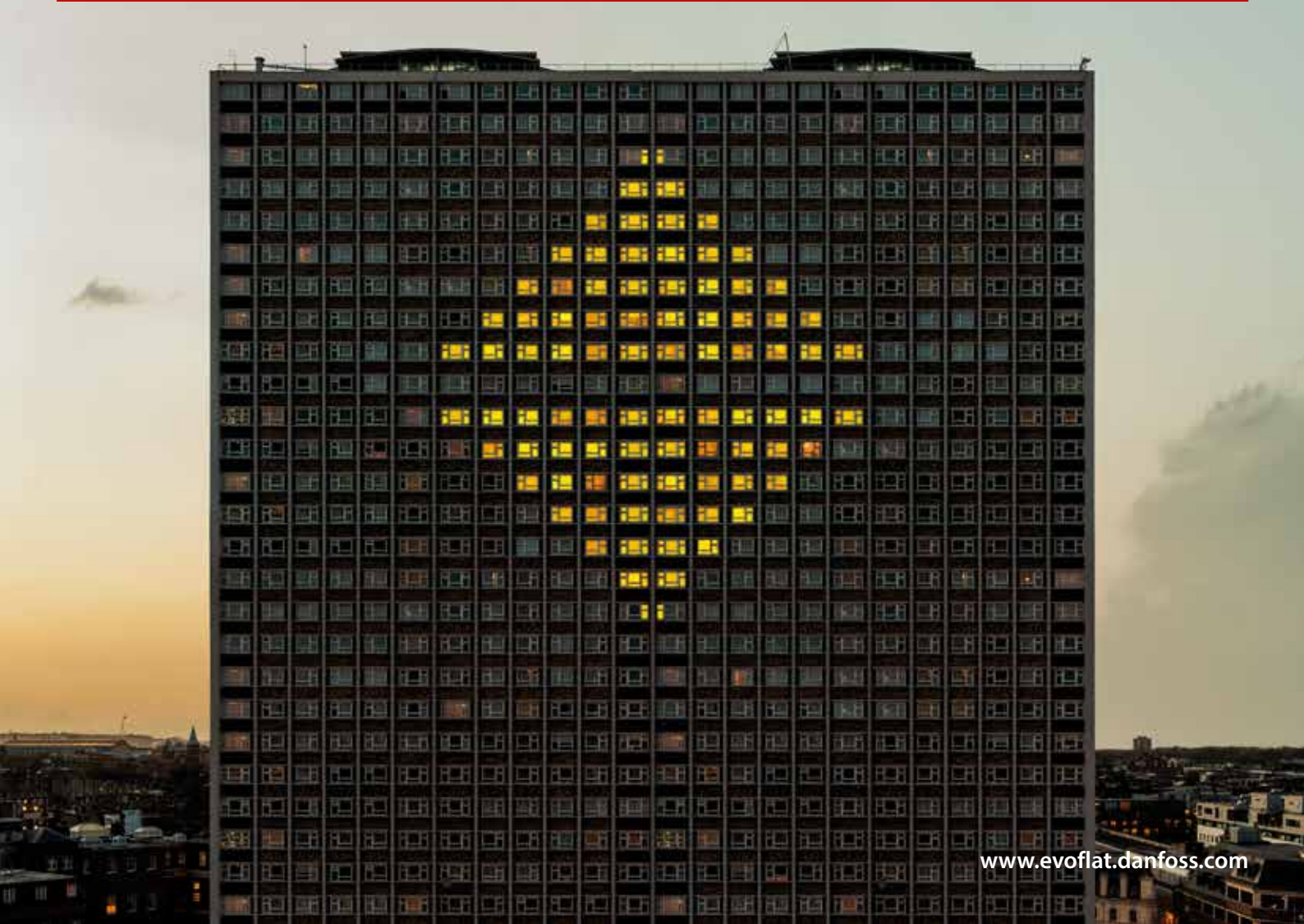
ENGINEERING
TOMORROW

Danfoss

Technical handbook | Danfoss EvoFlat systems from A-Z

Take lead on your project with an **efficient system** concept

30%
lower energy
consumption by individual metering in each apartment



www.evoflat.danfoss.com

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1. Introduction

– An innovative energy concept for residential buildings

Fully

future compatible

EvoFlat systems are compatible with virtually any kind of heat supply infrastructure, and are independent of the type of energy used.

1.1 New energy concepts for residential buildings

Refurbishment and new buildings

Energy efficiency pays off

Millions of apartments worldwide are to be renovated every year. Heat insulation on roofs and facades, new windows and doors can reduce the energy requirements of an apartment building by up to 83%*. Such a significant energy savings with possible integration of renewable energy sources require new energy concepts – for both renovations and new buildings.

Integration of renewable energy sources

Regardless of whether it is an existing building renovation or a new building, alternative energy sources require a buffer tank, which collects the heated water and distributes it to individual apartments. Every apartment has its own flat station, which as the hydraulic interface ensures that the heating water is distributed to the individual radiators in the apartment at the desired temperature. Each of these flat stations is also fitted with a fresh water system, which heats the domestic water when is needed, in a sufficient amount and, above all, hygienically safe.

Benefits for all

Decentralized heating systems in new buildings and renovation projects offer many benefits for both investor and tenant.

Building renovation and decentralized systems reduce heat losses and heating costs. They increase comfort, convenience and domestic water hygiene. At the same time separate meters in each apartment ensure more consumption transparency and better control over heating and hot water bills for the tenant. This makes the building more attractive for all concerned.

** Source: dena (German Energy Agency), 2010*

1.2 Documented benefits of EvoFlat systems

Low overall costs

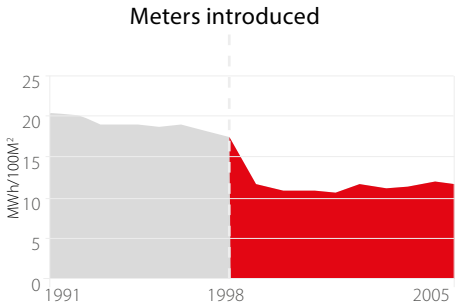
The idea behind the decentralized system for heating and domestic hot water is not new, and the advantages and benefits of opting for such systems are well documented.

The main benefits with decentralized systems include lower energy consumption as a result of individual metering, more revenue-generating space in apartment blocks and multi-family houses, and reductions in the amount of heat wasted in long pipe runs. Here are some factual numbers.

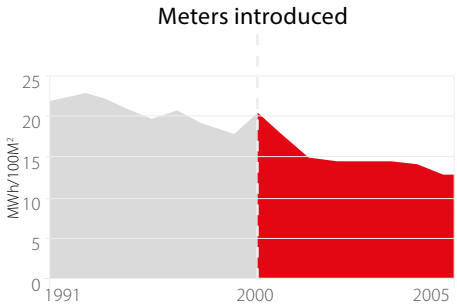
Encourage people to save on energy

When residents and tenants only pay for what they use, they tend to keep a critical eye on their energy consumption. A study carried out in Denmark in 1991-2005 examined the actual energy consumption before and after individual meters were installed.

The results clearly showed that individual metering significantly reduces energy consumption per square metre – normally by as much as 15-30%.



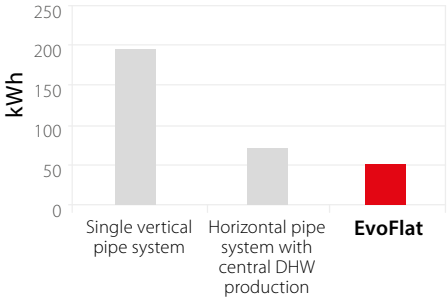
Housing association "Hyldespjældet"
Individual metering since 01.98



Housing association "Morbærhaven",
Individual metering since 01.00

Reduce energy loss

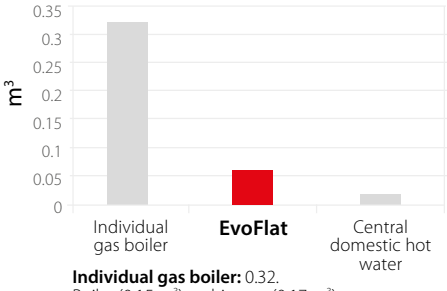
A 2008 study compared the different distribution systems available for apartment blocks and multi-family houses. The calculations were based on a 4-storey building with eight 133-square-metre apartments per storey. The figures compared a EvoFlat solution with a single vertical riser pipe system and a horizontal riser pipe system with centralized production of domestic hot water. The study showed that compared to modern centralized domestic hot water solutions, a EvoFlat solution reduces heat loss from the pipes by more than 40% and by as much as 80% compared to traditional one-pipe solutions.



Take up less space

As the name suggests, EvoFlat systems take up very little space. Compared to individual gas-fuelled boilers, which are often combined with a storage tank, a flat station takes up about 80% less space and can normally be mounted in a wall recess or small cupboard.

Admittedly, flat stations do take up a little more space than centralized systems for domestic hot water production, although they are still very unobtrusive. In return, however, they free up considerable amounts of space in basement areas.



Individual gas boiler: 0.32.
Boiler (0.15 m³) + chimney (0.17 m³)

EvoFlat: 0.062. Flat station (0.062 m³)

Central domestic hot water: 0.02.
Water meter (0.01 m³) + heat meter (0.01 m³)

* Storage tank in basement will take up significantly more space than in a EvoFlat solution

1.2.1 System comparison investments and operating costs

The purchase price is not everything

Frequently investment costs are the first consideration when planning renovation or new build. As with an iceberg, they are the immediately visible part, which, however, only account for a fraction of the overall costs that a product incurs during its entire service life.

The lifecycle costs of what appears to be a cheaper product at first glance can often be significantly higher than those of an allegedly more expensive variant. This is also demonstrated in a study by the Kulle & Hofstetter partnership, which was compiled for Stadtwerke München, and with which the central systems for heating and hot water production were compared with decentralized systems.

Central and decentralized systems comparison

The below example for renovation of 50 apartments shows that the initial investment costs for a traditional central heating system with central domestic water heating are lower than the investments for corresponding decentralized systems.

The 30% higher investment costs for the decentralized system with decentralized DHW production pays themselves back within approx. 9 years due to the 70% lower energy consumption costs. This even without considering future price increases for energy and fossil fuels.

Renovation cost effectiveness analysis

Renovation of 50 apartments			**Variant 1** Electrical DHW boiler in apartment Central heating	**Variant 2** Central DHW Central heating	**Variant 3** Decentralized DHW Central heating + buffer tank
1.	**Investment and capital costs**				
1.1	Investment costs	€	0,00	45.596,00	63.867,00
1.2	Capital dependant costs	€ / a	0,00	3.257,70	5.461,48
	Relation to Variant 1	%	0,00	100,00	167,65
2.	**Consumption related costs**				
2.1	Heat loss	€ / a	1.608,14	3.013,23	2.168,33
2.2	Utility heat District heating	€ / a		8.012,93	8.012,93
2.3	Electricity costs (circulation pumps)	€ / a		104,09	119,32
2.4	Tariff change	€ / a	1.146,00		
2.5	El. boiler useful heat	€ / a	15.377,33		
	Total		18.131,47	11.130,25	10.300,58
	Relation to Variant 1	%	100,00	61,39	56,81
3.	**Operation related costs**	€			
3.1	Maintenance	€ / a	4.500,00	1.080,00	1.170,00
	Total	€ / a	4.500,00	1.080,00	1.170,00
	Relation to Variant 1	%	100,00	24,00	26,00
4.	**Annual costs**	€ / a	22.631,47	15.467,95	16.932,06
	Relation to Variant 1	%	100,00	68,35	74,82

(Source: Kulle & Hofstetter, Stadtwerke München, 2011)

Central versus decentralized domestic hot water production

The renovation study compares the lifecycle costs of an existing hot water production with electrical water heaters in every apartment with a central hot water production and a decentralized hot water production.

Both the central and the decentralized domestic hot water production demonstrate such major benefits with the lower consumption and operating costs alone, that their investment is already paid back within approx. 3 years.

The future price increases for fossil fuels were not yet considered here either.

New building cost effectiveness analysis

50 apartments – new building			**Variant 1** Electrical DHW boiler in apartment Central heating	**Variant 2** Central DHW Central heating	**Variant 3** Decentralized DHW Central heating + buffer storage
1.	**Investment and capital costs**				
1.1	Investment costs	€	67.334,00	85.505,00	72.291,00
1.2	Capital-dependent costs	€ / a	4.865,83	7.062,68	6.277,80
	Relation to Variant 1	%	100,00	145,18	129,02
2.	**Consumption related costs**	€			
2.1	Heat loss	€ / a	3.012,81	2.168,03	745,42
2.2	Energy costs Circulation pumps	€ / a	253,99	177,18	164,03
	Total	€ / a	3.266,80	2.345,21	909,45
	Relation to Variant 1	%	100,00	71,79	27,84
3.	**Operation related costs**	€			
3.1	Maintenance	€ / a	1.080,00	1.170,00	1.170,00
	Total	€ / a	1.080,00	1.170,00	1.170,00
	Relation to Variant 1	%	100,00	108,33	108,33
4.	**Annual costs**	€ / a	9.212,62	10.577,89	8.357,25
	Relation to Variant 1	%	100,00	114,82	90,72

(Source: Kulle & Hofstetter, Stadtwerke München, 2011)

1.3 Domestic hot water: hygiene and high comfort

Water is essential to life

After air, water is our most important essential. Legislators set very high requirements for domestic water systems and their operators to protect the consumers.

They therefore pass the responsibility for the domestic water quality through different drinking water directives on to the manufacturers and operators of installations and systems for domestic water heating and distribution.

Legionella bacteria

Thermal disinfection is a proven method for hygienically safe domestic water heating. The domestic water is heated over a longer period to a temperature of more than 60 °C, which prevents any Legionella bacteria to grow in domestic hot water.

The hot water circulation must also be submitted to the same. When the entire distribution system for domestic hot water has been regularly rinsed and hydronicly balanced, all domestic water regulations have been met.

The disadvantage of central domestic water heating with thermal disinfection is enormous heat loss, which escapes when transporting domestic hot water from the point of heating to the individual tap points.

The decentralized domestic water heating has the advantage that water is only heated when it is actually needed – and in the required amount. Storage is not required, nor are long transport pipes with enormous heat losses.

As the „fresh" water system is directly in the respective apartment, the supply pipes are so short that complies with DVGW 3-liter (German) regulation. This means: The volume of the heating water pipe between the water heating point and the consumer is less than 3 liters.

In the case of flat stations, the heating water pipes are regularly rinsed and the domestic hot water is completely replaced, which means practically no Legionella bacteria growth is possible.

High domestic hot water comfort
Flat stations are built in the way that always provides a warm water start: when the hot tap is open, hot water starts to be produced, just the right temperature and as much as you need.

If you have several taps, at the same time you will get the desired amount of warm water and temperatures on all of them.

In that way, EvoFlat flat stations always give users the maximum comfort of hot water!

2. Why decide for the EvoFlat system?

2.1 From traditional central heating...

Energy efficient and individually controlled

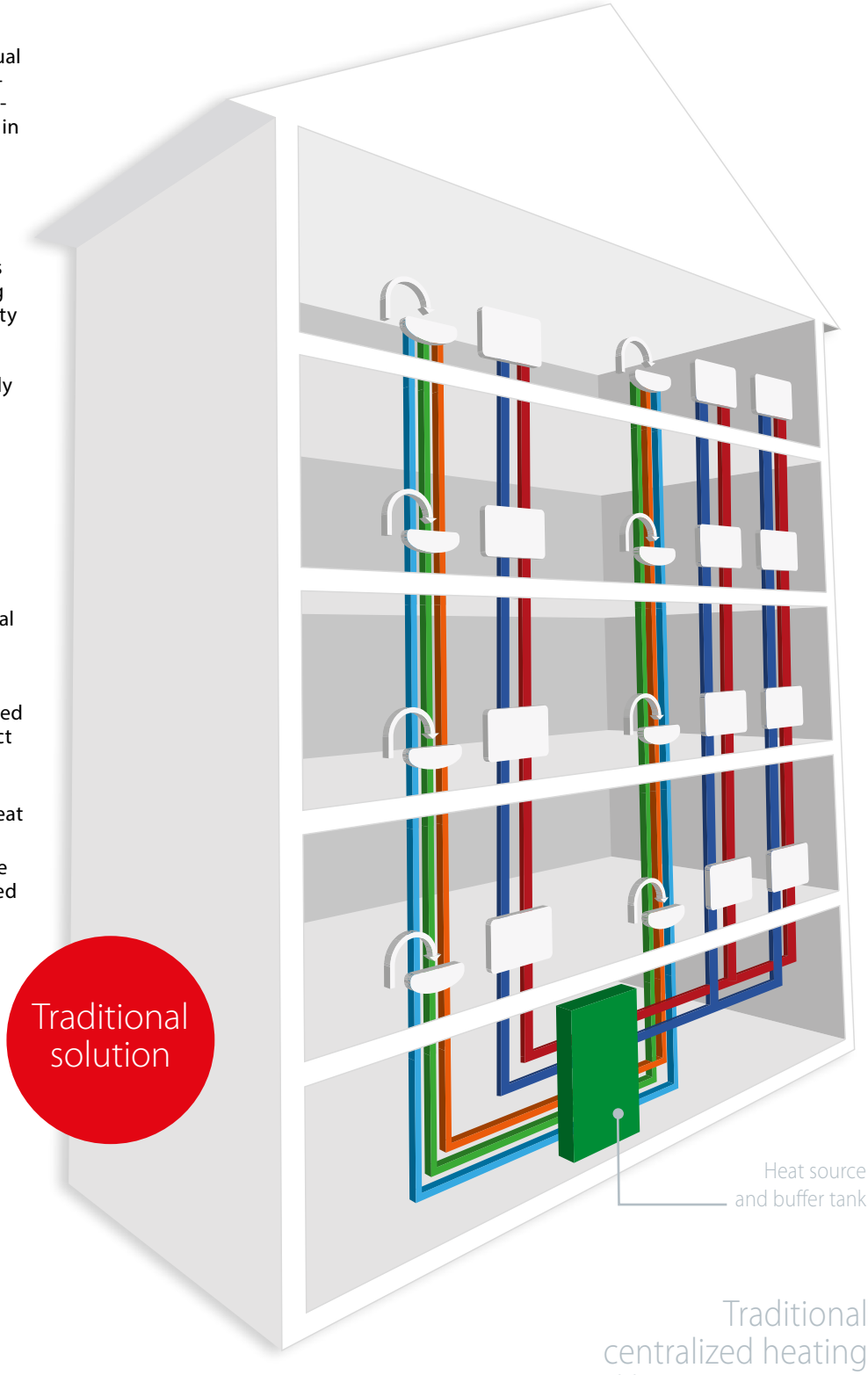
A EvoFlat system consists of flat stations installed in each individual apartment with 3 central ascending pipes, supplied from one central heat source typically located in the basement.

The EvoFlat system can be connected with a buffer tank to any heat source in the building. Thus any changes and modernizations of the heat supply in the building will have no effect on functionality of flat stations.

A flat station include an extremely compact heat exchanger with a pressure controlled flow proportional controller, which delivers domestic hot water immediately, and a differential pressure controller for the heat supply of the individual radiators.

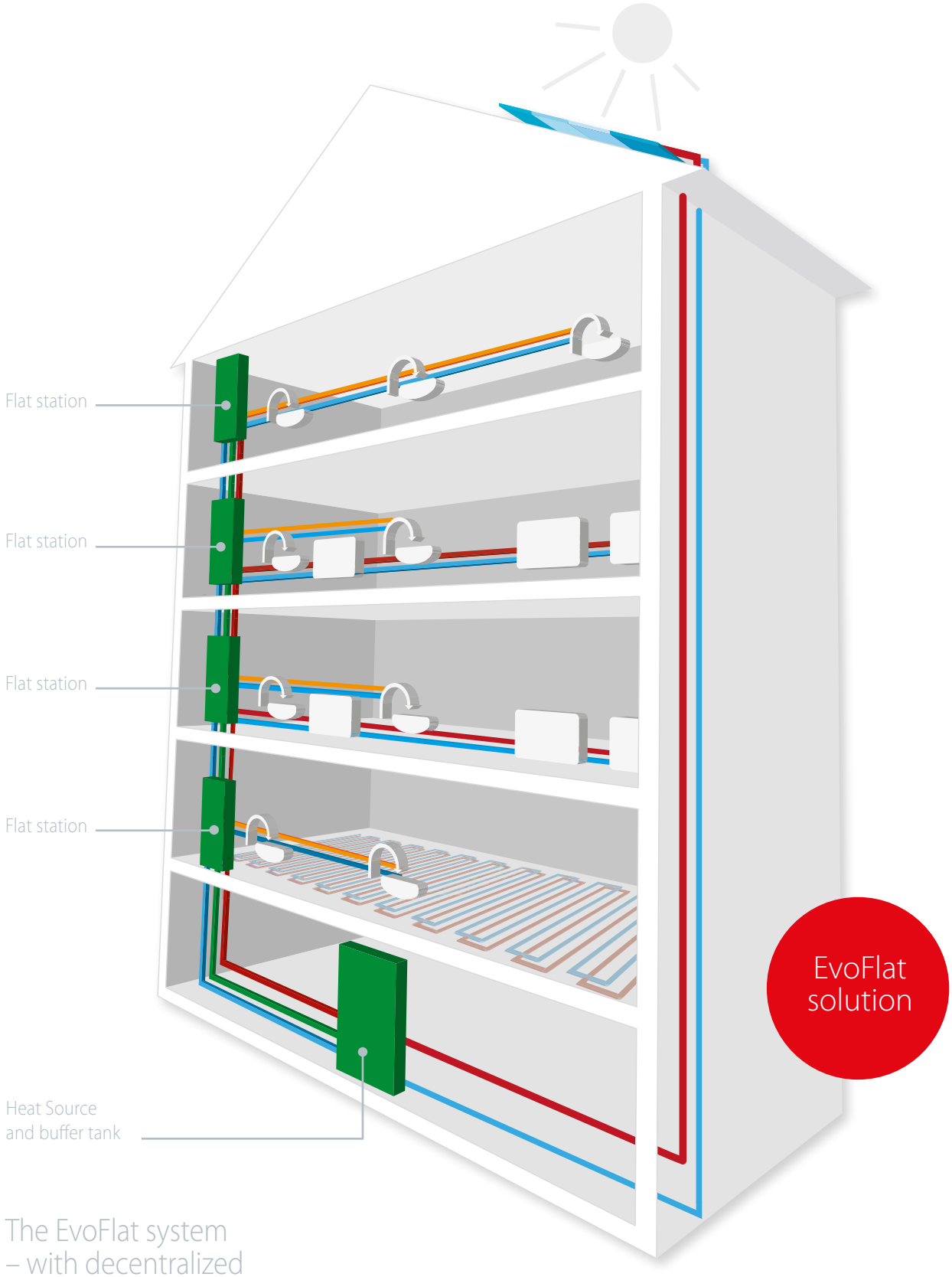
EvoFlat systems are the modern replacement for traditional central heating and hot water systems, such as:

- Central heating systems with central DHW production, fuelled by oil and gas boilers or district heating.
- Gas-fired boilers installed in each apartment to produce heat and domestic hot water.
- Electrical heaters, whereby the domestic hot water is produced by small electrical heaters in each apartment.



Traditional centralized heating and hot water system

... to modern decentralized solutions



The EvoFlat system
– with decentralized
heating and domestic hot water

2.2 Comparison with traditional central and decentralized heating systems

System comparison and benefits over individual gas and electrical heaters

There are numerous options when selecting an energy concept for heating and domestic water heating in new buildings and existing renovations. Every system has its advantages and disadvantages.

Despite the dangers posed by Legionella bacteria growth, central systems for domestic water heating with integrated thermal disinfection are only rarely to be found in large apartment blocks. This has also been considered in the following list, as have some other things that are often lacking in existing buildings.

