	+
		0.3 – 0.5	+	0/-	+	+
		>0.5	+	+	+	+

+ Good corrosion resistance

o \*\*Corrosion could happen when more parameters are evaluated with 0

o/- Risk of corrosion

- Use is not recommended

\* Hardness ration limits defined per experience and internal tests in Danfoss laboratory

\*\* In case of three or more parameters evaluated with 0 consultancy is needed with Consultant for Corrosion &amp; Microbiology or BU HHE Representative

Recommended Chloride concentration to avoid Stress Corrosion Cracking (SCC) in the stainless-steel plates:

Application temperature	Chloride concentration
at T ≤ 20°C	max 1000 mg/l
at T ≤ 50°C	max 400 mg/l
at T ≤ 80°C	max 200 mg/l
at T ≥ 100°C	max 100 mg/l









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