Parameter	EvoFlat system with flat stations	Individual gas boiler	Decentralized domestic hot water	Centralized boiler and domestic hot water	Solar-powered domestic hot water
Individual metering and billing	✓	✓	÷	÷	÷
Efficient exploitation of heat energy	✓	÷	÷	÷	✓
Eliminate risk of bacteria growth	✓	✓	✓	÷	÷
Individual comfort	✓	÷	÷	✓	✓
Full flexibility of heat source	✓	÷	÷	✓	÷
Space-saving system installation	✓	÷	÷	÷	÷
Reduced service requirements	✓	÷	÷	÷	÷
Installation safety and convenience	✓	÷	✓	✓	✓
Reduced complexity of piping	✓	✓	✓	÷	÷
Shorter piping runs	✓	✓	✓	÷	÷
Individual water storage tank saving	✓	✓	✓	÷	÷
Central boiler saving	÷	✓	÷	÷	÷

2.3 Significant benefits with EvoFlat

Operating efficiency, energy and the environment

- Highest level of efficiency with central heat source compared to individual boilers
- No pollution and CO_2 emissions when connected to district heating
- Easy integration of renewable energy sources with buffer tank
- Optimum boiler operation with longer burner run times
- Lower return temperatures with low pressure loss with high efficient heat exchangers
- Higher utilization of solar and condensing systems with low return temperatures
- Less pipe loss with decentralized water heating
- No additional pump energy used with decentralized water heating
- No meter sections in the kitchen or bathroom with integrated heating and water meters in the station

Convenience and cost transparancy

- Higher heating comfort throughout entire year with continuous supply
- Higher domestic hot water comfort with „fresh" water system in every apartment
- High tapping capacity with respected flat stations sizes
- Consumption accurate billing with energy and water meters in every station
- Thrifty energy handling with water and heat consumption transparency
- Easy consumption recording and billing per residential unit with remote read out systems

Installation and commissioning

- No flow and differential pressure controllers in the distribution system
- Low space requirement with in wall and shaft installation
- Lower installation costs with 3 instead or 5 ascending pipes
- Easier hydronic balance with integrated differential pressure for DHW and heating integrated in every station
- Highly efficient heat transfer with new MicroPlate heat exchanger inside the EvoFlat station
- Step-by-step renovation in occupied flats (flat-by-flat conversion)
- 5 steps mounting make it easy to install stations just when they are needed, partial installation and operation possible

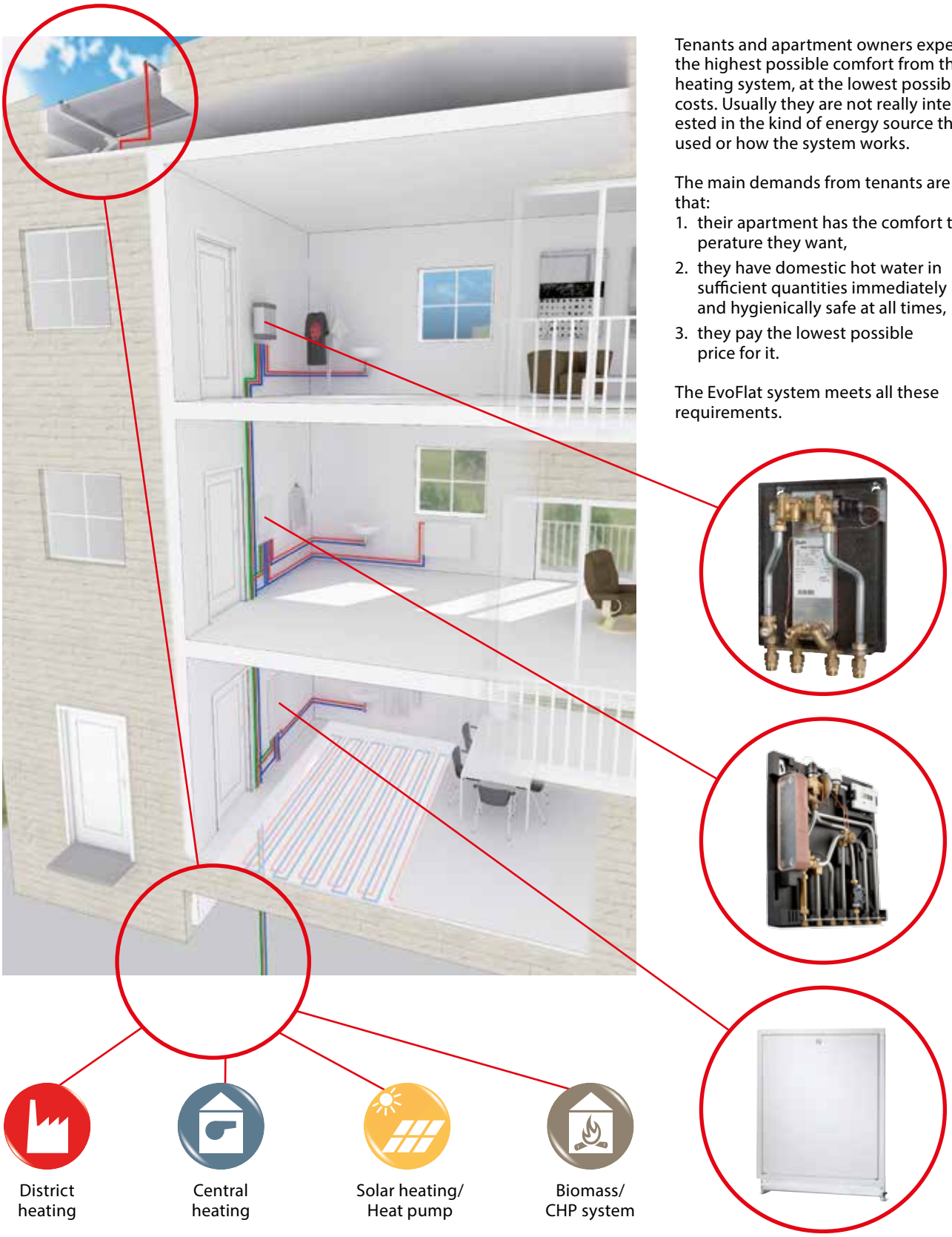
Safety and hygiene

- No open fire source in apartment (gas boiler)
- No gas leakage in apartment
- No legionella bacteria growth with decentralized, instantaneous water heating

Maintenance and service

- Just one or none (depending on source) chimney sweep visit for central heat production
- No special maintenance for decentralized flat stations needed
- Easy maintenance: fault usually only affects one system (apartment)

3. What is the EvoFlat system solution?



Tenants and apartment owners expect the highest possible comfort from their heating system, at the lowest possible costs. Usually they are not really interested in the kind of energy source that is used or how the system works.

The main demands from tenants are that:

1. their apartment has the comfort temperature they want,
2. they have domestic hot water in sufficient quantities immediately and hygienically safe at all times,
3. they pay the lowest possible price for it.

The EvoFlat system meets all these requirements.

Independent of energy source

3.1 The function of the EvoFlat station

The EvoFlat station is a complete individual heat transfer unit for domestic hot water and heating in flats as well as in single family houses. The supply system can be fuelled by all heat sources; oil, gas, district heating as well as in combination with renewable energy sources like solar, biomass and heat pumps

Individual comfort

The end-user will be able to adjust the EvoFlat station to their individual needs for comfort and each user is able to save energy and reap the rewards.

Complete solution

The EvoFlat station is equipped with all necessary components, correctly dimensioned to the individual dwelling. The station consists of three main elements: Instantaneous preparation of domestic hot water, differential pressure control of the heating and DHW system and metering of the energy consumption.

DHW preparation

The station includes a heat exchanger for instantaneous preparation of the domestic hot water. The temperature of the domestic hot water is controlled by multi functional Danfoss control valves, which ensures optimum comfort.

Heating system

A differential pressure controller is a part of all stations in order to secure correct pressure for the radiator system. The EvoFlat can also include mixing loop for lowering the supply temperature for floor heating system or a heat exchanger for separating the supply system from the individual dwellings.

Individual billing

Meter fitting pieces are a part of the station, for easy mounting of meters for measuring energy and cold water use, to give the individual customer accurate billing according to consumption.

Easy to install

The EvoFlat station is a compact combination of all needed equipment, which takes up as little space as possible. Also a complete solution ensures that all components are placed and chosen correctly. Finally the installer will save installation time and money with a prefabricated solution.

Hygiene

The EvoFlat is a very hygienic solution, because the DHW is prepared when needed close to taps and is not stored.

Examples – DHW Capacity

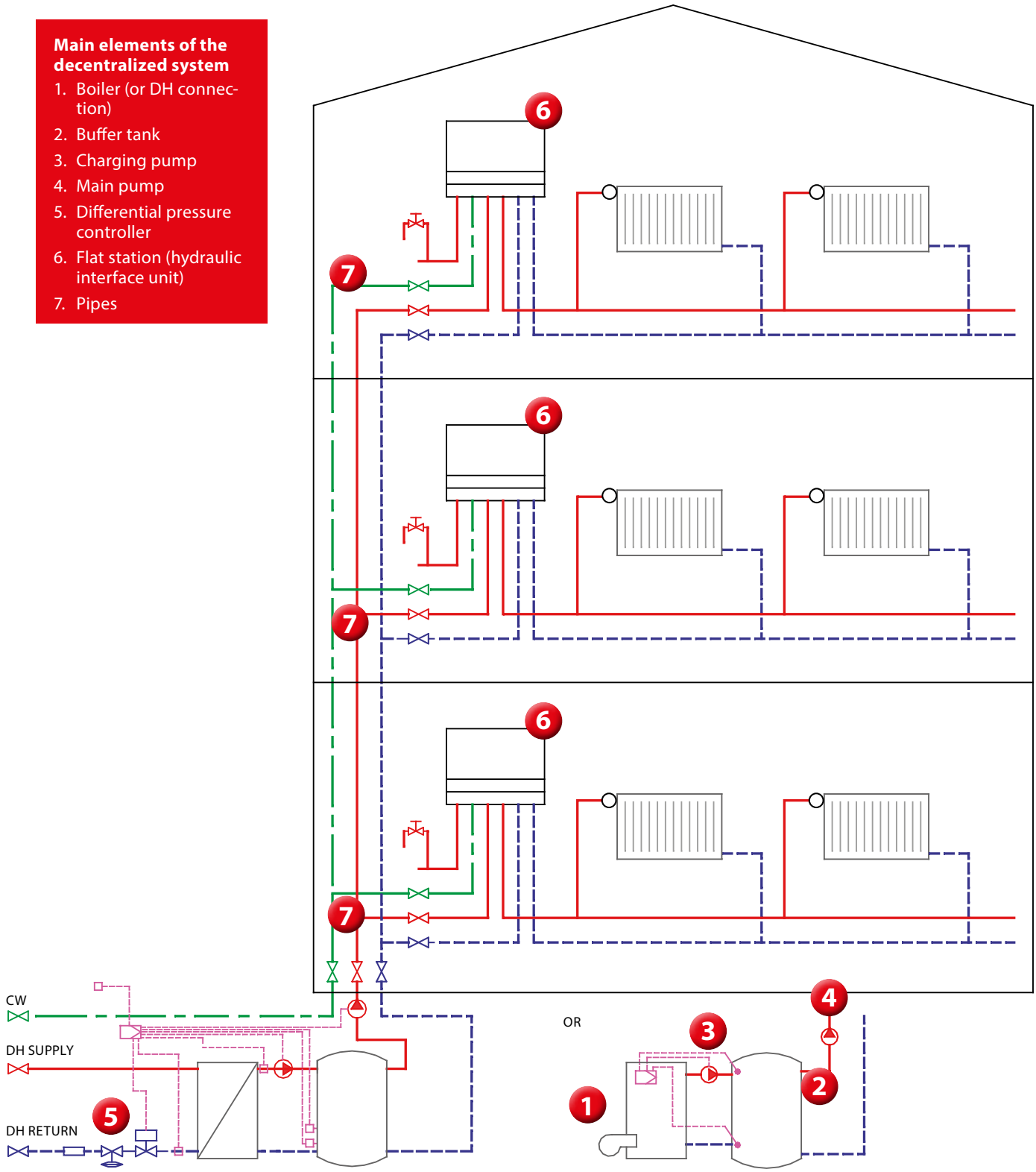
Capacity	Tapping volume 10/45 °C	Tapping volume 10/50 °C
36kW	14,8 l/min	13,0 l/min
45kW	18,4 l/min	16,2 l/min
55kW	22,51 l/min	19,8 l/min

3.2 Main elements of the decentralized system

The decentralized EvoFlat system can be designed and utilize any available energy source for heating, as stand alone or in combination.

Main elements of the decentralized system

1. Boiler (or DH connection)
2. Buffer tank
3. Charging pump
4. Main pump
5. Differential pressure controller
6. Flat station (hydraulic interface unit)
7. Pipes



3.3 Independent of the available energy source

Flat stations are open to work with all available energy sources.
The most frequently used are:

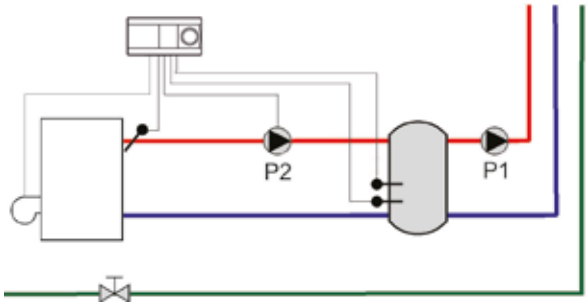
1) Oil or gas condensing boilers, solid or pellet boilers or CHP as central heat supply
2) Local and district heating connection with a central transfer station
3) Solar thermal energy with solar collectors as primary energy combined with other heat supply

All available energy sources can be combined with each other. This makes housing associations and their tenants independent and offers the option of reacting in future to energy price changes and availability, replacing old with more energy efficient technology.

Investments in heating comfort, domestic water hygiene and energy efficiency pay off very quickly for both tenants and owners due to increased real estate value and capital yield by reducing the costs.

Condensing boiler

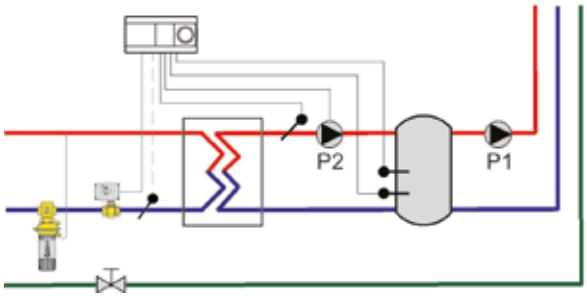
Variant 1
Gas, oil or biomass boiler



The decentralized system and the flat stations are supplied with hot water for domestic hot water and heating from oil or gas boiler in the basement. The boiler is combined with a buffer tank.
The buffer tank serves as energy storage for providing quickly required peak loads, ensures long burner run times and reliable operation of condensing boilers in economical condensation operation. It also buffers solid fuel boiler peak capacities.

Substation

Variant 2
District heating, micro networks and block heating system

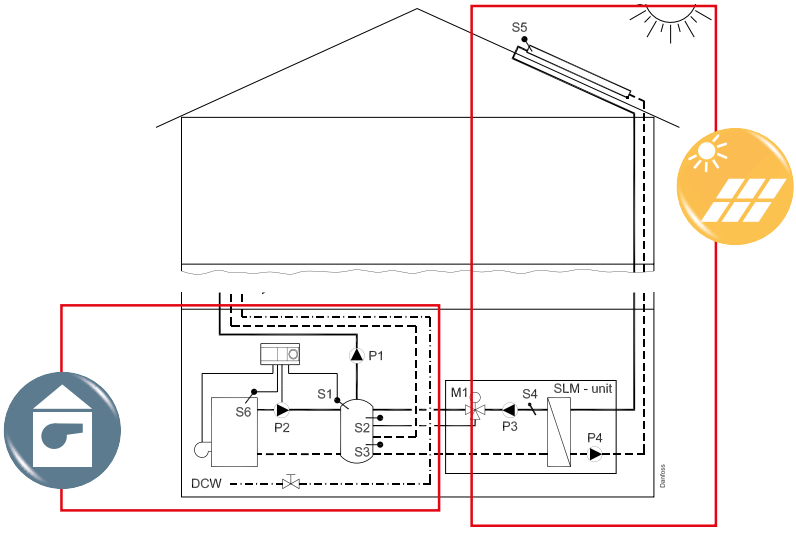


The decentralized system and the flat stations can be supplied with hot water for domestic hot water production and heating from a district heating substation in the basement.
The substation is supplied with district heating, indirectly connected and is typically combined with a buffer tank.

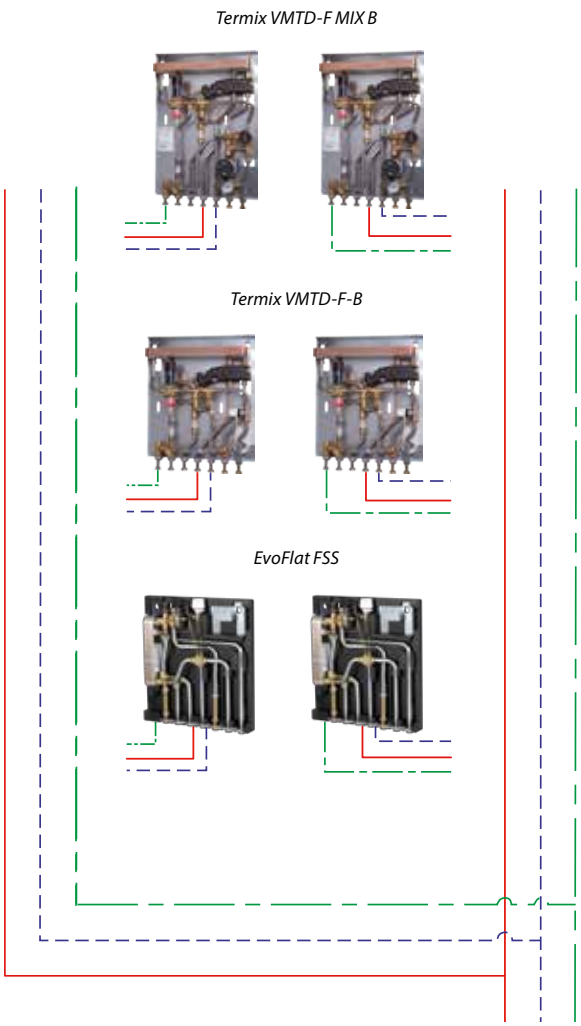
Thermal solar system

In most EU countries trends are to setting directives of renewable energies used in a specified amount with new buildings and complete renovations of heating systems. Solar thermal energy is usually the preferred choice. The seasonal difference in solar system capacity means a buffer tank is always required, and if there is not enough heat from the solar system, it can be heated with a boiler or district heating connection.

Variant 3
Combined system – thermal solar with boiler



3.4 Hydronic balancing of the EvoFlat system



Hydronic balance

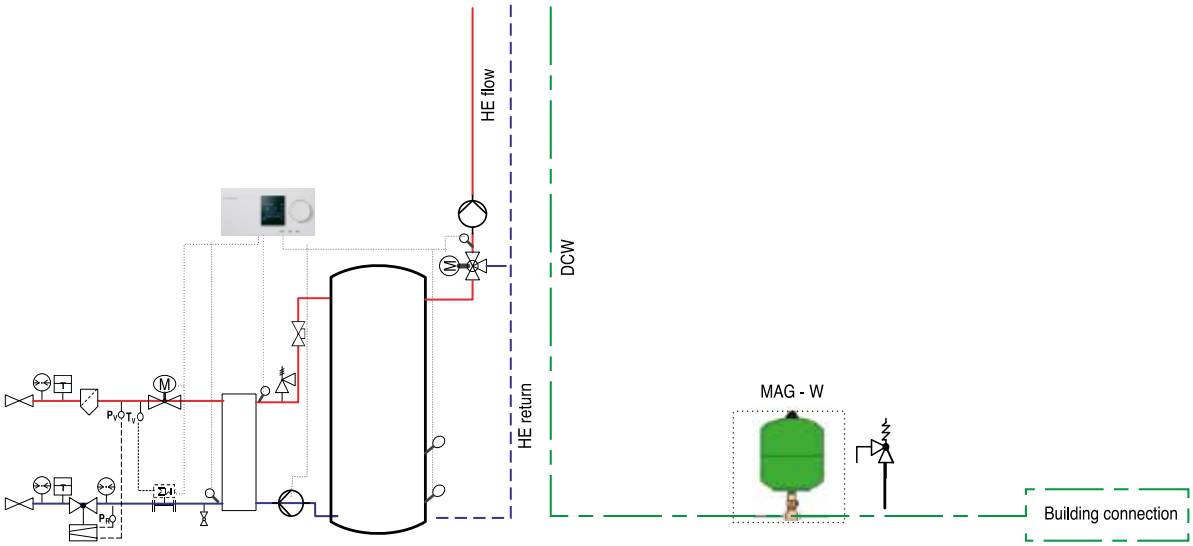
The flow volumes must be balanced so that all consumers of a heating system can be supplied equally. These resistances vary on different section lengths, elbows, valves and cross sections, which are then balanced, and the system can operate energy efficiently, reliably and quietly. The hydronic balancing of the heating water flow is performed directly on the presetting radiator valves and on the zone valve integrated into the station. Section compensation valves are then no longer required.

Domestic hot water

The maximum DHW flow rate per minute is limited by the device capacity and the selected hot water temperature. We recommend inclusion of a safety valve to compensate any possible pressure rise within the domestic hot water system.
(German technical regulations, especially those of the applicable Drinking water Directive and of DIN EN 806, DIN EN 1717 and DIN 1988 /DVGW-TRWI 1988 and DIN EN 12502, apply for connection to the domestic water supply and the performance of the entire domestic water installation.)

Complete system

The individual sections do not have to be balanced between each other. Section differential pressure controllers or section control valves are not required with EvoFlat stations. The flow rate for the heating water production is determined by the number of tapping points. The heat source flow rate is determined by considering the simultaneity factors for apartment buildings. Danfoss hot water controller in the respective flat station completely balances pressure and temperature fluctuations on the primary side with its integrated differential pressure controller, together with the temperature controller.



Hydronic balance of the apartment's heating circuit

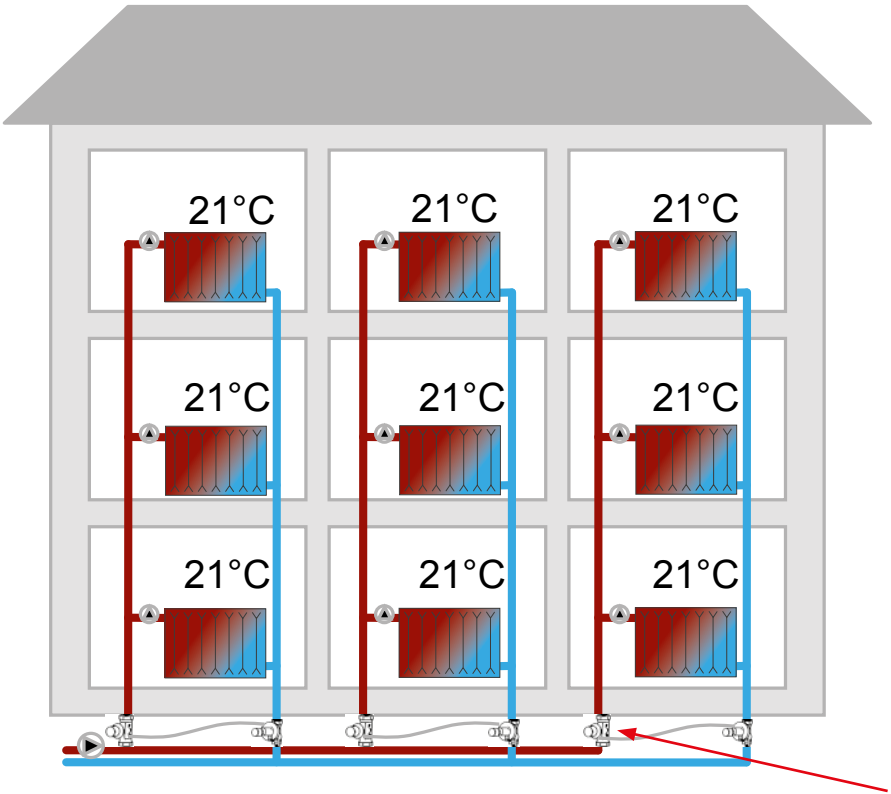
Distribution system must ensure that thermal energy is available for the consumer at all times and loads, at the right temperature and the right differential pressure.

The required differential pressure must be ensured at all relevant points of a distribution system, beginning with the energy production, right through to the least favorable radiator. Installation of a differential pressure controller in the apartment heating circuit guarantees fault free hydronic conditions.

A strong opinion, which still exists around, that a heating system can be properly balanced with section manual balancing valves and regulated pumps once again proved to be erroneous in practice.

In addition to a correctly set differential pressure controller for the apartment heating circuit, the individual radiator valves must also be correctly preset. Standard compliant differential pressures in front of the radiator valves now make flow noises a thing of the past.

The heating side connection is made without any system separation. The heating circuit supply must be fitted with a differential pressure controller to guarantee optimum pressure conditions and flows in the heating system. The room temperature is controlled with radiator thermostats. With the mounting of a thermal actuator with installed zone valve and using central manual or programmable room thermostat enables a convenient, energy optimized control of the heating.

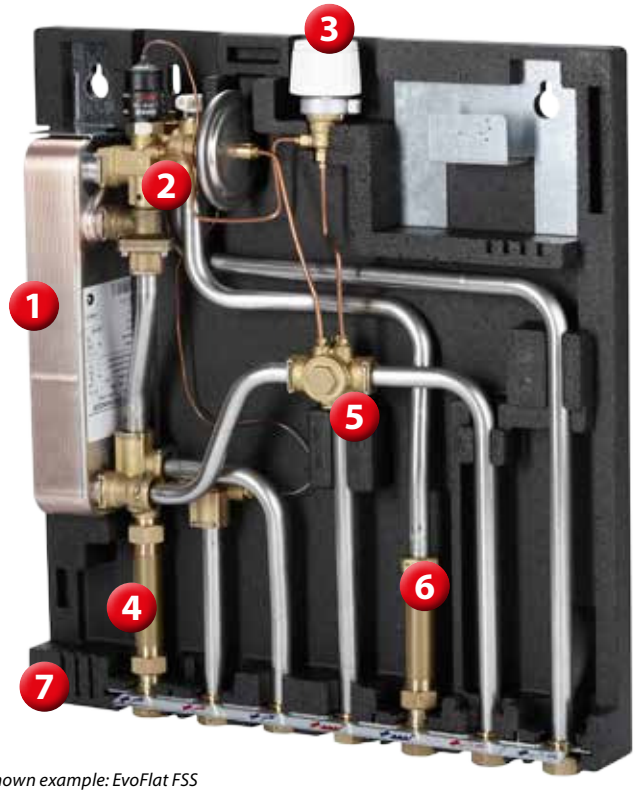


Example of well balanced heat distribution

- Proper control of flow and pressure to each flat with differential pressure controller
- proper temperature in each room secured with pre-setting valves with thermostat sensor on each radiator

Differential pressure controller is part of each flat station

3.5 Design, key components and features of a flat station



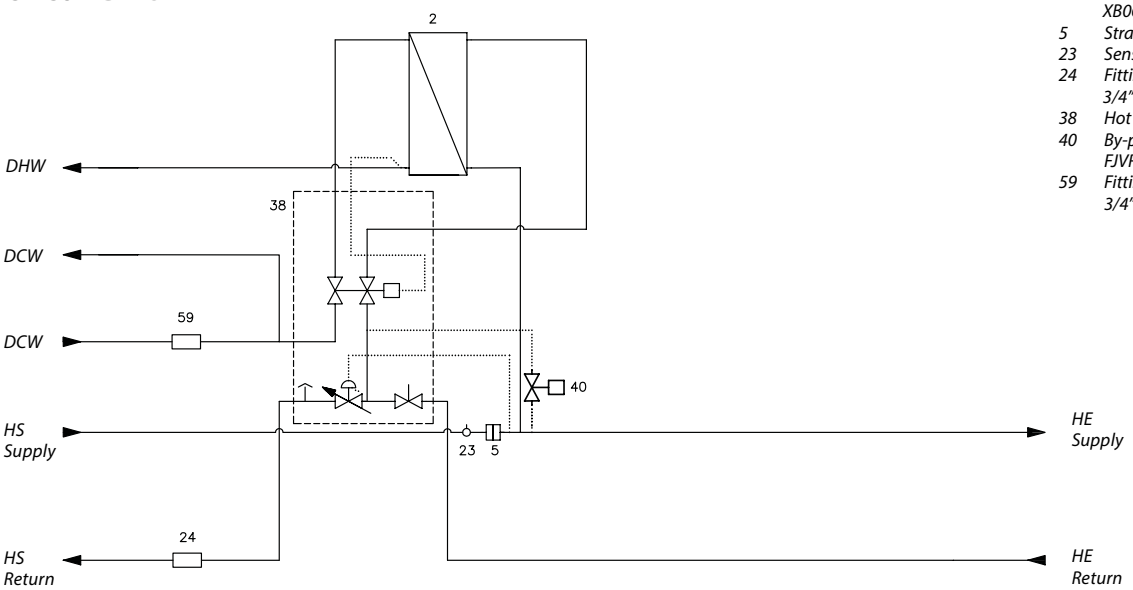
Shown example: EvoFlat FSS

Key components on the EvoFlat station

1. Micro Plate Heat exchanger for DHW
2. Multi-functional controller
3. Thermostatic summer bypass
4. Insert for water meter
5. Strainer
6. Insert for Energy meter
7. Insulation

The total quality of the flat station is the sum of the applied components. The main control components from Danfoss warrant a reliable and stable operation.

CIRCUIT DIAGRAM



2 Plate heat exchanger Danfoss XB06H -1
5 Strainer 3/4" N/ N mv=0,6 mm
23 Sensor pocket 1 /2"
24 Fitting piece for energy meter 3/4" x 110 mm
38 Hot Water Controller TPC - M
40 By-pass/circulation Danfoss FJVR (optional)
59 Fitting piece for water meter 3/4" x 110 mm

3.5.1 Brazed plate heat exchangers

MicroPlate™ heat exchanger - for efficient and instantaneous production of domestic hot water

Significant benefits:
- Energy and cost savings
- Better heat transfer
- Lower pressure loss
- More flexible design
- Longer life time
- Patented MicroPlate™ pattern technology
- Reduced CO_2 foot print

Type XB06

MicroPlate™ plate pattern

The lowest possible return temperature with instantaneous production of the required tapping capacity is critical for the energy efficiency of domestic water systems in flat stations.

To meet that demand, heat exchangers with a particularly high level of efficiency are required. Danfoss uses the new MicroPlate™ heat exchanger for its EvoFlat flat stations. These are configured and dimensioned in accordance with the requested tapping capacity. The hot water temperature depends on the available temperature on the primary side (supply temperature).

The supply which flows in one direction is heating domestic water flowing in opposite directions in the heat exchanger.

The Danfoss heat exchanger connections and plates are produced from stainless steel 1.4404 and connected with copper solder. They are ideal for use with all standard heating water and use in domestic water systems. If in any doubt the water quality must be checked with the respective supply company.

3.5.2 Domestic hot water control valve – Introduction

A multi-functional DHW control valve inside EvoFlat!

During tapping
When domestic hot water is needed the DHW control valve opens and the heat exchanger heats the cold water to the desired temperature. The sensor of the DHW control valve is placed in the heat exchanger and the valve maintains the temperature of DHW according to the temperature set on the thermostat part of the valve. The temperature is kept stable independently of the changes in tapping flow, differential pressure and supply temperature.

Quick closing
When the demand for DHW stops the valve must close quickly in order to protect the heat exchanger against overheating and lime scale formation.

Idle mode
The EvoFlat can be delivered with a summer bypass to keep the house supply line warm. This shortens the waiting periods during summer when the heating system is in reduced operation.

Main features and benefits of the DHW controller

Intelligent control with thermostatic override
The TPC-M controller controls the domestic hot water by taking both flow volume and temperature into account. By tapping the valves opens and the thermostat start to control the DHW temperature.

The control is independent of varying flow temperatures and differential pressure. When tapping ends, the valve closes immediately. This protects the heat exchanger from scaling.

Key features of TPC-M:
- Optimum control performance
- Suitable for low temperature operation
- Instant availability of water leads to minimum water waste
- Robust controller
- Quick opening and closing function
- Minimum heat loss from heat exchanger by stand-by

3.5.2 Domestic hot water control valve – TPC-M

The domestic hot water is prepared in the heat exchanger based on the flow principle and the temperature is regulated by the self-acting controller with integrated differential pressure controller – the TPC-M. Supreme easy of operation is obtained via the combined hydraulic and thermostatic regulation of the TPC-M controller.

The pressure-controlled part allows primary and secondary side flow through the heat exchanger, only when hot water is tapped and blocks the flow immediately after completion of the tapping process.

The thermostatic part controls the domestic hot water temperature. Thanks to the quick-acting hydraulic control of the heat exchanger, it is largely protected from the formation of lime scale and growth of bacteria.

The TPC-M controller with integrated differential pressure controller compensates for variations in supply temperature and varying differential pressure and thereby ensures a constant domestic hot water temperature at all times.

TPC-M

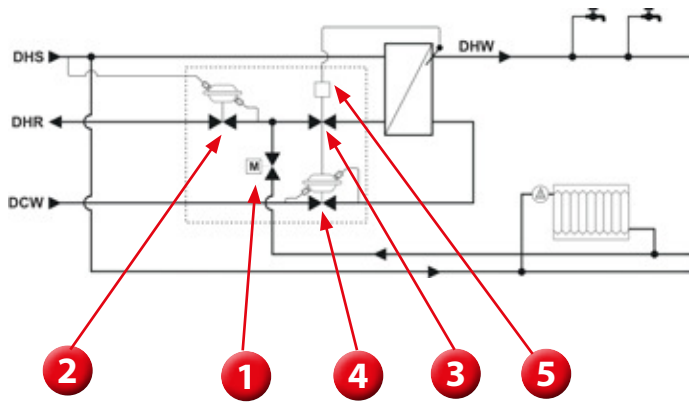
Multi-functional temperature controller
with integrated differential pressure controller, zone valve, flow actuator and air vent

Main data

- Pressure stage:
  PN10 primary side
  PN10 secondary side
- Dimensions:
  DN 15: Kvs = 2,5 m³/h
- Max. flow temperature:
  95°C
- Temperature range:
  40°C - 60°C

Applications:
Networks with varying flow temperatures of 50 - 95°C and diff. pressure variations in the range 0,5 – 4 bar, Used where a "cold" heat exchanger is required.

Function

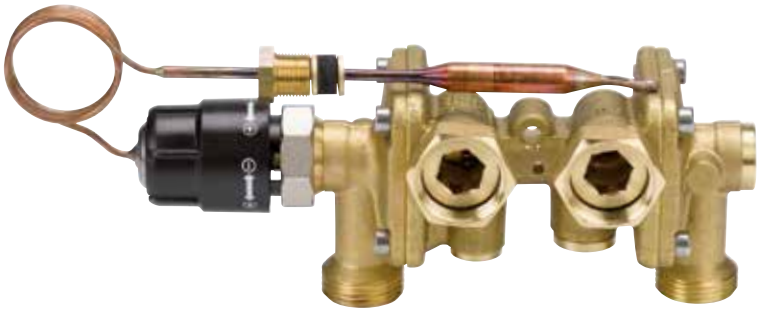


The TPC-M controller consist of following:

1) Zone valve
2) Differential pressure controller
3) Thermostatic control valve
4) Flow actuator
5) Thermostat with sensor

When you open the DHW tap a pressure drop arise at the flow actuator (4) which force the thermostatic valve (3) towards open position. The thermostat (5) adjust DHW temperature according to the set value. The differential pressure controller (2) controls a constant and low differential pressure across the station. By closing the DHW tap the flow actuator closes the primary flow immediately.

3.5.2 Domestic hot water control valve – IHPT



IHPT

Flow-compensated temp. controller
with integrated differential pressure controller (NO).

Main data

- Pressure stage:
  PN16 primary side
  PN16 secondary side
- Dimension:
  DN 15: Kvs = 3,0 m³/h
- Max flow temperature:
  120°C
- Temperature range:
  45°C - 65°C

Intelligent control with thermostatic override
The IHPT controller controls the domestic hot water (DHW) by taking both flow volume and temperature into account. During tapping the valve opens and the thermostat start to control the DHW temperature. The control is independent of varying tapping flows, supply temperature and differential pressure. When tapping ends, the valve closes immediately. This protects the heat exchanger (HEX) from scaling.

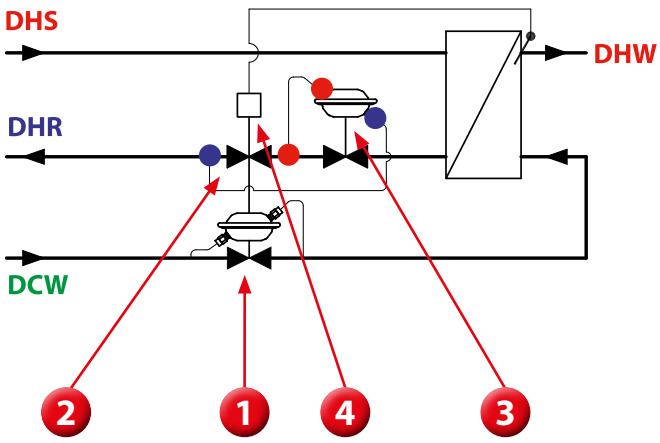
Integrated energy efficient standby function (idle mode)
In periods with no tapping of water, the standby function automatically adjusts itself below the selected DHW temperature. Thereby the HEX is always ready to produce DHW. The idle mode is built into the controller and requires no readjustments. Thereby the idle temperature will always be set correctly, and the energy usage is kept to a minimum. Furthermore low return temperature is ensured, also during standstill.

Suitable for low supply temperature operation
The IHPT controller ensures perfect regulation of DHW at both low and higher supply temperatures. It also guarantees maximum comfort at minimum energy consumption. Thus IHPT is the perfect choice in low supply temperature systems.

Environmental-friendly comfort – no waste of water
IHPT ensures that the HEX is always ready to produce DHW. The house owner or user feels the comfort by the instant availability of hot water in the tap. This means high comfort as well as minimum waste of water.

Integrated differential pressure controller
The integrated differential pressure controller inside the IHPT optimizes the control conditions for the thermostatic part of the valve.

Function



The IHPT control valve consist of following:

1) The proportional valve / pilot valve
2) Thermostatic control valve.
3) Differential pressure controller.
4) Thermostat with sensor.

When you open the DHW tap a pressure drop arise at the proportional valve (1) which force the thermostatic valve (2) towards open position. The thermostat (4) adjust DHW temperature according to the set value. The differential pressure controller (3) control a constant and low differential pressure across the thermostatic control valve (2). By closing the DHW tap the proportional valve close the primary flow immediately.

3.5.2 Domestic hot water control valve – AVTB with sensor accelerator

AVTB

The patented Termix sensor accelerator is mounted and applied together with the thermostatic control valve AVTB of the flat station. Thereby high comfort and safety of the DHW production are achieved.

Main data

- PN16 bar
- Kvs 1,9 / 3,4 m^3/h
- Max. Flow temperature: 120 °C
- Optimum control up to 90 °C
- Temperature range: 20-60 °C

Key features and benefits

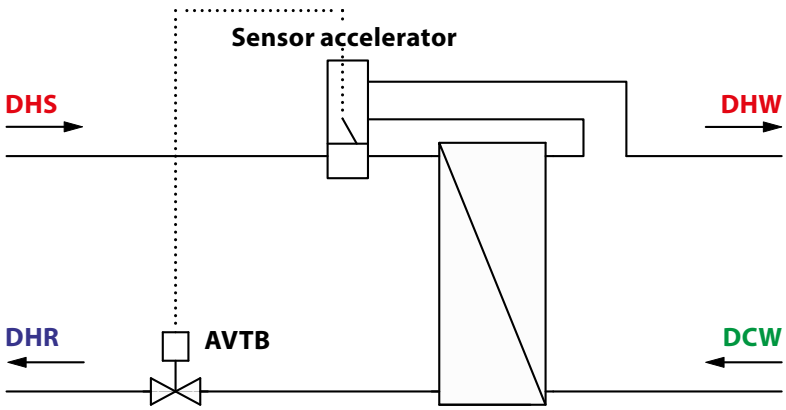
Acceleration of closting time
The sensor accelerator accelerates the closing of the Danfoss AVTB thermo-static valve and due to the rapid closing time protects the heat exchanger against overheating and lime scale formation.

Integrated bypass
The AVTB valve and sensor accelerator work as a bypass to keep the house sup-ply line warm. This shortens the waiting periods during summer when the heat-ing system is in reduced operation.

No secondary pressure loss
There is no additional pressure loss on the secondary side of the hot water heat exchanger with this type of regulation. Therefore this regulation can also be used by low pressure in the cold water mains.

No readjustments necessary
The user does not need to readjust the setting temperature, even if the district heating plant changes operating param-eters between summer and winter, either by lowering or increasing the flow temperature of the district heating water and/or the operating pressure in the network.

Stable hot water temperature
The sensor accelerator helps to ensure a stable hot water temperature also by varying loads, flow temperatures and differential pressure.



Function:
Thermostatic controller AVTB including sensor accelerator

Application:
Systems with varying flow temperatures and differential pressure, where high out put and low domestic cold water pressure is needed.

Idle control:
Idle controller is integrated with setting equal to DHW temperature

3.5.3 Additional flat station components

Heat meter
All EvoFlat™ flat stations are prepared for the installation of water and heat meters. The use of direct immersion sensors is secured.
Heat meter, installed in flat station, is an ultrasonic device for measuring the consumption of thermal energy.
It consists of:
-calculator with integral hardware and software for measuring flow rate, temperature and energy consumption,
-ultrasonic flow sensor,
-two temperature sensors.
Dynamic range measurement is 1:250. Minimum flow rate for which is guaranteed measurement accuracy, according to EN1434, is 6 l/h. If equipped with one of the communication modules enables easy data collection and transfer.

Heat insulation cover
The Neopolen heat insulation complies with the requirements of energy conservation regulations.

Room thermostat - together with electro-thermal actuator with zone valve
Installed in the flat station's return side, enables hydronic balancing and the central control of room temperature, timer and night set-back. This gives maximum heating comfort and additional energy savings to end users. Room thermostat can be manual or programmable.
Manually adjustable room thermostat type RMT-230 with:
– adjustable temperature: 8-30 °C,
– power: 230 V AC,
– switching differential (on/off): 0.6 K
is supplied as standard.

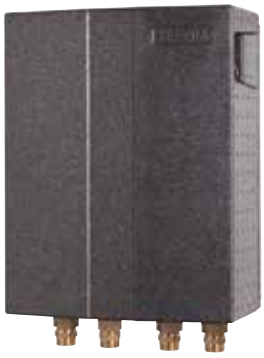
For users with higher demands for comfort it is possible to use programmable thermostats TP5001 with a weekly program (5/2) and TP7000 with a daily program (6 intervals), and with the possibility of lowering the night temperature.

3.5.4 Multiple cover options – Termix

Danfoss Flat stations can be mounted on-wall, in recess (built-in) or in shafts. Depending on the place of mounting different cover and recess boxes are available. As an example the compact EPP insulation greatly reduces the heat loss of the flat station.

Water heater

Cover, grey-lacquered steel
(Dimensions: H 442 x W 315 x D 165 mm)



EPP insulation box, fully enclosed
(Dimensions: H 432 x W 300 x D 155 mm)

EvoFlat flat stations

Cover, white-lacquered steel
(Dimensions: H 800 x W 540 x D 150 mm)

Recess box with white-lacquered steel cover
(Dimensions: H 810 x W 610 x D 110 (150) mm)

EPP insulation box, fully enclosed
(Dimensions: H 665 x W 530 x D 110 mm)

3.5.5 EvoFlat insulation options – Termix

The EvoFlat system is focused on saving energy, therefore the EvoFlat stations can be delivered with individually designed insulation, adjusted to the local rules and to the site, where the station will be placed.

EvoFlat stations with mixing loop or indirect heating can also be delivered with an A-class circulation pump in order to save on electricity.

A EvoFlat station is a compact and well regulated system, which ensures that minimum possible energy is used.

The EvoFlat station can also be delivered with HEX and pipe insulation, which is a flexible solution to minimize heat loos in areas where a heat loss does not benefit the building.

Finally the optimum solution is ordering the EvoFlat with complete insulation, which ensures minimum heat loss from the station.
Not all stations are available with this solution.

3.5.6 Heat and energy meter

Recommendation for short measurement intervals

The total heat flows are billed via a heat meter which are installed in the primary return side of the station. The energy consumption for both domestic water heating and the heating per residential unit is therefore recorded, which ensures the fair billing system.

Sonometer™ 1100 consists of:

- calculator with integral hardware and software for measuring flow rate, temperature and energy consumption,
- ultrasonic flow sensor,
- two temperature sensors.

Dynamic range measurement is 1:250.

Minimum flow rate for which is guaranteed measurement accuracy, according to EN1434, is 6 l/h.

If equipped with one of the communication modules enables easy data collection and transfer.

Walk-By/Drive-by

Radio 868MHz

Heat meters and read-out systems

Read out systems are used in heating systems where the distribution of thermal energy between the flats is done by heat meters and it is necessary to read the values of consumption and diagnostic data from one central location. Heat meters are installed in each flat station on return pipe and and have been fitted with a suitable communication module.

There are two existing read-out systems:

- M-BUS (wired)
- RADIO (wireless), with mobile and fixed solution

3.6 Domestic hot water requirements

Heating water

In the past there were some norms how to fill heating systems with the usual local domestic water. The variety of materials used in heating systems today requires a precise analysis of the composition of the hot water used, and an appropriate preparation where required, to prevent unwanted build ups and corrosion.

Scale, which occurs at specific temperatures and can build up on the elements of boilers or heat exchangers, is one of the "problem substances" in hot water. Such deposits impair the heat exchanger's efficiency and performance capacity, cause higher return temperatures and therefore reduce energy efficiency.

The use of suitable specialist companies is recommended for the analysis and preparation of the hot water. The pH value should also be checked regularly.

EvoFlat flat stations comply with EU heating water guidelines.

Domestic hot water

Danfoss EvoFlat flat stations comply with EU drinking water directives and norms (German: DVGW, DIN 1988, EN 1717, 805 and 806 and DVGW guidelines).

EvoFlat flat stations

4. Introduction to the product range

The flat station or the hydraulic interface units occupy a leading position in the decentralized system concept.
Danfoss offers a comprehensive product range of flat stations, which fits to all possible applications, system conditions and performance demands. It comes with multiple control solutions for DHW control (temperature and pressure) as well as design/mounting concepts such as on wall mounting, recess (built-in) mounting and shaft installation.

EvoFlat flat stations

4.1 Product range overview – Main data and functions

Application/ Product type	 Termix Novi	 Termix One B	 EvoFlat FSS	 Termix VMTD F-B	 EvoFlat MSS	 Termix VMTD-F-Mix-B	 Termix VVX-I	 Termix VVX-B
Domestic hot water (DHW)	X	X						
Direct heating & DHW			X	X				
Direct heating w/ mixing loop & DHW					X	X		
Indirect heating & DHW							X	X

Key data	Termix Novi	Termix One B	EvoFlat FSS	Termix VMTD F-B	EvoFlat MSS	Termix VMTD-F-Mix-B	Termix VVX-I	Termix VVX-B
DHW capacity (kW)	32-61	29-90	35-55	33-85	35-55	33-85	33-59	33-75
HE capacity (kW)	-	-	15	10-35	15	7-30	18-54	18-54
DHW control type	Flow/ Thermostatic	Thermostatic	Flow/ Thermostatic	Thermostatic	Flow/ Thermostatic	Thermostatic	Flow/ Thermostatic	Thermostatic
HE control type	-	-	Δp	Δp	Thermostatic	Thermostatic/ Electronic	Thermostatic/ Electronic	Thermostatic/ Electronic
Design	Wall	Wall	Wall/ Recess	Wall/ Recess	Wall/ Recess	Wall/ Recess	Wall	Wall
PN (bar)	16	16	10	16	10	10	10/16	10/16
Max. DH supply temp. (°C)	120	120	95	120	95	120	120	120
Construction	Fitted	Fitted	Fitted	Fitted	Fitted	Fitted	Fitted	Fitted

Water heater

4.2.1 Termix Novi

Domestic hot water (DHW)

DESCRIPTION

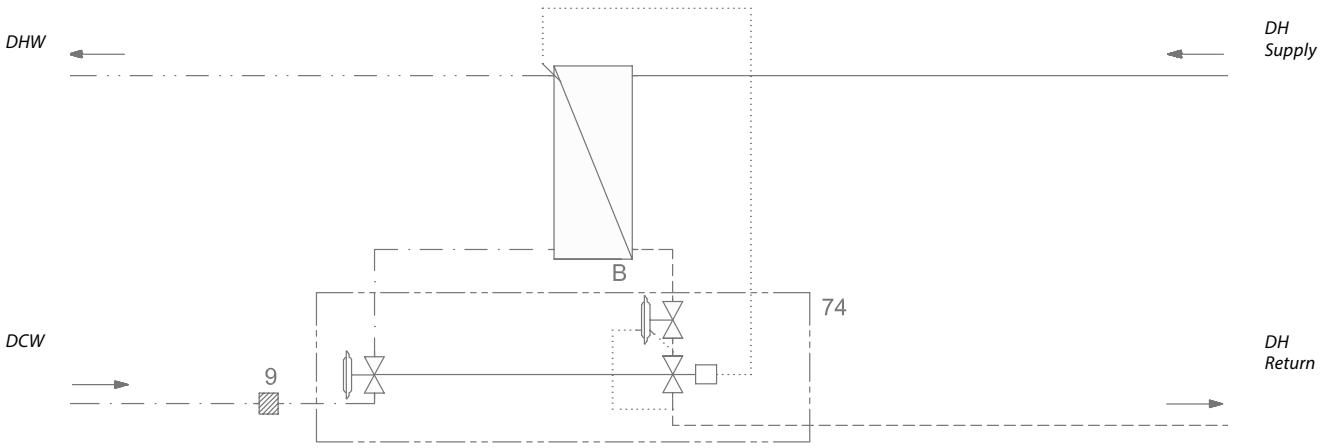
Instantaneous water heater for flats, single-family houses and small apartment buildings.
The Termix Novi water heater includes heat exchanger and IHPT valve.
The Danfoss IHPT valve is a flow-compensated temperature controller with a built-in Δp controller. The two regulating parameters protect the heat exchanger against over heating and lime scale formation and enables an outstanding control performance.

FEATURES AND BENEFITS:

- Instantaneous water heater
- DHW control with a thermostatic / flow controller
- Capacity: 32-61 kW DHW
- Sufficient supply of DHW
- Operates independently of differential pressure and flow temperature
- Minimum space required for installation
- Pipes and plate heat exchanger made of stainless steel
- Fully insulated with grey PU cover
- Min. risk of limescale and bacteria formation

CIRCUIT DIAGRAM

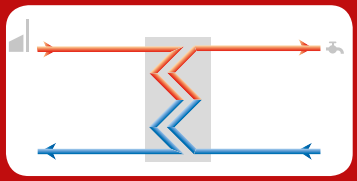
B Plate heat exchanger DHW
9 Strainer
74 IHPT control valve

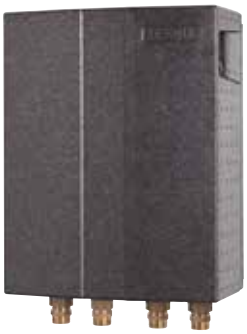


Water heater

4.2.1 Termix Novi

Domestic hot water (DHW)





EXTENSION OPTIONS:

- Cover, grey-lacquered steel (Designed by Jacob Jensen)
- Safety valve
- GTU pressure equalizer, eliminates safety valve discharge piping
- Ball valves on all connections
- Booster pump (increases DH flow)
- Circulation pipe/connection with non-return valve

TECHNICAL PARAMETERS:

Nominal pressure:	PN 16
DH supply temperature:	T_{max} = 120 °C
DCW static pressure:	p_{min} = 1.5 bar
Brazing material (HEX):	Copper
Weight incl. cover: (incl. packing)	7-9 kg
Cover:	Grey-lacquered steel

Dimensions (mm):

With insulation:
H 432 x W 300 x D 155

With cover:

H 442 x W 315 x D 165

Pipes dimensions (mm):

Primary:	Ø 18
Secondary:	Ø 18

Connections sizes:

DH + DCW + DHW:	G ¾" (ext. thread)

DHW: Capacity examples

Substation type	Heat exchanger	DHW Capacity kW	Supply flow Primary °C	Return flow Primary °C	DHW °C	Pressure loss Primary kPa*	DHW Tap load l/min
Novi Type 1	XB06-H-26 IHPT 3.0	32.3	60	19.8	10/45	20	13,3
		40.3	60	20.7	10/45	29	16,6
		43	70	17.4	10/45	20	17,7
		53	70	18.5	10/45	29	21,8
		29	60	24.3	10/50	20	10,5
			60	24.6	10/50	29	12,6
		41	70	19.6	10/50	20	14,8
		50	70	20.8	10/50	29	18,0
Novi Type 2	XB06-H-40 IHPT 3.0	32.3	55	21.9	10/45	22	13,3
		38	55	22.2	10/45	30	15,7
		38	60	19.6	10/45	20	15,7
		48.7	60	19.6	10/45	32	20,1
		50	70	16.4	10/45	20	20,6
		57	70	17.1	10/45	32	23,3
		34	60	23.4	10/50	20	12,3
		44	60	24.1	10/50	32	15,9
		48	70	18.8	10/50	20	17,3
		61.5	70	19.4	10/50	32	22,2

(Please contact your local Danfoss representative for capacity examples at other temperature conditions)

Water heater

4.2.2 Termix One B

Domestic hot water (DHW)

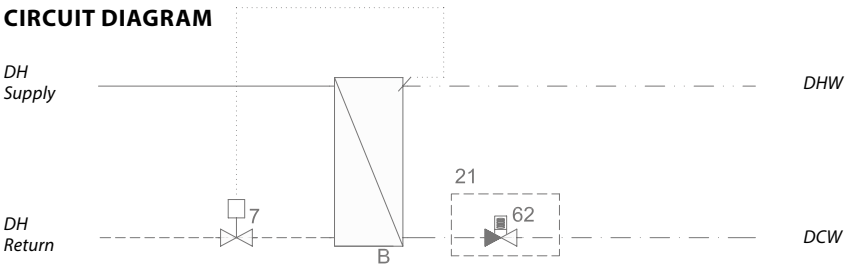
DESCRIPTION

Instantaneous water heater for flats, single-family houses and small apartment buildings with up to 10 apartments. The Termix One water heater includes heat exchanger and thermostatic control. The patented sensor accelerator accelerates the closing of the thermostatic valve and protects the heat exchanger against over heating and lime scale formation.

FEATURES AND BENEFITS:

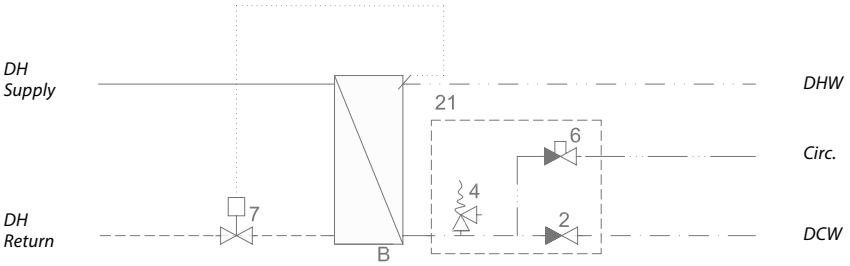
- Instantaneous water heater
- DHW control with an accelerated thermostatic control
- Capacity: 29-90 kW DHW
- Sufficient supply of DHW
- Operates independently of differential pressure and flow temperature
- Minimum space required for installation
- Pipes and plate heat exchanger made of stainless steel
- Minimized risk of lime scale and bacteria formation

CIRCUIT DIAGRAM



Termix One - with GTU

B Plate heat exchanger DHW
7 Thermostatic valve
21 To be ordered separately
62 GTU Pressure equalizer



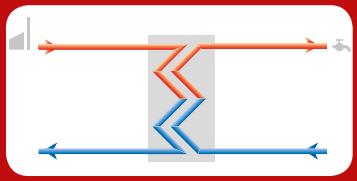
Termix One - with safety valve

B Plate heat exchanger DHW
2 Non-return valve
4 Safety valve
6 Thermostatic / non-return valve
7 Thermostatic valve
21 To be ordered separately

Water heater

4.2.2 Termix One B

Domestic hot water (DHW)



EXTENSION OPTIONS:

- Cover, grey-lacquered steel (Designed by Jacob Jensen)
- Safety valve
- GTU pressure equalizer, eliminates safety valve discharge piping
- Circulation set, Danfoss MTCV and check valve
- Ball valves on all connections
- Booster pump (increases DH flow)

TECHNICAL PARAMETERS:

Nominal pressure:	PN 16
DH supply temperature:	T_{max} = 120 °C
DCW static pressure:	p_{min} = 0.5 bar
Brazing material (HEX):	Copper

Weight incl. cover: (incl. packing) 10-12 kg

Cover: Grey-lacquered steel

Dimensions (mm):

Without cover:
H 428 x W 312 x D 155 (type 1 + 2)
H 468 x W 312 x D 155 (type 3)

With cover:
H 430 x W 315 x D 165 (type 1 + 2)
H 470 x W 315 x D 165 (type 3)

Pipes dimensions (mm):

Primary:	Ø 18
Secondary:	Ø 18

Connections sizes:

DH + DCW + DHW: G ¾" (ext. thread)

DHW: Capacity examples, 10 °C/50 °C					
Substation type Termix One-B	DHW Capacity kW	Supply flow Primary °C	Return flow Primary °C	Pres-sure loss Primary *kPa	DHW Tap load l/min.
Type 1 w/AVTB 15	29.3	60	23.0	20	10.5
	38.2	60	25.2	45	13.7
	37.8	70	20.0	20	13.6
Type 2 w/AVTB 20	34.7	60	24.4	20	12.4
	47.1	60	26.8	45	16.9
	45.1	70	21.3	20 1	6.2
Type 3 w/AVTB 20 5 to 10** households	60	60	23.0	35	21.3
	66	60	24.0	45	23.8
	80	70	20.3	35	28.8
	90	70	21.0	45	32.3

** Heat meter not incl.*
*** Capacity for 10 households at 70 °C DH flow temperature*
(Please contact your local Danfoss representative for capacity examples at other temperature conditions)

4.3.1 EvoFlat FSS

Direct heating & DHW

DESCRIPTION

Flat substation for direct heating and instantaneous domestic hot water with innovative self-acting multifunctional controller TPC-M for single-family, semi-detached and terraced as well as flats. The EvoFlat FSS is especially suitable for two-pipe systems in residential buildings, which are supplied from a secondary connected district heating system, a block heating system or a centrally located boiler system.

The domestic hot water is prepared in the heat exchanger based on the flow principle and the temperature is regulated by the self-acting controller with integrated differential pressure controller – the TPC-M. Supreme easy of operation is obtained via the combined hydraulic and thermostatic regulation of the TPC-M controller.

The pressure-controlled part allows primary and secondary side flow through the heat exchanger, only when hot water is tapped and blocks the flow immediately after completion of the tapping process.

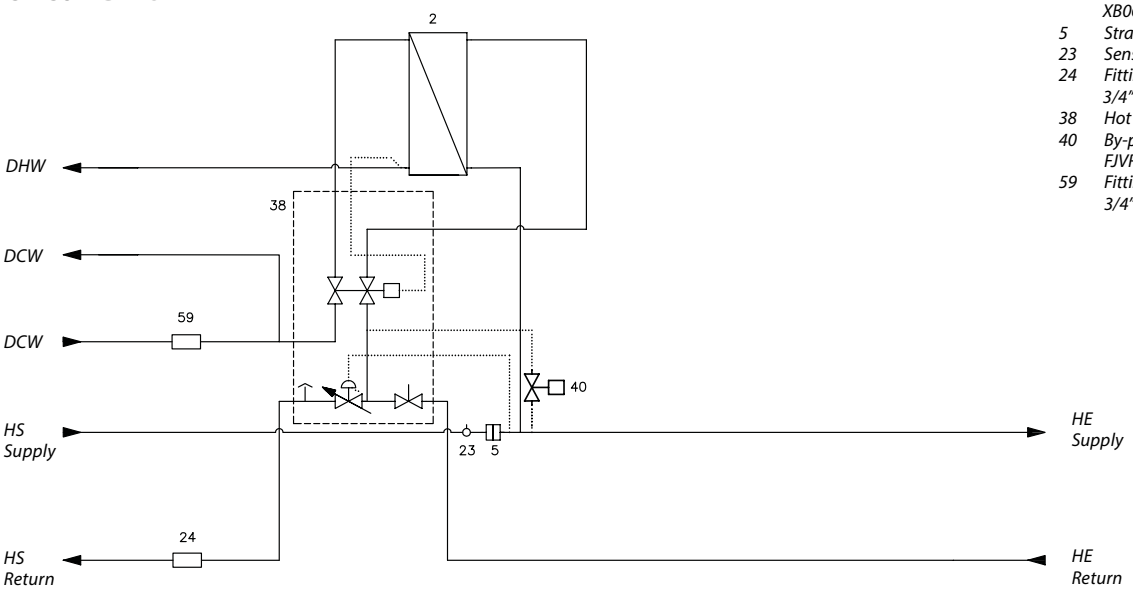
The thermostatic part controls the domestic hot water temperature. Thanks to the quick-acting hydraulic control of the heat exchanger, it is largely protected from the formation of lime scale and growth of bacteria.

The EvoFlat FSS is built up on an EPP insulation back-plate and a front insulation cover, thus ensuring reduced heat losses and excellent operating economy. All pipes are made of stainless steel. The connections are made by a newly designed click-fit connection, which does not need re-tightening. Connections of energy meter as well as cold water meter are with nuts and gaskets.

FEATURES AND BENEFITS:

- Complete unit for direct heating and DHW
- Prepared for low supply temperature
- Fully insulated and with the lowest heat loss on the market
- Innovative, energy-saving multifunctional controller TPC(-M) in combination with high performance heat exchanger for on-demand domestic water heating without no-load losses
- Pipes and heat exchanger made of stainless steel AISI 316
- Minimum space required for installation
- Build-in or wall-mounted variant
- Minimized risk of lime scale and bacteria formation

CIRCUIT DIAGRAM

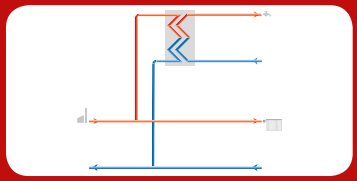


2 Plate heat exchanger Danfoss XB06H -1
5 Strainer 3/4" N/ N mv=0,6 mm
23 Sensor pocket 1 /2"
24 Fitting piece for energy meter 3/4" x 110 mm
38 Hot Water Controller TPC - M
40 By-pass/circulation Danfoss FJVR (optional)
59 Fitting piece for water meter 3/4" x 110 mm

Flat Stations

4.3.1 EvoFlat FSS

Direct heating & DHW



EXTENSION OPTIONS:

- Room thermostat
- Actuator for zone valve
- Safety valve
- Ball valves (60 mm)
- Ball valves with connection for pressure gauge ¾"(120 mm) including safety valve
- Mounting rail for mount-on-wall variant
- Recess box for build-in variant including mounting rail

TECHNICAL PARAMETERS:

Nominal pressure:	PN 10
DH supply temperature:	T_{max} = 95 °C
DCW static pressure:	p_{min} = 1 bar
Brazing material (HEX):	Copper

Weight excl. cover: 14.0 kg

Insulation: EPP λ 0,.039

Cover: White-lacquered steel

Electrical supply: 230 V AC

Dimensions (mm):

Without insulation front cover:
H 590 x W 550 x D 110 mm
With insulation front cover:
H 590 x W 550 x D 150 mm

Pipes dimensions (mm):

Primary:	Ø 15-18
Secondary:	Ø 15-18

Connections sizes :

DH, HE, DHW, DCW:	G ¾" (int. thread)

DHW: Capacity examples

DHW Capacity kW	Type	Temperature Primary °C	Temperature Secondary °C	Flow rate Primary l/h	Flow rate Secondary l/min	Pressure loss Primary *kpa
37	1	65/19,1	10/45	707	15,2	16
37	1	65/22,4	10/50	762	13,3	18
37	2	65/16,8	10/45	673	15,2	12
45	2	65/17,6	10/45	833	18,4	18
37	2	65/19,6	10/50	714	13,3	14
45	2	65/20,6	10/50	890	16,1	21
55,5	3	65/14	10/45	950	22,8	41
53	3	65/15,8	10/50	950	19	41
42	3	55/16,3	10/45	950	17,2	41
33,7	3	50/19,1	10/45	950	13,8	41

* Energy meter not incl.

Heating: Capacity examples

Heating Capacity	Heating Circuit Δt °C	Total pressure loss primary *kpa	Flow rate Primary l/h
10	20	3	430
10	30	1	287
10	40	1	215
15	20	8	645
15	30	3	430
15	40	1,5	323

* Energy meter not incl.

Type 1 = XB 06H-1 26 (plate heat exchanger)
Type 2 = XB 06H-1 40 (plate heat exchanger)
Type 3 = XB 06H+ 60 (plate heat exchanger)

4.4.1 Termix VMTD-F-B

Direct heating & DHW

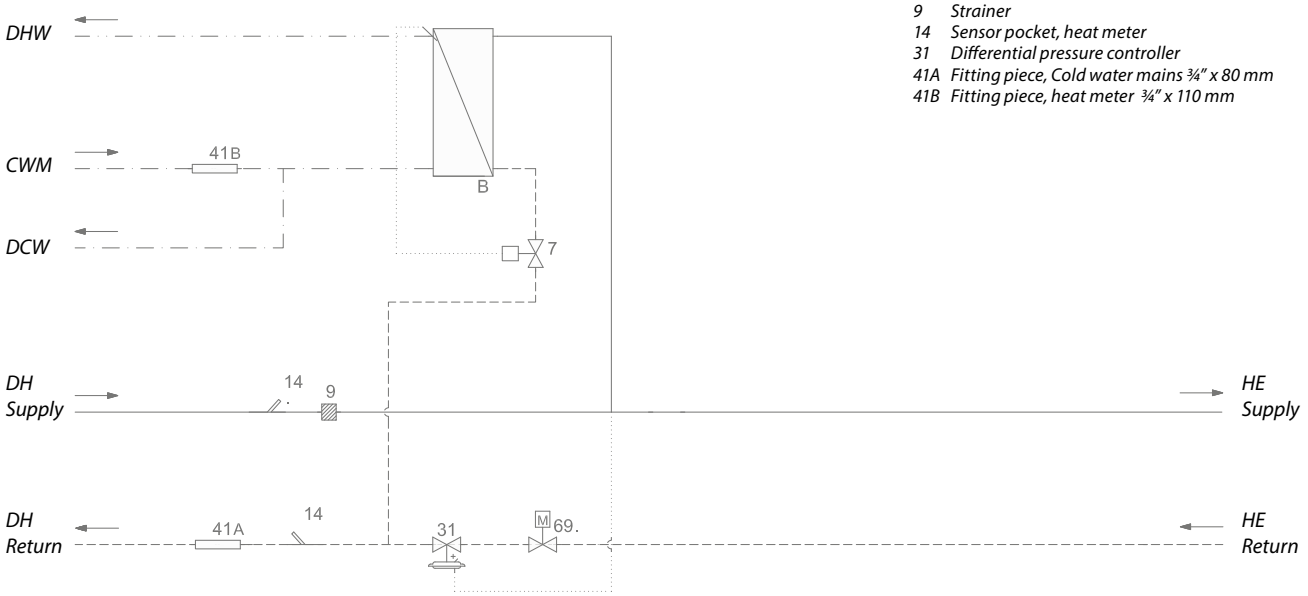
DESCRIPTION

Direct substation for flats, decentralized systems, single and multi-family houses with up to 7 flats.
District heating substation for direct heating and instantaneous domestic hot water with thermostatic control.
The Termix VMTD-F-B is a complete solution with built-in water heater and a differential pressure controlled heating system. The patented sensor accelerator accelerates the closing of the thermostatic valve and protects the heat exchanger against over heating and lime scale formation.
The differential pressure controller sets the optimum operation conditions for radiator thermostats in order to enable individual temperature control in each room.

FEATURES AND BENEFITS:

- Substation for DH and decentralized systems
- Direct heating and DHW temperature control with a thermostatic control valve
- Capacity: 33-85 kW DHW, 10-35kW HE
- DHW in sufficient quantity
- Operates independently of differential pressure and flow temperature
- Minimum space required for installation
- Pipes and plate heat exchanger made of stainless steel
- Minimized risk of lime scale and bacteria formation

CIRCUIT DIAGRAM

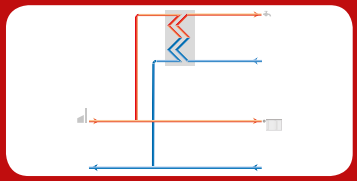


B Plate heat exchanger DHW
7 Thermostatic valve
9 Strainer
14 Sensor pocket, heat meter
31 Differential pressure controller
41A Fitting piece, Cold water mains ¾" x 80 mm
41B Fitting piece, heat meter ¾" x 110 mm

Flat Stations

4.4.1 Termix VMTD-F-B

Direct heating & DHW



EXTENSION OPTIONS:

- Cover, white-lacquered steel, for wall-mounted or built-in variant (Designed by Jacob Jensen)
- Mounting rail for easy installation
- Safety valve
- GTU pressure equalizer, eliminates safety valve discharge piping
- Circulation set, Danfoss MTCV and check valve
- DHW Circulation pump
- Return temperature limiter
- Room thermostats
- Zone valve, on/off function
- Mixing circuit for floor heating

TECHNICAL PARAMETERS:

Nominal pressure:	PN 10
DH supply temperature:	T_{max} = 120 °C
DCW static pressure:	p_{min} = 0.5 bar
Brazing material (HEX):	Copper

Weight incl. cover: 20 kg
(incl. packing)

Cover: White-lacquered steel

Dimensions (mm):

Without cover:
H640 x W 530 x D 110 (150) mm

With cover (mount on wall variant):
H 800 x W 540 x D 242 mm

With cover (recess variant):
H 915-980 x W 610 x D 110 mm
H 915-980 x W 610 x D 150 mm

Pipes dimensions (mm):

Primary:	Ø 18
Secondary:	Ø 18

Connections sizes:

DH + DCW + DHW + HE:	G ¾" (int. thread)

Heating: Capacity examples				
Substation type Termix VMTD-F	Heating Capacity kW	Heating Circuit Δt °C	Pressure loss Primary *kPa	Flow rate l/h
VMTD-1/2	10	20	25	430
VMTD-1/2	10	30	25	290
VMTD-1/2	15	30	25	430
VMTD-3/4	10	10	25	860
VMTD-3/4	15	20	25	645
VMTD-3/4	15	30	25	430
VMTD-3/4	20	20	25	860
VMTD-3/4	20	30	25	570
VMTD-3/4	30	30	25	860
VMTD-3/4	35	30	25	1000

** Heat meter not incl*

4.5.1 EvoFlat MSS

Direct heating w/ mixing loop & DHW

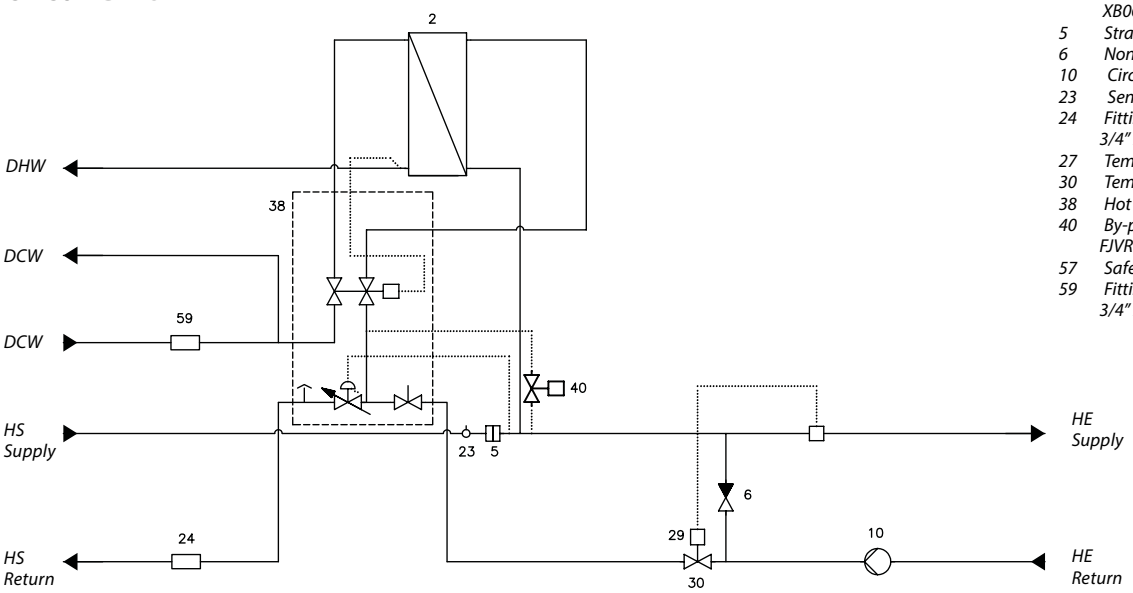
DESCRIPTION

Flat substation for direct heating and instantaneous domestic hot water with innovative self-acting multifunctional controller TPC-M for single-family, semi-detached and terraced as well as flats.
The EvoFlat FSS is especially suitable for two-pipe systems in residential buildings, which are supplied from a secondary connected district heating system, a block heating system or a centrally located boiler system.
The domestic hot water is prepared in the heat exchanger based on the flow principle and the temperature is regulated by the self-acting controller with integrated differential pressure controller – the TPC-M. Supreme easy of operation is obtained via the combined hydraulic and thermostatic regulation of the TPC-M controller.
The pressure-controlled part allows primary and secondary side flow through the heat exchanger, only when hot water is tapped and blocks the flow immediately after completion of the tapping process.
The thermostatic part controls the domestic hot water temperature. Thanks to the quick-acting hydraulic control of the heat exchanger, it is largely protected from the formation of lime scale and growth of bacteria.
With mixing loop, which provides a suitable temperature level e.g. for floor heating and with connection pipes for radiator circuit mounted in front of mixing loop for direct connection to radiator circuit. Especially suitable for single-pipe systems and systems with floor heating. With fitting piece for heat meter mounted in the district heating return pipe.
The EvoFlat FSS is built up on an EPP insulation back-plate and a front insulation cabinet, thus ensuring reduced heat losses and excellent operating economy.
All pipes are made of stainless steel. The connections are made by a newly designed click-fit connection, which does not need re-tightening.

FEATURES AND BENEFITS:

- Complete unit for direct heating with mixing loop and DHW
- Prepared for low supply temperature
- Fully insulated and with the lowest heat loss on the market
- Innovative, energy-saving multifunctional controller TPC(-M) in combination with high performance heat exchanger for on-demand domestic water heating without no-load losses
- Pipes and heat exchanger made of stainless steel AISI 316
- Minimum space required for installation
- Build-in or wall-mounted variant
- Minimized risk of lime scale and bacteria formation

CIRCUIT DIAGRAM

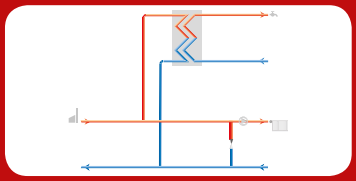


2 Plate heat exchanger Danfoss XB06H -1
5 Strainer 3/4" N/ N mv=0,6 mm
6 Non-return valve
10 Circ. pump HE Wilo Yonos Para
23 Sensor pocket 1 /2"
24 Fitting piece for energy meter 3/4" x 110 mm
27 Temp. sensor
30 Temp. controller
38 Hot Water Controller TPC - M
40 By-pass/circulation Danfoss FJVR (optional)
57 Safety valve
59 Fitting piece for water meter 3/4" x 110 mm

Flat Stations

4.5.1 EvoFlat MSS

Direct heating w/ mixing loop & DHW



EXTENSION OPTIONS:

- Room thermostat
- Actuator for zone valve
- Safety valve
- Ball valves (60 mm)
- Ball valves with connection for pressure gauge ¾"(120 mm) incl. safety valve
- Mounting rail for mount-on-wall variant
- Recess box for build-in variant incl. mounting rail

TECHNICAL PARAMETERS:

Nominal pressure:	PN 10
DH supply temperature:	T_{max} = 95 °C
DCW static pressure:	p_{min} = 1 bar
Brazing material (HEX):	Copper

Weight excl. cover: 14.0 kg

Insulation: EPP λ 0,.039

Cover: White-lacquered steel

Electrical supply: 230 V AC

Dimensions (mm):

Without insulation front cover:
H 590 x W 550 x D 110 mm
With insulation front cover:
H 590 x W 550 x D 155 mm

Pipes dimensions (mm):

Primary:	Ø 15-18
Secondary:	Ø 15-18

Connections sizes :

DH, HE, DHW, DCW:	G ¾" (int. thread)

DHW: Capacity examples

DHW Capacity kW	Type	Temperature Primary °C	Temperature Secondary °C	Flow rate Primary l/h	Flow rate Secondary l/min	Pressure loss Primary *kpa
37	1	65/19,1	10/45	707	15,2	16
37	1	65/22,4	10/50	762	13,3	18
37	2	65/16,8	10/45	673	15,2	12
45	2	65/17,6	10/45	833	18,4	18
37	2	65/19,6	10/50	714	13,3	14
45	2	65/20,6	10/50	890	16,1	21
55,5	3	65/14	10/45	950	22,8	41
53	3	65/15,8	10/50	950	19	41
42	3	55/16,3	10/45	950	17,2	41
33,7	3	50/19,1	10/45	950	13,8	41

* Energy meter not incl.

Heating: Capacity examples

Heating Capacity	Heating Circuit Δt °C	Total pressure loss Primary *kpa	Flow rate Primary l/h
10	20	3	430
10	30	1	287
10	40	1	215
15	20	8	645
15	30	3	430
15	40	1,5	323

* Energy meter not incl.

Type 1 = XB 06H-1 26 (plate heat exchanger)
Type 2 = XB 06H-1 40 (plate heat exchanger)
Type 3 = XB 06H+ 60 (plate heat exchanger)

4.6.1 Termix VMTD-F-MIX-B

Direct heating w/ mixing loop & DHW

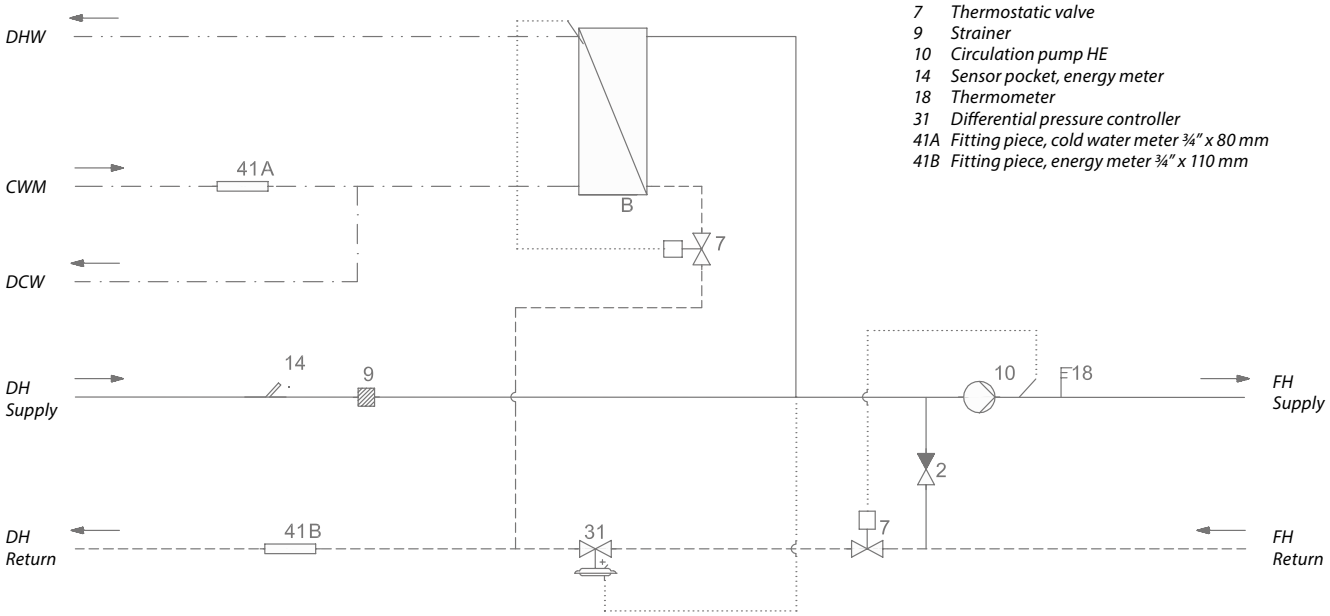
DESCRIPTION

Direct substation for flats, decentralized systems, single and multi-family houses with up to 7 flats.
District heating substation for direct heating with mixing loop and instantaneous domestic hot water with thermostatic control.
The Termix VMTD-F MIX-B is a complete solution with built-in water heater and a differential pressure controlled heating system with integrated mixing loop. The patented sensor accelerator accelerates the closing of the thermostatic valve and protects the heat exchanger against over heating and lime scale formation.
The differential pressure controller sets the optimum operation conditions for radiator thermostats in order to enable individual temperature control in each room.
The mixing loop creates a suitable temperature level e.g. for floor heating.

FEATURES AND BENEFITS:

- Substation for DH and decentralized systems
- Direct heating and DHW temperature control with a thermostatic control valve
- Capacity: 33-85 kW DHW, 7-30 kW HE
- Sufficient supply of DHW
- Operates independently of differential pressure and flow temperature
- Minimum space required for installation
- Pipes and plate heat exchanger made of stainless steel
- Minimized risk of lime scale and bacteria formation

CIRCUIT DIAGRAM

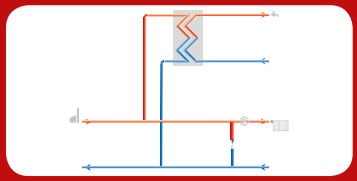


B Heat exchanger DHW
2 Single check valve
7 Thermostatic valve
9 Strainer
10 Circulation pump HE
14 Sensor pocket, energy meter
18 Thermometer
31 Differential pressure controller
41A Fitting piece, cold water meter ¾" x 80 mm
41B Fitting piece, energy meter ¾" x 110 mm

Flat Stations

4.6.1 Termix VMTD-F-MIX-B

Direct heating w/ mixing loop & DHW



EXTENSION OPTIONS:

- Cover, white-lacquered steel (Design Jacob Jensen) or built-in variant
- Mounting rail for easy installation
- Safety valve
- GTU pressure equalizer, eliminates safety valve discharge piping
- Circulation set, Danfoss MTCV and check valve
- Hot water circulation pump
- Safety thermostat surface type
- Weather compensation, electronic controller
- Zone valve, on/off function
- Return temperature limiter
- Room thermostats

TECHNICAL PARAMETERS:

Nominal pressure:	PN 10
DH supply temperature:	T_{max} = 120 °C
DCW static pressure:	p_{min} = 0.5 bar
Brazing material (HEX):	Copper

Weight incl. cover: (incl. packing) 25.0 kg

Cover: White-lacquered steel

Electrical supply: 230 V AC

Dimensions (mm):

Without cover:
H 780 x W 528 x D 150

With cover (mount on-wall variant):
H 800 x W 540 x D 242

With cover (recess variant):
H 1030 x W 610 x D 150

Pipes dimensions (mm):

Primary:	Ø 18
Secondary:	Ø 18

Connections sizes:

DH + DCW + DHW + HE:	G ¾" (int. thread)

Heating: Capacity examples						
Substation Type VMTD-MIX-Q	Heating Capacity kW	Supply flow Primary °C	Heating circuit °C	Pressure loss Primary *kPa	Flow rate Primary l/h	Flow rate Secondary l/h
VMTD-1/2	7	70	40/35	20	172	1204
VMTD-1/2	10	70	40/30	20	245	860
VMTD-1/2	15	80	60/35	20	286	516
VMTD-1/2	20	80	60/35	20	382	688
VMTD-1/2	20	80	70/40	20	430	573
VMTD-3/4	9	70	40/35	20	221	1548
VMTD-3/4	25	70	60/35	20	614	860
VMTD-3/4	30	80	70/40	20	645	860

** Heat meter not incl*

4.7.1 Termix VVX-I

Indirect heating & DHW

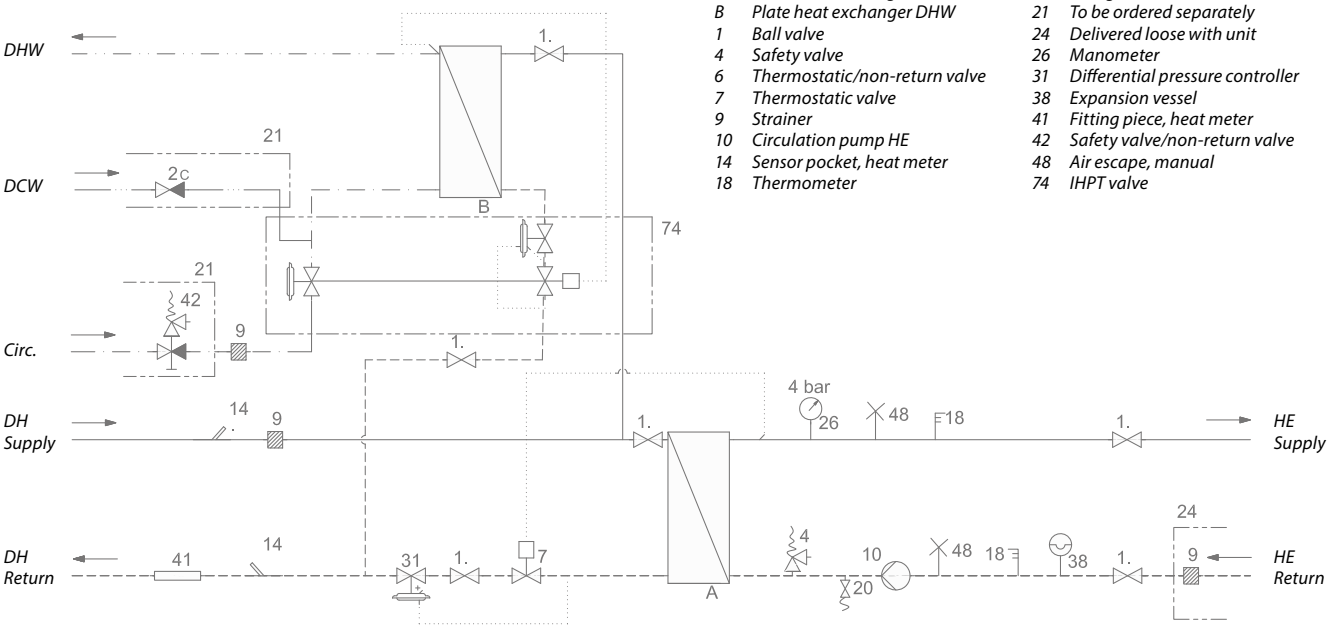
DESCRIPTION

Indirect substation for single and multi-family houses.
District heating substation for indirect heating and instantaneous domestic hot water with flow-compensated temperature controller.
The Termix VVX-I is used if a heat exchanger is required or on a conversion to district heating where the existing equipment is unsuitable for direct connection. The domestic hot water is prepared in the heat exchanger and the temperature is regulated with a flow-compensated temperature controller.
The two regulating parameters protect the heat exchanger against over heating and lime scale formation.
The VVX-I substation can be used together with the Termix distribution units for floor heating or radiator heating.

FEATURES AND BENEFITS:

- Substation for single and multi-family houses
- Indirect heating, DHW temperature control with a thermostatic control valve
- Thermostatic or electronic control of (HE) temp.
- Capacity: 18-54 kW HE, 33-59 kW DHW
- Sufficient supply of DHW
- Operates independently of differntial pressure and flow temperature
- Minimum space required for installation
- Pipes and plate heat exchanger, stainless steel
- Minimized risk of lime scale and bacteria formation

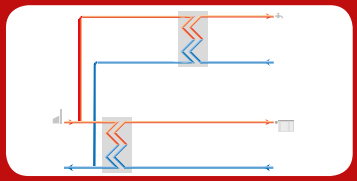
CIRCUIT DIAGRAM



A	*Plate heat exchanger HE*	*20*	*Filling/drain valve*
B	*Plate heat exchanger DHW*	*21*	*To be ordered separately*
1	*Ball valve*	*24*	*Delivered loose with unit*
4	*Safety valve*	*26*	*Manometer*
6	*Thermostatic/non-return valve*	*31*	*Differential pressure controller*
7	*Thermostatic valve*	*38*	*Expansion vessel*
9	*Strainer*	*41*	*Fitting piece, heat meter*
10	*Circulation pump HE*	*42*	*Safety valve/non-return valve*
14	*Sensor pocket, heat meter*	*48*	*Air escape, manual*
18	*Thermometer*	*74*	*IHPT valve*

4.7.1 Termix VVX-I

Indirect heating & DHW



EXTENSION OPTIONS:

- Cover, white-lacquered steel (Design Jacob Jensen)
- Safety valve
- GTU pressure equalizer, eliminates safety valve discharge piping
- Booster pump (increases DH flow)
- Pipe insulation
- Mixing circuits for under floor heating
- Floor heating manifold system
- Safety thermostat surface type
- Weather compensation, electronic controls
- Filling line, refill from DH for heating circuit
- Zone valve with actuator

TECHNICAL PARAMETERS:

Nominal pressure:	PN 10*
DH supply temperature:	T_{max} = 120 °C
DCW static pressure:	p_{min} = 1.0 bar
Brazing material (HEX):	Copper

** PN 16 versions are available on request*

Weight incl. cover: 29 kg
(incl. packing)

Electrical supply: 230 V AC

Cover: White-lacquered steel

Dimensions (mm):
Without cover:
H 750 x W 505 x D 375

With cover:
H 800 x W 540 x D 430

Pipes dimensions (mm):

Primary:	Ø 18
Secondary:	Ø 18

Connections sizes:

DH + HE:	G ¾" (int. thread)
DCW + DHW:	G ¾" (int. thread)

Heating: Capacity examples

Substation type Termix VVX-I	Heating Capacity kW	Supply flow primary °C	Heating circuit °C	Pressure loss Primary *kPa	Pressure loss Secondary *kPa	Flow rate Primary l/h	Flow rate Secondary l/h
VVX x-1	18	70	60/35	25	20	442	650
	20	80	70/40	25	20	430	603
	24	90	70/40	25	20	476	724
VVX x-2	30	70	60/35	35	20	737	1084
	34	80	70/40	35	20	731	1025
	40	90	70/40	35	20	783	1206
VVX x-3	45	70	60/35	45	20	1106	1629
	50	80	70/40	45	20	1075	1509
	54	90	70/40	45	20	980	1629

** Heat meter not incl*

4.7.2 Termix VVX-B

Indirect heating & DHW

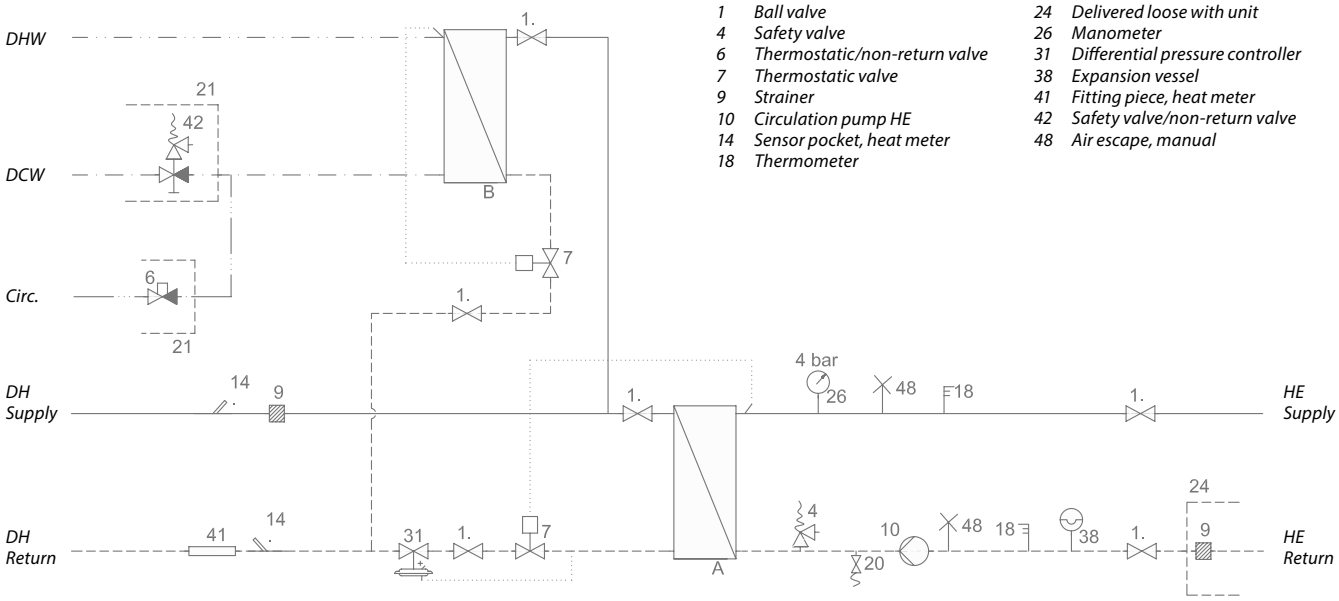
DESCRIPTION

Indirect substation for single and multi-family houses with up to 7 flats.
District heating substation for indirect heating and instantaneous domestic hot water with thermostatic control.
The Termix VVX-B is used if a heat exchanger is required or on a conversion to district heating where the existing equipment is unsuitable for direct connection. The domestic hot water is prepared in the heat exchanger and the temperature is regulated with a thermostatic control valve. The patented sensor accelerator accelerates the closing of the thermostatic valve and protects the heat exchanger against over heating and lime scale formation.
The VVX-B substation can be used together with the Termix distribution units for floor heating or radiator heating.

FEATURES AND BENEFITS:

- Substation for single and multi-family houses
- Indirect heating, DHW temperature control with a thermostatic control valve
- Thermostatic or electronic control of (HE) temp.
- Capacity: 18-57 kW HE, 33-75 kW DHW
- Sufficient supply of DHW
- Operates independently of differntial pressure and flow temperature
- Minimum space required for installation
- Pipes and plate heat exchanger, stainless steel
- Minimized risk of lime scale and bacteria formation

CIRCUIT DIAGRAM

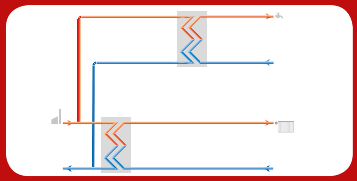


A	*Plate heat exchanger HE*	*20*	*Filling/drain valve*
B	*Plate heat exchanger DHW*	*21*	*To be ordered separately*
1	*Ball valve*	*24*	*Delivered loose with unit*
4	*Safety valve*	*26*	*Manometer*
6	*Thermostatic/non-return valve*	*31*	*Differential pressure controller*
7	*Thermostatic valve*	*38*	*Expansion vessel*
9	*Strainer*	*41*	*Fitting piece, heat meter*
10	*Circulation pump HE*	*42*	*Safety valve/non-return valve*
14	*Sensor pocket, heat meter*	*48*	*Air escape, manual*
18	*Thermometer*		

Flat Stations

4.7.2 Termix VVX-B

Indirect heating & DHW



EXTENSION OPTIONS:

- Cover, white-lacquered steel (Design Jacob Jensen)
- Safety valve
- GTU pressure equalizer, eliminates safety valve discharge piping
- Circulation set, Danfoss MTCV and check valve
- Booster pump (increases DH flow)
- Pipe insulation
- Mixing circuits for under floor heating
- Floor heating manifold system
- Safety thermostat surface type
- Weather compensation, electronic controls
- Filling line, refill from DH for heating circuit

TECHNICAL PARAMETERS:

Nominal pressure:	PN 10*
DH supply temperature:	T_{max} = 120 °C
DCW static pressure:	p_{min} = 0.5 bar
Brazing material (HEX):	Copper

** PN 16 versions are available on request*

Weight incl. cover: (incl. packing)	35 kg
Electrical supply:	230 V AC
Cover:	White-lacquered steel

Dimensions (mm):

Without cover:
H 810 x W 525 x D 360

With cover:
H 810 x W 540 x D 430

Pipes dimensions (mm):

Primary:	Ø 18
Secondary:	Ø 18

Connections sizes:

DH + HE:	G ¾" (int. thread)
DCW + DHW:	G ¾" (int. thread)

Heating: Capacity examples

Substation type Termix VVX-B	Heating Capacity kW	Supply flow primary °C	Heating circuit °C	Pressure loss Primary *kPa	Pressure loss Secondary *kPa	Flow rate Primary l/h	Flow rate Secondary l/h
VVX x-1	18	70	60/35	25	20	442	650
	20	80	70/40	25	20	430	603
	24	90	70/40	25	20	476	724
VVX x-2	30	70	60/35	35	20	737	1084
	34	80	70/40	35	20	731	1025
	40	90	70/40	35	20	783	1206
VVX x-3	45	70	60/35	45	20	1106	1629
	50	80	70/40	45	20	1075	1509
	54	90	70/40	45	20	980	1629

** Heat meter not incl*

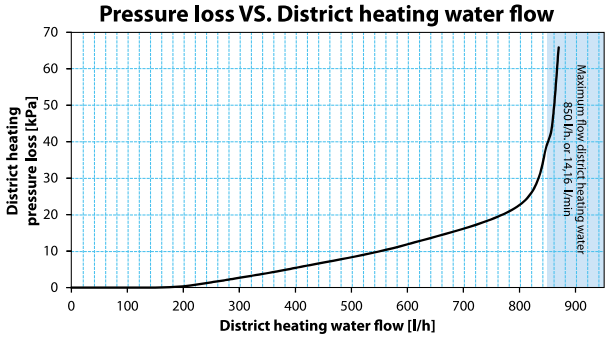
4.8.1 Performance curve: EvoFlat stations – TPC-M controller (type 1)

On the following pages you find performance curves for domestic hot water (DHW) capacity, which allow you easily to pre-select the right type of flat station.
For the DHW controller, type TPC-M, applied in EvoFlat flat stations,
Performance curves are shown for 3 different capacity ranges (type 1, 2 & 3), enabled by different size of brazed plate heat exchanger.

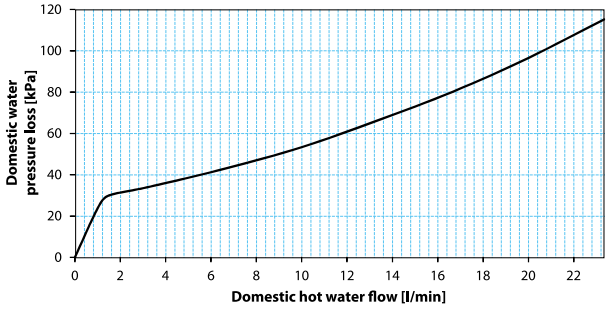
Type 1 – with heat exchanger, type XB 06H-1 26

Pressure loss:

Primary side
Pressure loss VS. District heating water flow

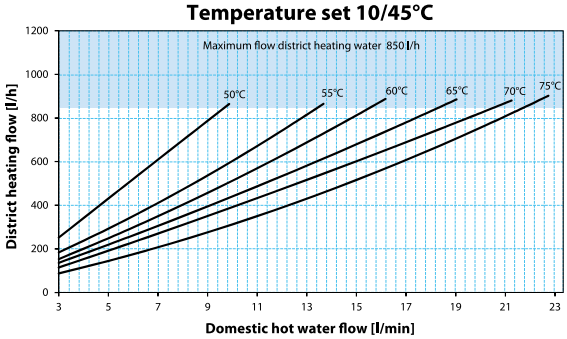


Secondary side
Pressure loss VS. Domestic water flow

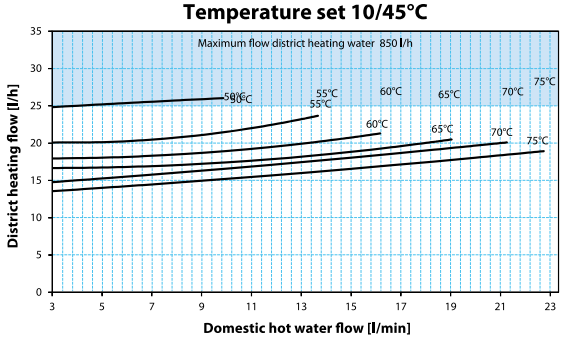


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

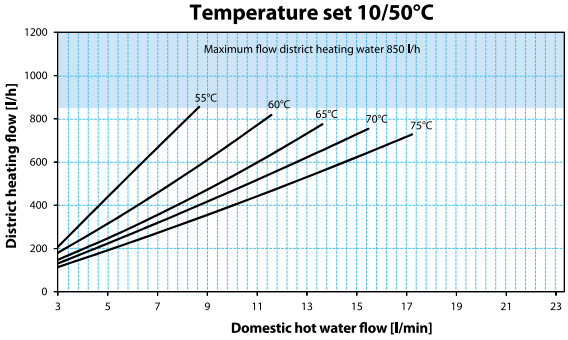


Domestic hot water
Temperature set 10/45°C

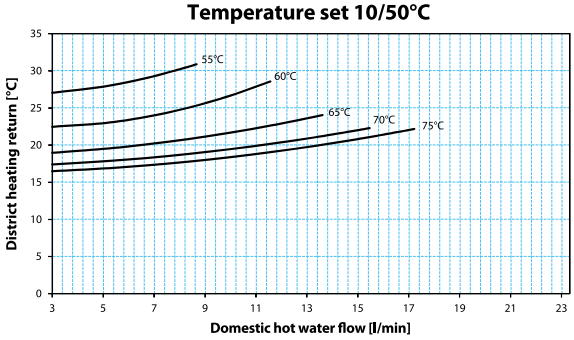


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C

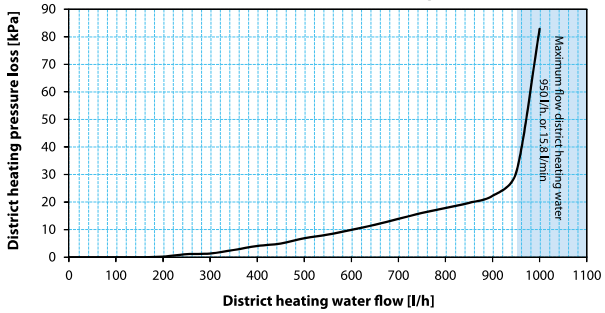


4.8.1 Performance curve: EvoFlat stations – TPC-M controller (type 2)

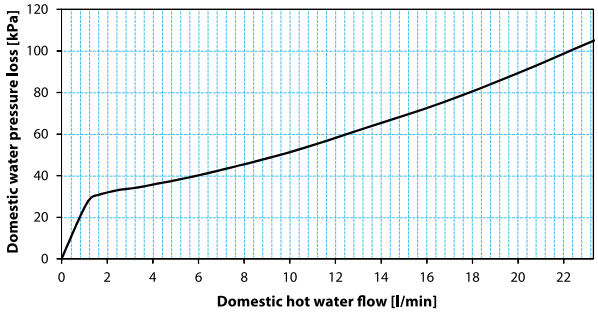
Type 2 – with heat exchanger, type XB 06H-1 40

Pressure loss:

Primary side
Pressure loss VS. District heating water flow

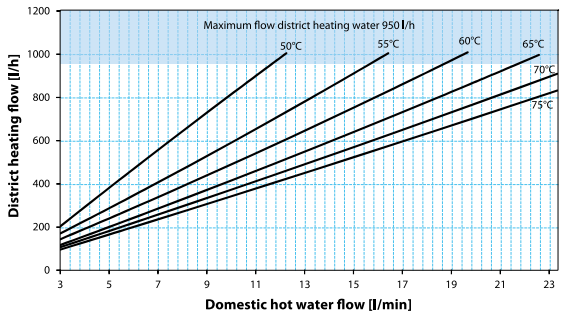


Secondary side
Pressure loss VS. Domestic water flow

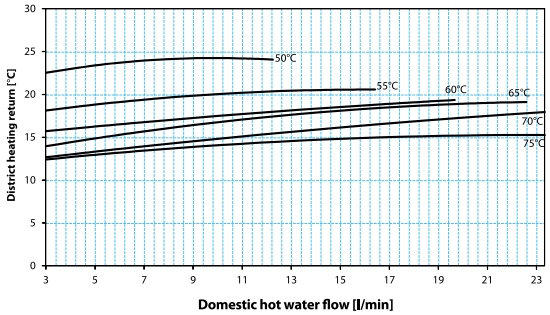


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

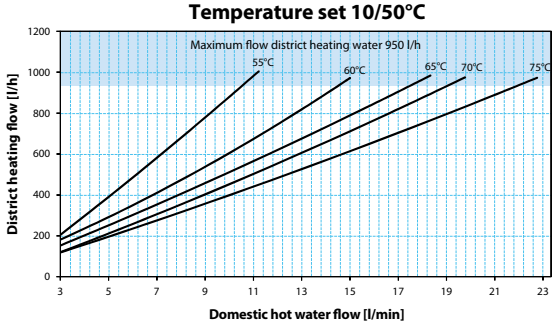


Domestic hot water
Temperature set 10/45°C

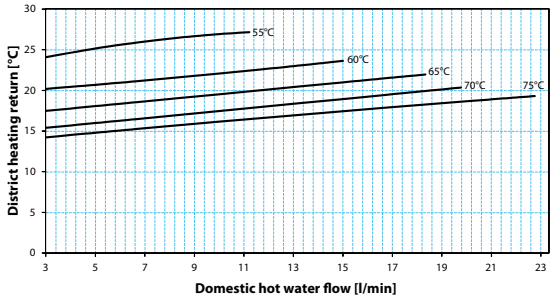


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C

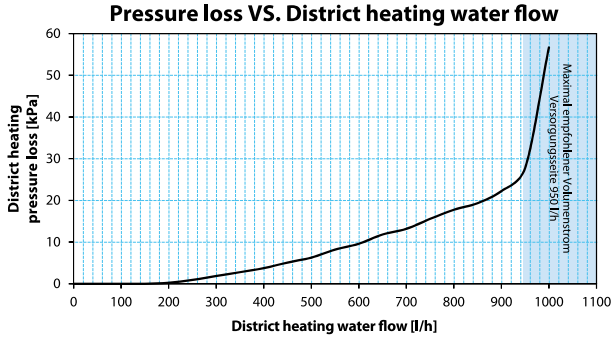


4.8.1 Performance curve: EvoFlat stations – TPC-M controller (type 3)

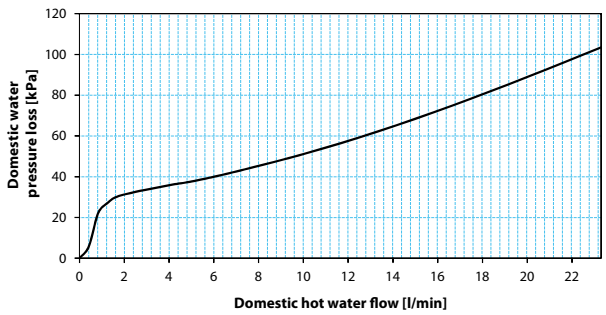
Type 3 – with heat exchanger, type XB 06H +60

Pressure loss:

Primary side
Pressure loss VS. District heating water flow

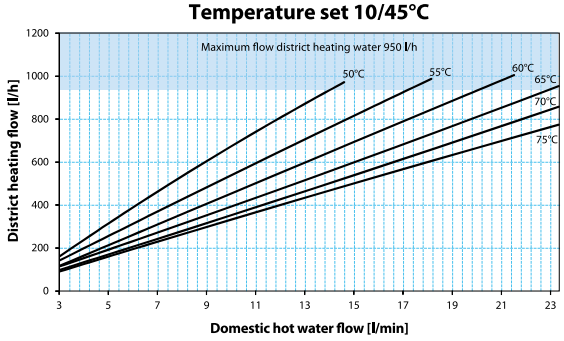


Secondary side
Pressure loss VS. Domestic water flow

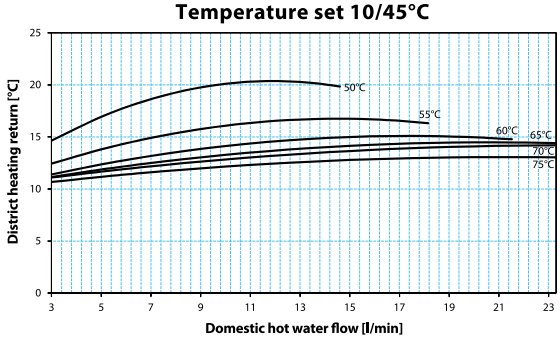


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

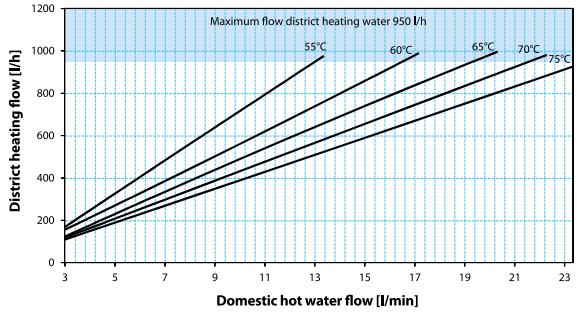


Domestic hot water
Temperature set 10/45°C

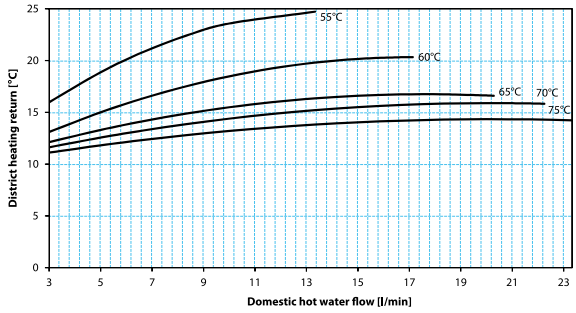


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C



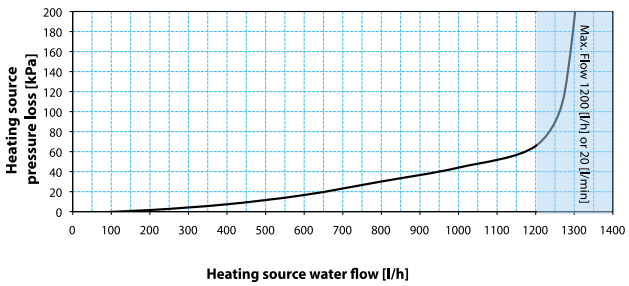
4.8.2 Performance curve: Termix stations – IHPT controller (type 1)

On the following pages you find performance curves for domestic hot water (DHW) capacity, which allow you easily to pre-select the right type of flat station.
For the DHW controller, type IHPT, applied in Termix flat stations, performance curves are shown for 2 different capacity ranges (type 1 & 2), enabled by different size of brazed plate heat exchanger.

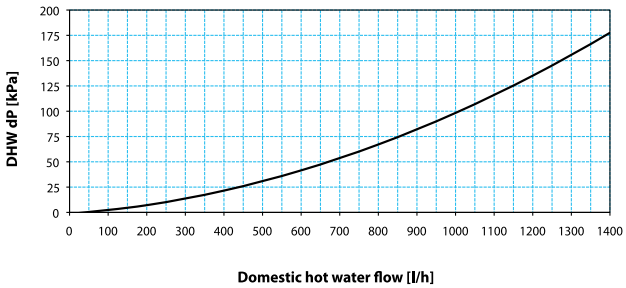
Type 1 – with heat exchanger, type XB 06H-1 26

Pressure loss:

Primary side
Pressure loss vs. Heating source water flow

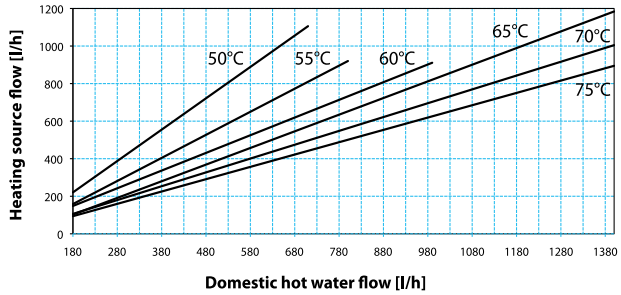


Seconday side
Pressure loss vs. Cold water flow

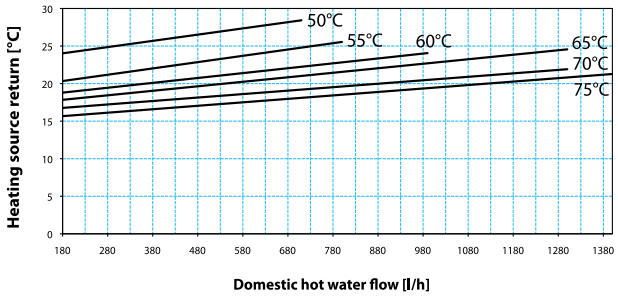


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

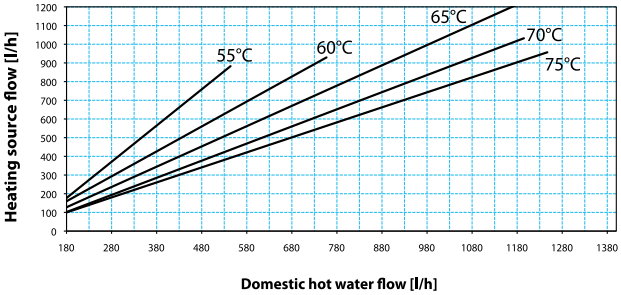


Domestic hot water
Temperature set 10/45°C

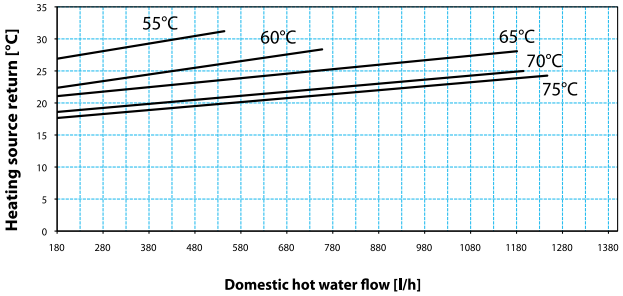


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C

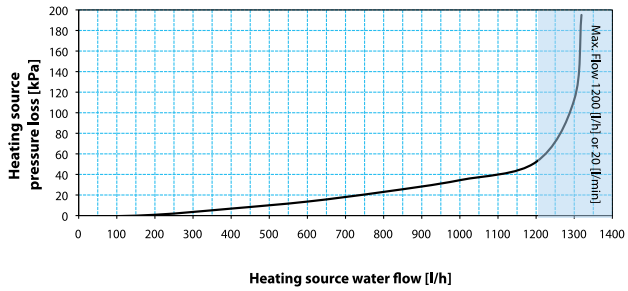


4.8.2 Performance curve: Termix stations – IHPT controller (type 2)

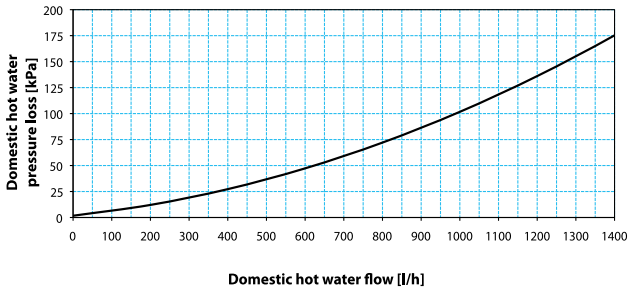
Type 2 – with heat exchanger, type XB 06H-1 40

Pressure loss:

Primary side
Pressure loss vs. Heating source water flow

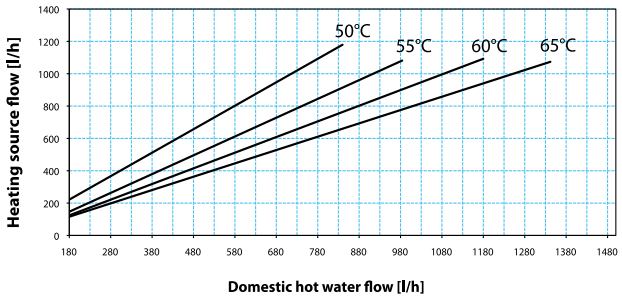


Seconday side
Pressure loss vs. Cold water flow

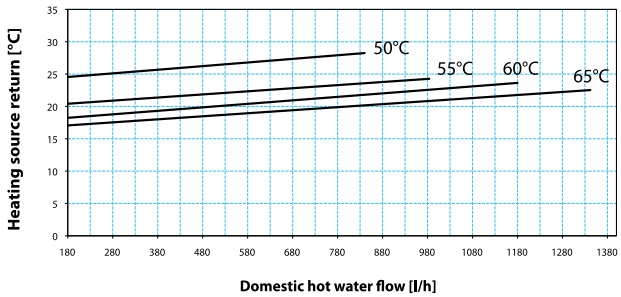


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

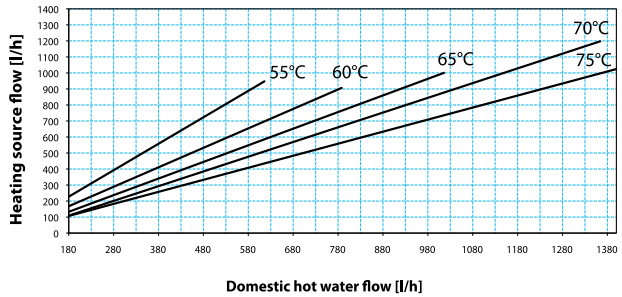


Domestic hot water
Temperature set 10/45°C

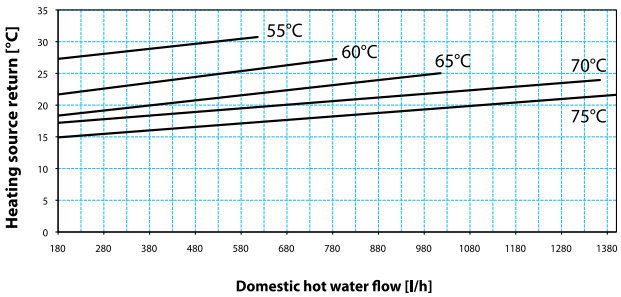


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C



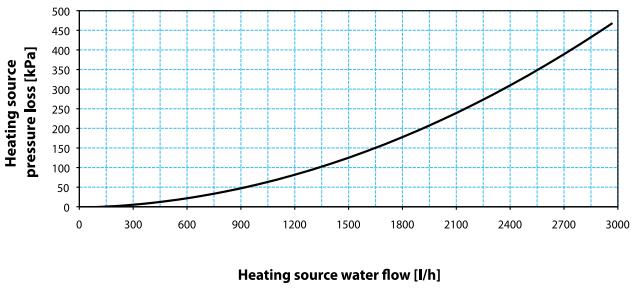
4.8.3 Performance curve: Termix stations – AVTB controller (type 1)

On the following pages you find performance curves for domestic hot water (DHW) capacity, which allow you easily to pre-select the right type of flat station.
For the DHW controller, type AVTB, applied in Termix flat stations, performance curves are shown for 4 different capacity ranges (type 1-4), enabled by different size of brazed plate heat exchanger.

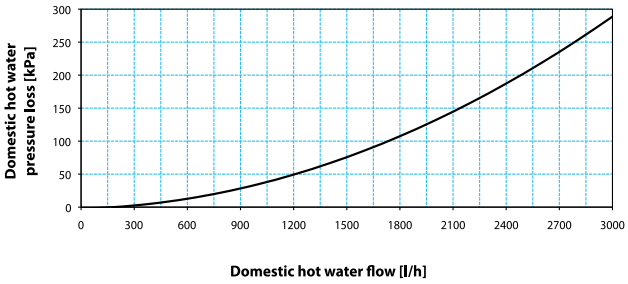
Type 1 – with heat exchanger type T24-16

Pressure loss:

Primary side
Pressure loss vs. Heating source water flow

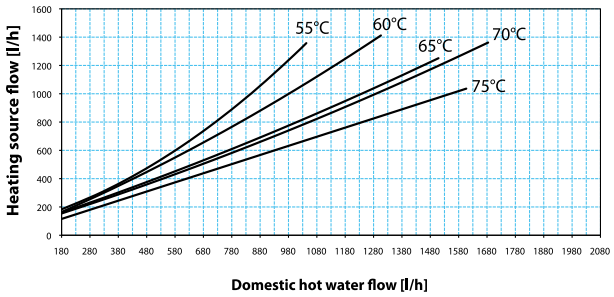


Secondary side
Pressure loss vs. Cold water flow

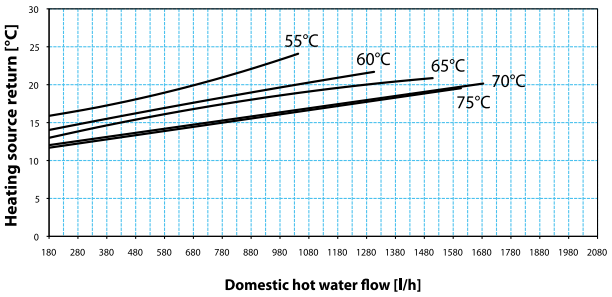


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

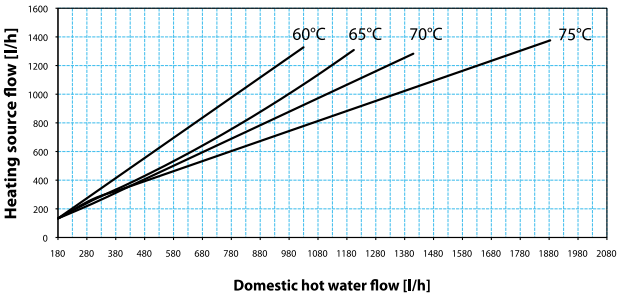


Domestic hot water
Temperature set 10/45°C

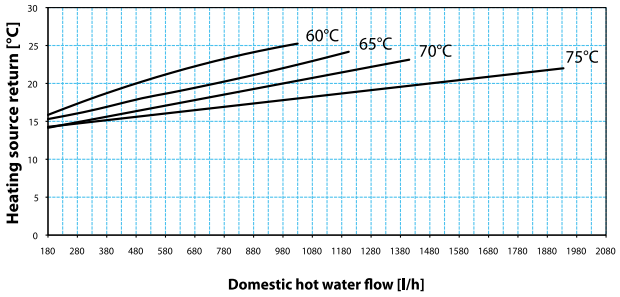


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C

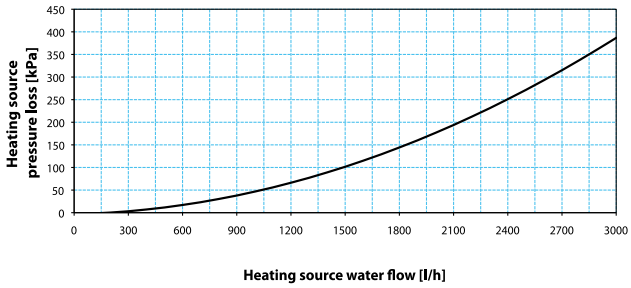


4.8.3 Performance curve: Termix stations – AVTB controller (type 2)

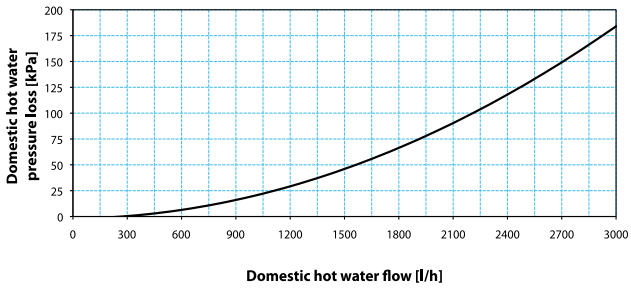
Type 2 – with heat exchanger type T24-24

Pressure loss:

Primary side
Pressure loss vs. Heating source water flow

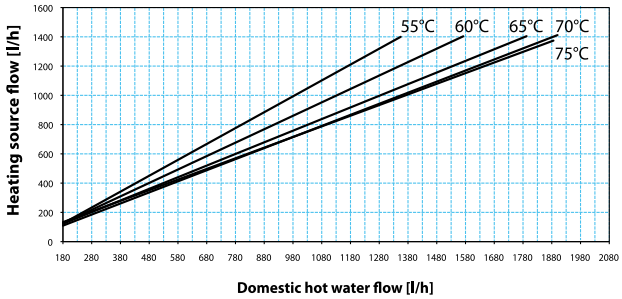


Secondary side
Pressure loss vs. Cold water flow

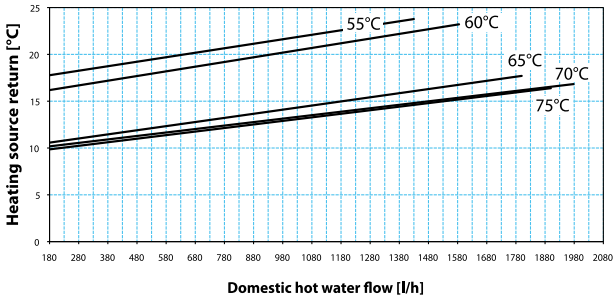


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

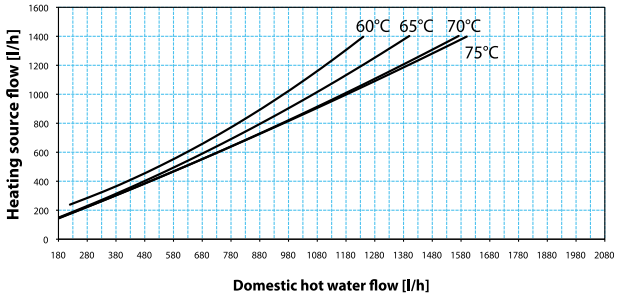


Domestic hot water
Temperature set 10/45°C

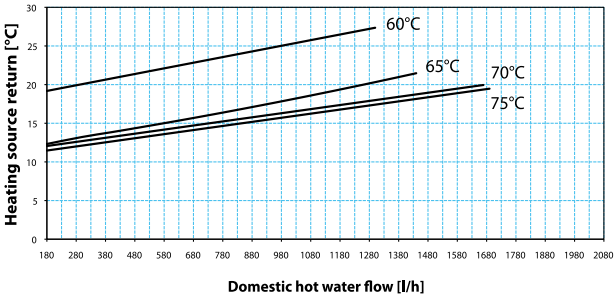


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C

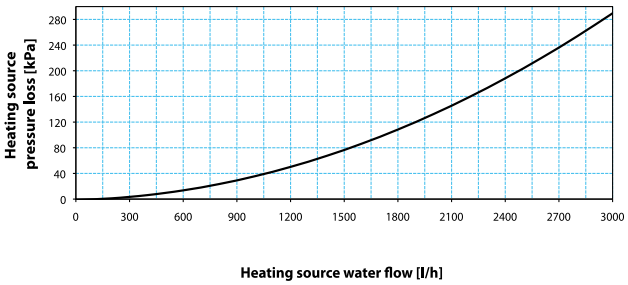


4.8.3 Performance curve: Termix stations – AVTB controller (type 3)

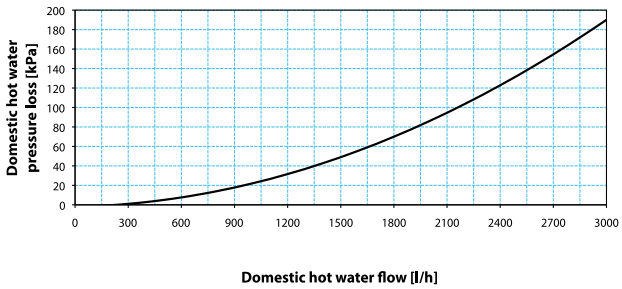
Type 3 – with heat exchanger type T24-24

Pressure loss:

Primary side
Pressure loss vs. Heating source water flow

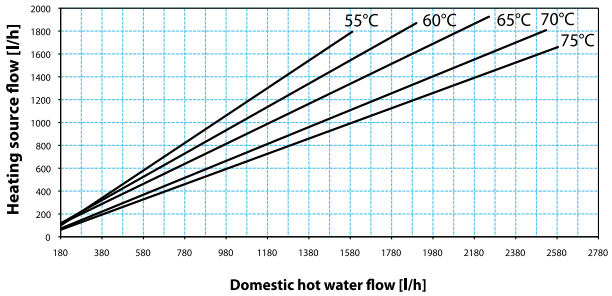


Secondary side
Pressure loss vs. Cold water flow

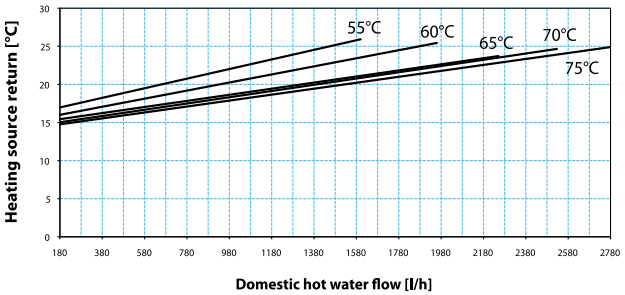


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

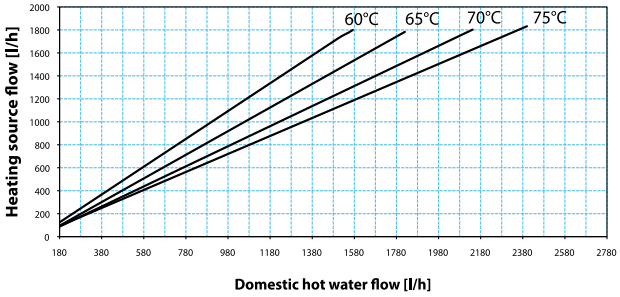


Domestic hot water
Temperature set 10/45°C

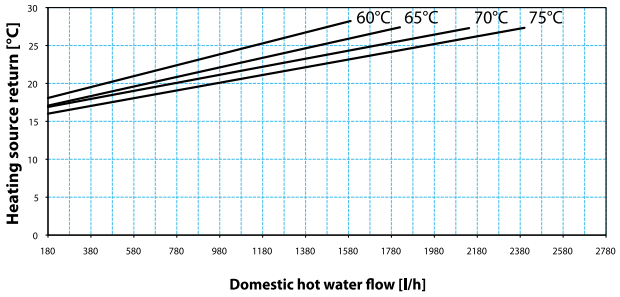


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C

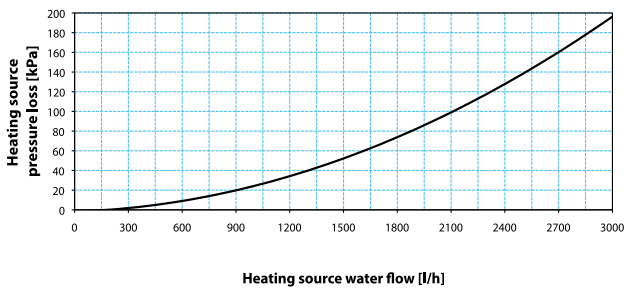


4.8.3 Performance curve: Termix stations – AVTB controller (type 4)

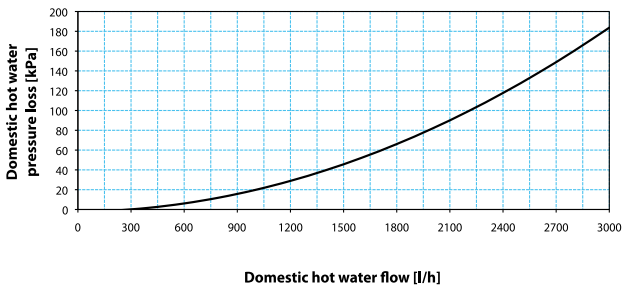
Type 4 – with heat exchanger type T24-32

Pressure loss:

Primary side
Pressure loss vs. Heating source water flow

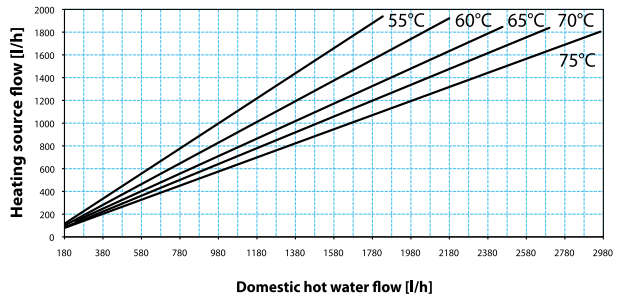


Secondary side
Pressure loss vs. Cold water flow

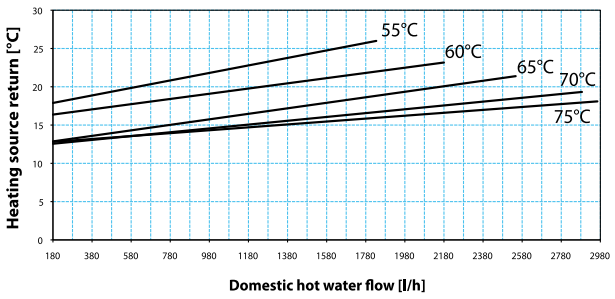


DHW capacity 45°C:

Domestic hot water
Temperature set 10/45°C

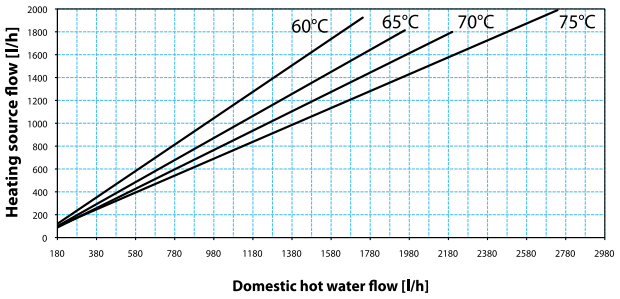


Domestic hot water
Temperature set 10/45°C

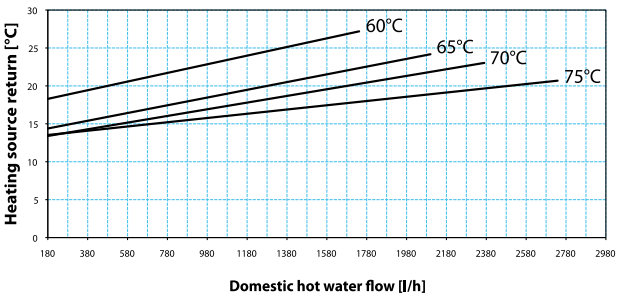


DHW capacity 50°C:

Domestic hot water
Temperature set 10/50°C



Domestic hot water
Temperature set 10/50°C



5. How to dimension the EvoFlat system?

System design and dimensioning principles

Dimensioning

A careful calculation of the pipe system and a precise configuration of the required dimensions are main requirements for an energy efficient operation of every system. In this respect systems with flat stations are no different to conventional systems, even though a complete hydraulic balanced complete system can be implemented considerably easier with the use of flat stations.

Elements of the system dimensioning

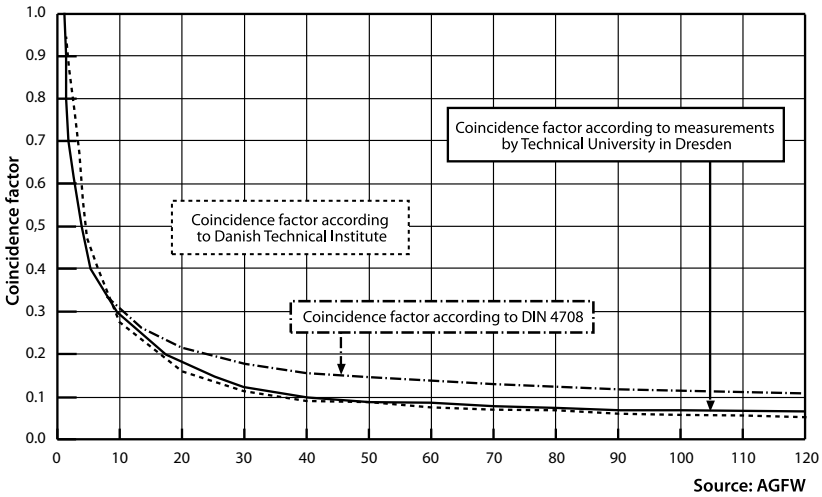
1. Heat source
2. Buffer tank
3. Pumps
4. Pipe system

System dimensioning

As basis for a proper dimensioning of the decentralized system, these parameters must be taken into account:

- Heat loss per apartment - required heating (HE) capacity
- Required domestic hot water (DHW) capacity
- Primary and secondary supply and return temperatures (summer/winter)
- Domestic cold water temperature (fresh water supply)
- Required DHW temperature
- Number of flats in the system (multi-dwelling building)
- Additional heat loss in the system

Coincidence factors for domestic hot water



Source: AGFW

Loads

Based on factual information or your estimation per apartment diversity factors

Temperatures

- Larger delta T (especially for heating) gives smaller flow rates - Secure a low return temperature(<30-40 °C)
- A flow temperature of min. 55-60 °C is always required (summer) but winter temperature could be higher

Flat station

Priority to DHW is in most cases given due to hydraulic lower pressure drop at DHW

Flow

Summer and winter situation should be compared and pipes chosen based on largest flow rate

Buffer vessel/boiler relation

- Buffer vessel takes up DHW-demand in a 10 minutes peak.
- Energy capacity in pipes must also be taken into account

Pump control

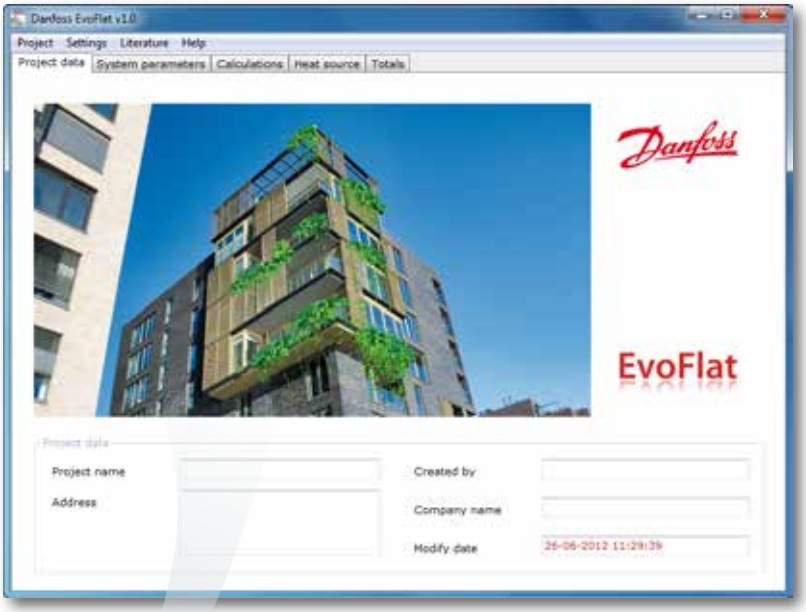
Ideally with remote diff. pressure sensors for "smaller" systems (10-20 apartments) use constant pressure setting at pump

5.1 Dimensioning with EvoFlat software

Support you in dimensioning decentralized heating systems

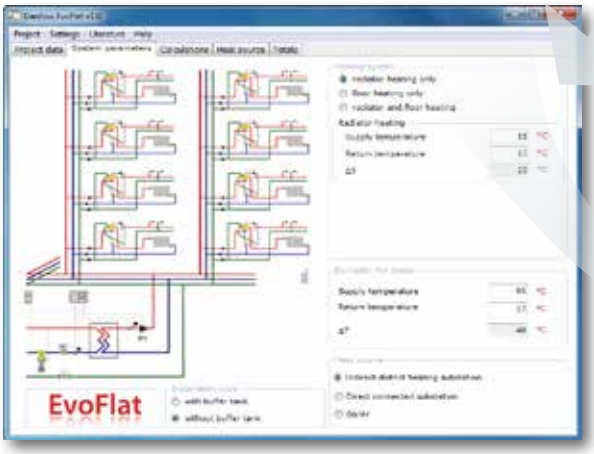
1: Start → Settings

Pre-selection of
the coincidence factors



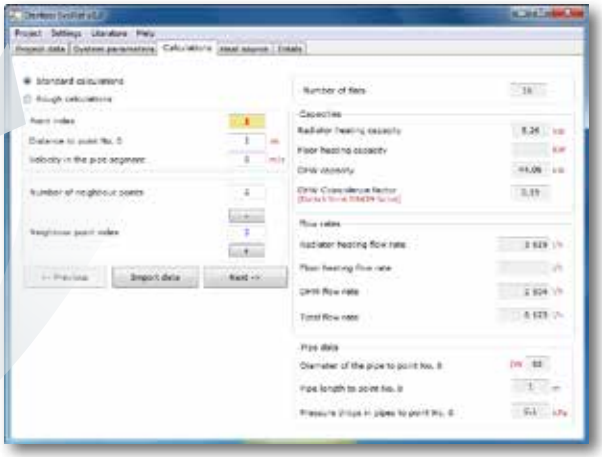
2: System → Application parameters

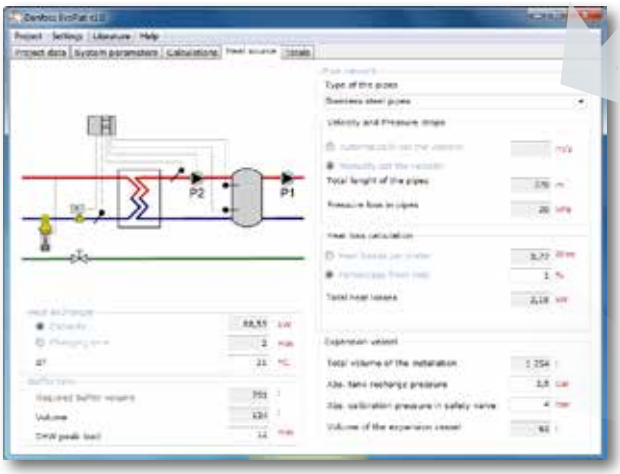
Type in the available application parameters



3: Table → Calculation

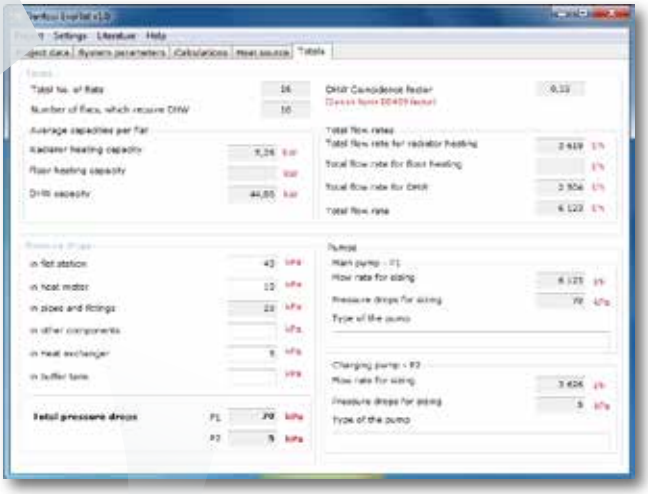
Pre-selection for the calculation of distribution
and raiser pipes





4: Result of central heat source

Calculation of the buffer tank volume



5: Dimensioning overview
Presentation of calculated flow volumes

Danfoss

Project name: Residential Park - Sofia

Address

Modify date: 28-06-2012 11:40:28

Created by: Todor Langochev

Company name: Danfoss

Heat source data

Heat source	Radiator heating	Floor heating	DHW
Indirect district heating substation with buffer tank	Tsupply 65 °C Treturn 45 °C ΔT 20 °C	Tsupply °C Treturn °C ΔT °C	Tsupply 65 °C Treturn 19 °C ΔT 46 °C

Result of calculations

Totals for the system

Total No. of flats: 16

Number of flats, which require DHW: 16

Average capacities		
Radiator heating capacity	5,26	kW
Floor heating capacity		kW
DHW capacity	44,06	kW
DHW Coincidence factor (Danish Norm DS439 factor)	0,19	

Total flow rates		
Total flow rate for radiator heating	3.619	l/h
Total flow rate for floor heating		l/h
Total flow rate for DHW	2.504	l/h
Total flow rate	6.123	l/h

Heat exchanger capacity		
Heat exchanger capacity	88,53	kW
Charging time	2	min

Buffer tank volume		
Required buffer volume	751	l
Buffer tank volume	124	l
DHW peak load	12	min

Pipe network				
Type of the pipes	Stainless steel pipes			
Total lenght of the pipes	378	m	Total volume of the installation	1.254 l
Velocity (Max)	0,6	m/s	Abs. tank recharge pressure	2,5 bar
Pressure loss in pipes	0,2	kPa/m	Abs. calibration pressure in safety valve	4 bar
Total pressure drops in pipes	20	kPa	Volume of the expansion vessel	63 l
Total heat losses	2,18	kW		

Pressure drops			Pumps	
in flat station	40	kPa	Main pump - P1	
in heat meter	10	kPa	Flow rate for sizing	6123 l/h

6: Print or export data
Export options of the data

How to install EvoFlat stations?

6. Installation examples

– Renovation and new buildings

Recess mounted flat station in a bathroom.

Recess mounting in a floor and kitchen.

On-wall mounting of a flat station.

Recess mounted flat station in a bathroom shaft.

Flat station with cover, recess mounted in a bathroom shaft.

Recess mounted flat station in a bathroom.

Recess mounting of a flat station with a floor heating distribution unit and controller.

A flat station mounted in a shaft or cupboard.

Recess mounting of a flat station with a floor heating distribution unit.

6.1 Dimensions and connections: EvoFlat stations
– On-wall mounting

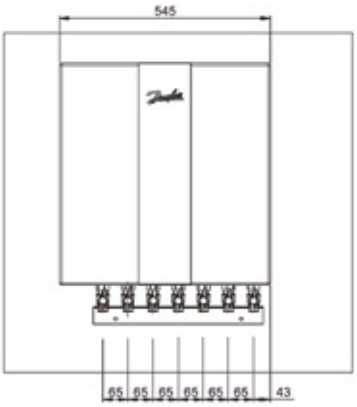
Flat station, type EvoFlat FSS

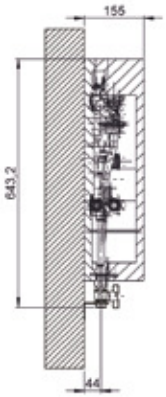
– for on-wall mounting with downward piping (with 62 mm ball valves)

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

Optional:

Connections with 120 mm ball valves





6.1 Dimensions and connections: EvoFlat stations

– Recess mounting

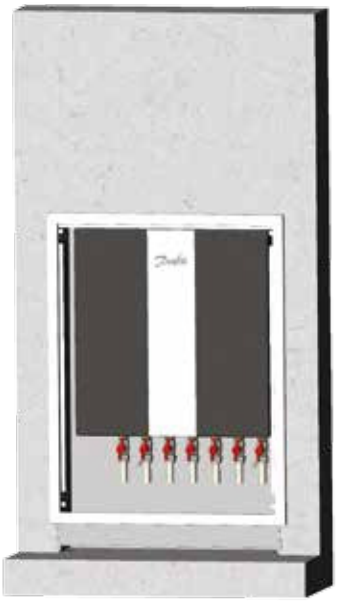
Flat station, type EvoFlat FSS

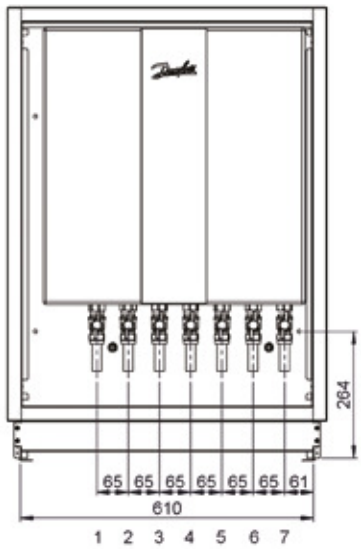
– for recess mounting with 62 mm ball valve connections

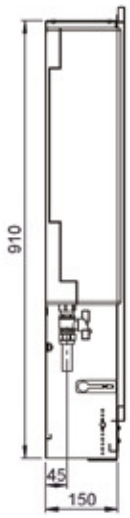
1: Domestic cold water (DCW) inlet
2: Domestic hot water (DHW)
3: Domestic cold water (DCW) outlet
4: District heating (DH) supply)
5: District heating (DH) return
6: Heating (HE) supply
7: Heating (HE) return

Optional:

Connections with 120 mm ball valves







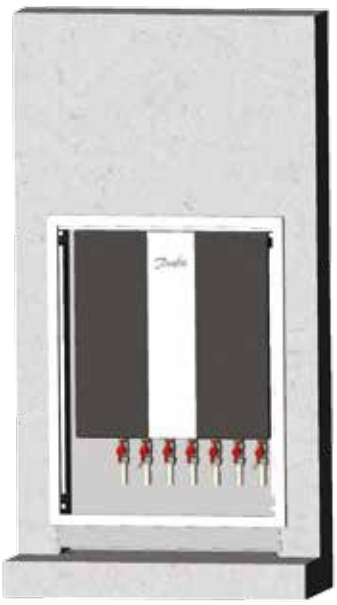
Flat station, type EvoFlat MSS

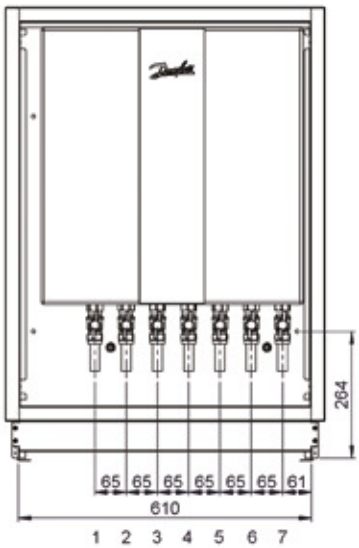
– for recess mounting with 62 mm ball valve connections

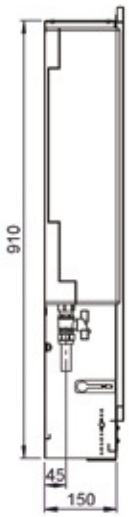
1: Domestic cold water (DCW) inlet
2: Domestic hot water (DHW)
3: Domestic cold water (DCW) outlet
4: District heating (DH) supply)
5: District heating (DH) return
6: Heating (HE) supply
7: Heating (HE) return

Optional:

Connections with 120 mm ball valves







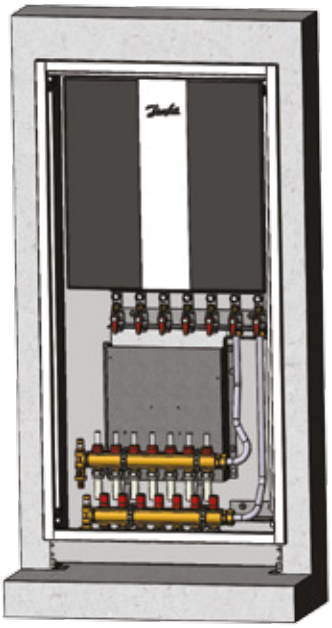
6.1 Dimensions and connections: EvoFlat stations

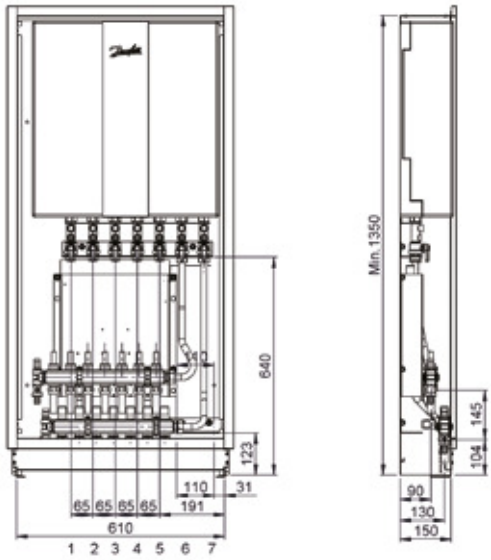
– Recess mounting with floor heating distribution unit

Flat station, type EvoFlat FSS

– for recess mounting, with floor heating distribution unit and 120 mm ball valve connections
(from 2 to max. 7 floor heating circuits)

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

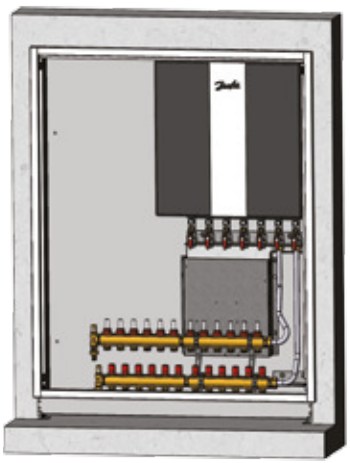


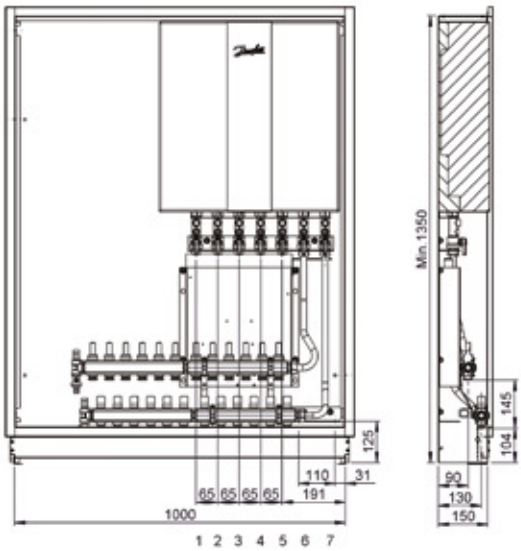


Flat station, type EvoFlat FSS

– for recess mounting, with floor heating distribution unit and 120 mm ball valve connections
(from 8 to max. 14 floor heating circuits)

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





6.2 Dimensions and connections: Termix stations

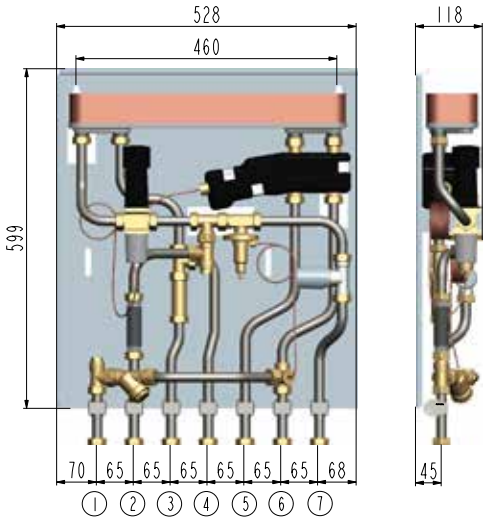
– On-wall or recess mounting

VMTD-F-B

– Type 1 + 2 + 3 +4

Connections:

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



Dimensions (mm):

Without cover
H 640 x W 530 x D 118
With cover (mount on wall variant)
H 800 x W 540 x D 242
With cover (built-in wall variant)
H 915-980 x W 610 x D 150

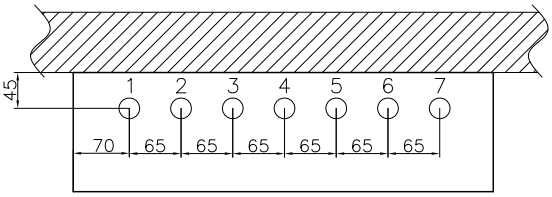
Other flat station variants – Termix range

VMTD-F-Mix-B

- Type 1 + 2 + 3 + 4

Connections:

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



Dimensions (mm):

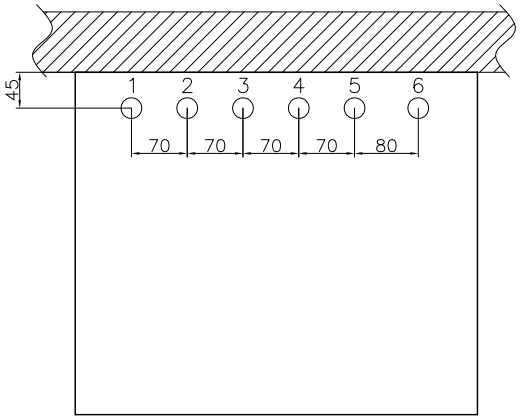
Without cover
H 780 x W 528 x D150
With cover
H 800 x W 540 x D 242

VVX-I

- Type 1 + 2 + 3

Connections:

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



Dimensions (mm):

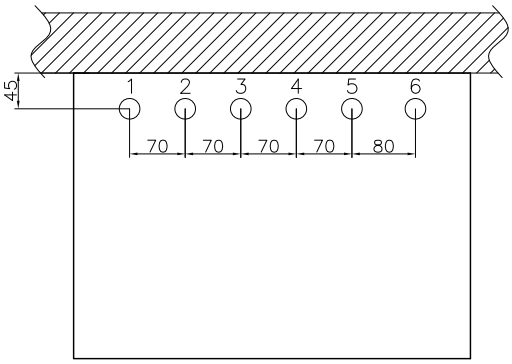
Without cover
H 750 x W 505 x D 375
With cover
H 800 x W 540 x D430

VVX-B

- Type 1 + 2 + 3

Connections:

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



Dimensions (mm):

Without cover
H 810 x W 525 x D 360
With cover
H 810 x W 540 x D 430

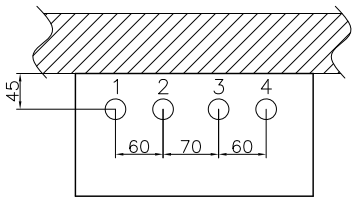
Water heaters

Termix Novi

- Type 1 + 2

Connections:

1. Domestic cold water (DCW)
2. Domestic hot water (DHW)
3. District heating flow (DH)
4. District heating return (DH)



Dimensions (mm).

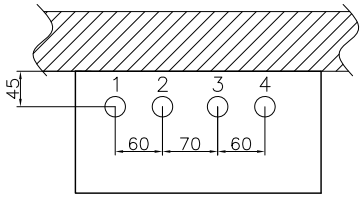
With insulation
H 432 x W 300 x D 155
With cover
H 442 x W 315 x D 165

Termix One

- Type 1 + 2 + 3

Connections:

1. Domestic cold water (DCW)
2. Domestic hot water (DHW)
3. District heating (DH) supply
4. District heating (DH) return



Dimensions (mm):

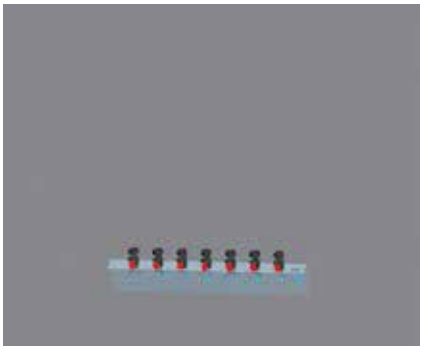
Without cover
H 428 x W 312 x D 155 (type 1+2)
H 468 x W 312 x D 155 (type 3)

With cover

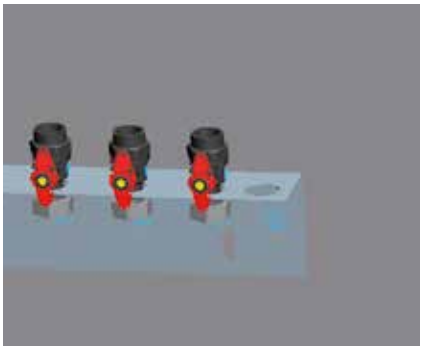
H 430 x W 315 x D 165 (type 1+2)
H 470 x W 315 x D 165 (type 3)

6.2 Dimensions and connections: Termix stations

– On-wall mounting sequence



Mounting rail is installed on the wall.



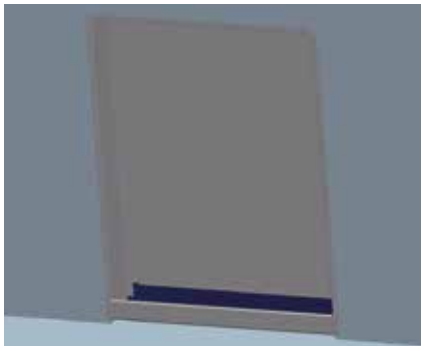
Ball valves positioning.

Mount the flat station directly on the ball valves.

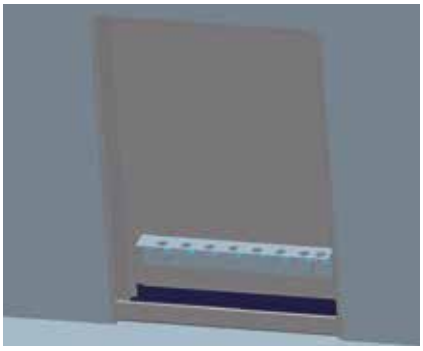
Place the door on the in the wall cover.

6.2 Dimensions and connections: Termix stations

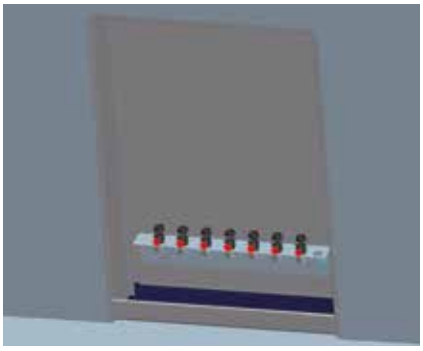
– Recess mounting sequence



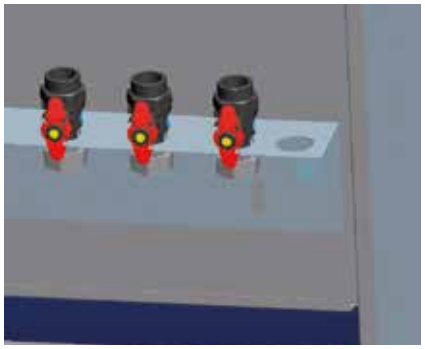
Prepare cut out for recess-box.



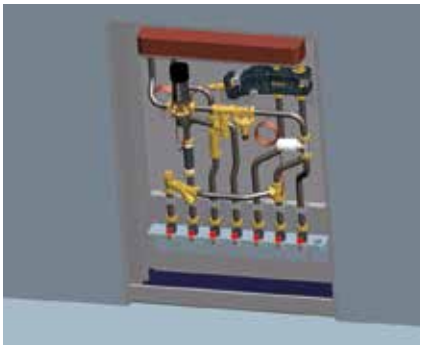
Mount recess-box with mounting rail.



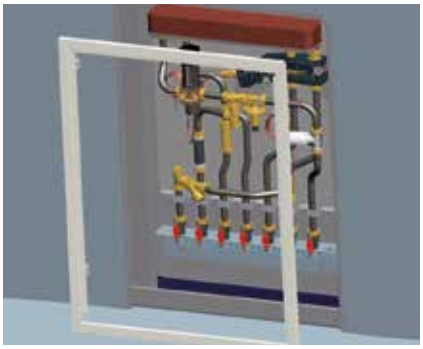
Install ball valves on the mounting rail.



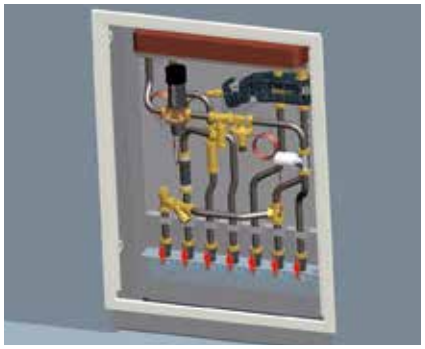
Ball valves positioning.



Mount the flat station directly on the ball valves.



After finishing the wall around the cut out, mount the painted frame.



Frame assembled.

Place the door on the in the wall cover.

6.3 Accessories for mounting of flat stations

Accessories - EvoFlat

Required accessories (built-in variant)	Option code
Recess box H 910 x W 610 x D 150 mm (recess mounting)	004B8408
Ball valve ¾" ext.-ext. thread, 60 mm	004B6039

Required accessories (built-in variant - safety valve variant)	Option code
Recess box H 910 x W 610 x D 150 mm (recess mounting)	004B8408
Ball valve with gauge ¾" ext.-ext. thread 120 mm	004B6040
Safety valve set, total length 120 mm	004U8445

Required accessories (wall-mounted variant - surface mounted piping)	Option code
White cover with door, open at the bottom H 740 x W 600 x D 200 mm	004B8407
White cover w/o door, open at the bottom H 780 x W 600 x D 200 mm	004B8578
Mounting rail for ball valves, 7 holes	004U8395
Ball valve ¾" ext. thread, 60 mm	004B6039
Ball valve with gauge ¾" ext.-ext. thread 120 mm	004B6040

Required accessories (built-in variant with distribution unit	Option code
Recess box H 1350 x W 610 x D 150 mm (recess mounting)	004U8387
Recess box H 1350 x W 850 x D 150 mm (recess mounting)	144B2111
Recess box H 1350 x W 1000 x D 150 mm (recess mounting)	004U8389

Accessories supplied loose	Option code
Thermometer Ø35, 0- 120°C, for mounting in 004B6040	004U8396
Actuator TWA-K NC 230V	088H3142
Actuator TWA-K NC 24V	088H3143
Room thermostat TP 7000	004U8398
Room thermostat Danfoss TP 5001	087N7910
Ball valve 3/4"ext.-int. thread, L = 60mm	004B6098
Ball valve 3/4"ext.-int. thread, L = 120mm	004B6095
EPP Front insulation cover	145H3016

Accessories for Termix One + Termix Novi

Description	Option code
Cover for Termix One type 1 + 2	AG1
Cover for Termix One type 3	AG2
Cover for Termix Novi	AG19
Safety valve/non-return valve 10 bar	BG1
GTU Pressure equalizer for type 1 and 2	BG4
Thermostatic circulation set	CG1 (Termix One)
Ball valve int./ext. Thread	RG1
Ball valve ext./ext. Thread	RG2
Circulation pipe/connection with non-return valve	CG10 (Termix Novi)

Accessories - for Termix VMTD-F-B, VMTD-F-MIX-B

Description	Option code
Cover for Termix VMTD-F, mount on wall variant	AG10
Safety valve/non-return valve 10 bar	BG1
GTU Pressure equalizer for type 1 and 2	BG4
Thermostatic circulation set	CG1 (VMTD-F + VMTD-F-MIX-B)
Connection for circulation	DG2
Circulation pump, UP 15-14 B	CG7
Circulation pump, Wilo Z 15 TT	CG9
Deduction for Grundfos UPS in VMTD-MIX	PG2 (VMTD-F-MIX-B)
Deduction for Grundfos UPS in VMTD-MIX-2/VMTD-MIX-3	PG3 (VMTD-F-MIX-B)
AT Thermostat for switching off pump at too high temperatures	TG1 (VMTD-F-MIX-B)
Extra charge for ECL Comfort 110 incl. mounting*	EG1 (VMTD-F-MIX-B)
Pipe insulation	IG5 (VMTD-F-B + VMTD-F-MIX-B)
Room thermostat, TP7000	FG1
Room thermostat Danfoss, TP 7000RF incl. RX1	FG3
Zone valve with actuator, VMT 15/8 TWA-V 230 NC	FG2
Return temperature limiter FJVR	GG1
Ball valve int./ext. Thread	RG1
Ball valve ext./ext. Thread	RG2
Thermometer	RG3
Manometer	RG4
Mounting rail, including 7 ball valves	SG1
Insulation of heat exchanger	IG15 (VMTD-F-B + VMTD-F-MIX-B)
Pipe connection combined up/down	On request

**) VS 2, AMV 150, AKS 11.*

6.3 Accessories for mounting of flat stations

Accessories for Termix VVX-B and VVX-I

Description	Option code
Cover for Termix VVX-B	AG12
Safety valve/non-return valve 10 bar	BG1
GTU Pressure equalizer for type 1 and 2	BG4
Thermostatic circulation set	CG1 (VVX-B)
Pipe insulation	IG8
Mixing circuit, thermostatic	MG2
Mixing circuit with ECL110 and UPS 15-60 pump	MG4
Connections for radiator on mixing circuit	DG3
Deduction for Grundfos UPS in VVX	PG32
Insulation of heat exchanger	IG15 (VVX-B)
Extra charge for ECL Comfort 110 incl. mounting**	EG1
Extra charge for ECL Comfort 210/A230 incl. mounting**	EG8
Extra charge for ECL Comfort 210/A237 incl. mounting**	EG9
Extra charge for ECL Comfort 210/A266 incl. mounting**	EG10
Extra charge for Danfoss AVPB-F	UG3
Filling line between DH and HE	VG1
Ball valve int./ext. Thread	RG1
Ball valve ext./ext. Thread	RG2
Thermometer	RG3
Manometer	RG4
Extra charge for replacement of VMT/RAVK with AVTB15 (x-1+x-2)	FG8
Extra charge for replacement of VMA/RAVK with AVTB20 (x-3)	FG7
Circulation pipe/connection with non-return valve	CG13 (VVX-I)

***) VS 2, AMV 150, ESMB 10, AKS 11*

Necessary accessories for in-wall mounting in 110 mm depth.

VMTD-F-B + VMTD-F-I complete insulation

Description	Amount	Option code
Cover for Termix VMTD-F, built-in wall variant (recess box 110 mm)	1	AG11
Ball valves ext.	7	RG2

Necessary accessories for in-wall mounting in 150 mm depth.

VMTD-F-B + VMTD-F-I complete insulation

Description	Amount	Option code
Cover for Termix VMTD-F, built-in wall variant (recess box 150 mm)	1	AG15
Ball valves ext.	7	RG2

Necessary accessory for premounting the pipes without stations

VMTD-F-B + VMTD-F-MIX-B + VMTD-F-I complete insulation

Description	Amount	Option code
Mounting rail, including 7 ball valves	1	SG1

7. Central control and monitoring from heat production to heat use

Electronic control with ECL Comfort

Danfoss develops and produces most of its flat station components itself. This results in crucial benefits for electronic control in particular. The controllers of the new ECL Comfort series can consequently perform the following controlling tasks:

- Requirement dependent control of a district heat transfer station
- Buffer management acceptance
- Control and regulation of the system pumps
- Weather compensated control of the supply temperature
- Contact point for heat sources

Central control and monitoring

The use of central control and monitoring system is recommended to optimise operation and billing in heating system, from energy production to decentralized heat distribution and domestic water heating.

For this very purpose Danfoss flat stations offer a complete solution ranging from weather compensated heat production to buffer tank management, through to the control of each individual flat station.

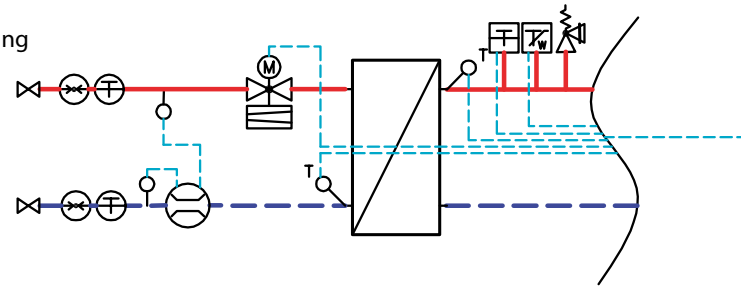
The "master" in this system is the freely programmable ECL Apex 20, which works with the ECL Apex Web Panel or a PC as a control unit that assumes the temperature and pressure control, pump management and system monitoring.

For integration into the system, every flat station must be fitted with the network-enabled ECL Comfort 310, which communicates via Modbus with the Apex 20. Consumer data for hot and cold water can therefore also be transferred, centrally recorded and billed.

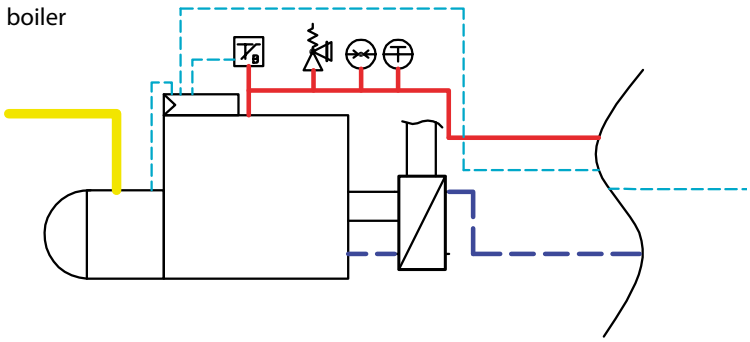
The most important benefits of central control and monitoring are:

- Weather compensated heat production (boiler, local and district heating)
- Optimum buffer tank and solar management
- Highest possible system operation reliability
- Energy efficient energy distribution
- Central consumption recording and billing

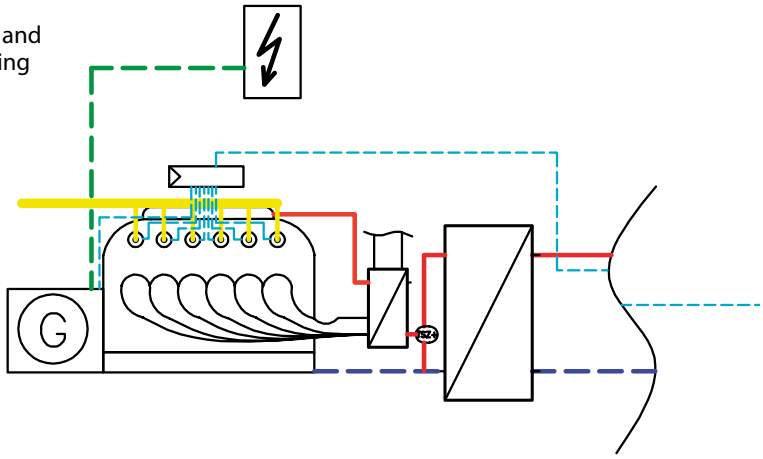
District heating substation and heat transfer unit

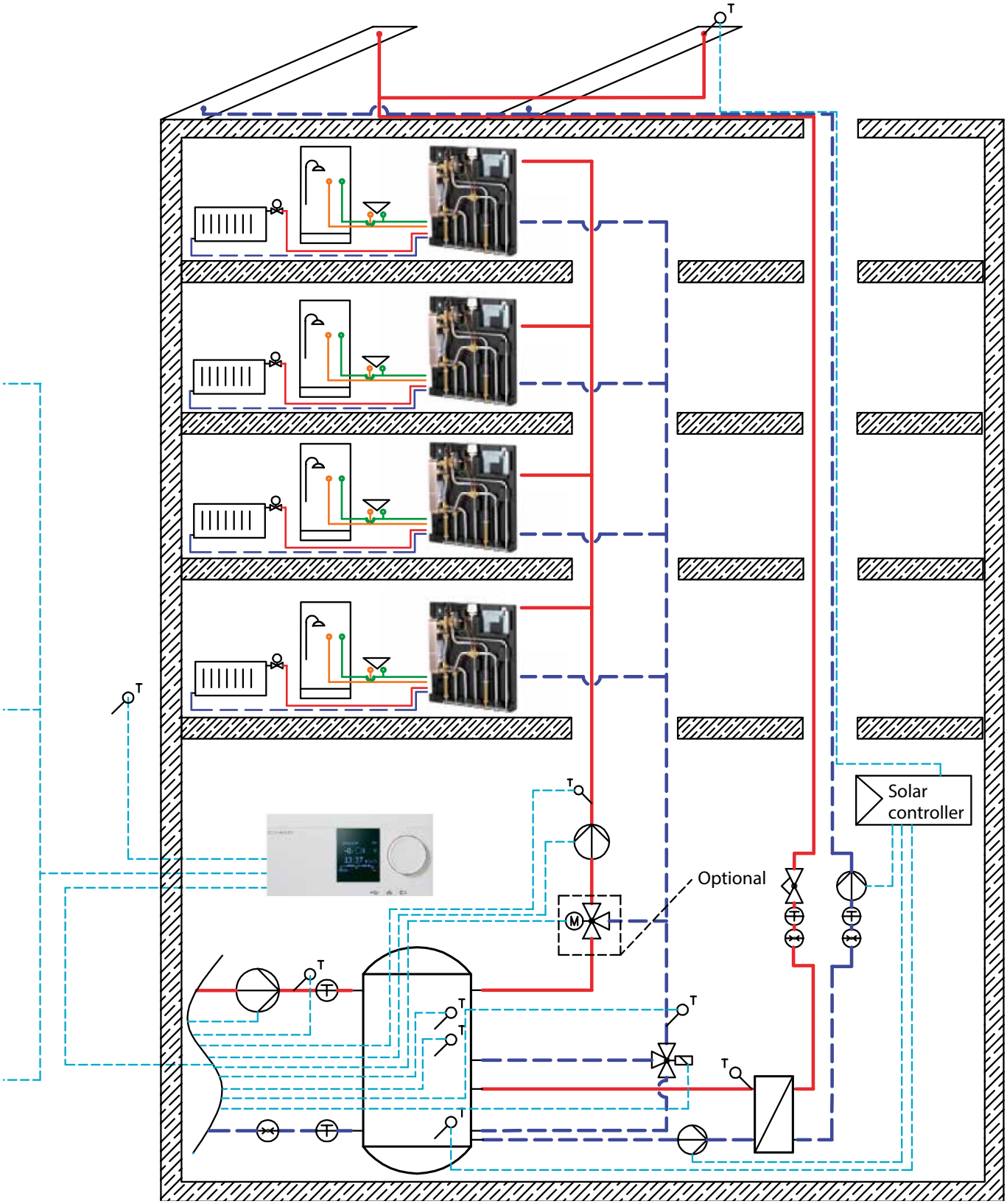


Condensing boiler



Micro CHP and block heating




T
Solar
controller
Optional
M

8. Reference list

In countries all over Europe thousands of Danfoss flat stations have already been installed. They are effectively in operation - trouble-free and giving high user satisfaction and comfort for house owners and tenants.

Project/Location	Country	Project year	Installed product type	Project size (# pcs.)
Hallein	Austria	2010	Akva Lux S-F	18
Linz	Austria	2010	Akva Lux S-F	101
Lungau	Austria	2010	Akva Lux II TDP-F	38
Neustadt	Austria	2010	Akva Lux II TDP-F	45
Walz	Austria	2007	Termix VMTD-F	49
Bourgas	Bulgaria	2013	EvoFlat FSS 1	35
Utrine	Croatia	2010	Termix VMTD-F	172
Vrbani VMD	Croatia	2010	Termix VMTD-F	82
Dubecek	Czech Republic	2007	Termix VMTD-F	68
Asagården, Holstebro	Denmark	2009	Termix VMTD-F	444
Lalandia Billund	Denmark	2008	Termix VMTD and distribution units	750
Sønderborg, Kærhaven	Denmark	2010	Akva Lux II TDP-F	324
Giessen	Germany	2009	Akva Vita TDP-F	300
Hano	Germany	2009	Akva Lux II TDP-F	61
Hamburg Urbana	Germany	2008	Termix VMTD-Mix/BTD-MIX	200
Hollerstauden	Germany	2009	Akva Lux II TDP-F	127
Ilmenau	Germany	2010	Akva Lux II TDP-F	44
Kornwestheim	Germany	2010	Akva Lux II TDP-F	36
Köln	Germany	2008	Termix VMTF-F	345
Neuhof II	Germany	2010	Termix VXX	23
Trier	Germany	2009	Akva Lux II S-F	100
Hollerstauden, Ingoldstadt	Germany	2010	Akva Lux II TDP-F	164
Dublin	Ireland	2007	Termix VMTD-F	113
The Elysian Tower	Ireland	2007	Termix VVX	46
BIG Klaipeda	Lithuania	2008-2010	Akva Lux II TDP-F	500
Stavanger	Norway	2008-2010	Akva Lux II TDP-F	1000
Stavanger	Norway	2010	Termix VVX	96
Eden Park	Slovakia	2009	Termix VMTD-F	344
Obydick	Slovakia	2009	Termix VMTD-F + BTD	94
Sliac	Slovakia	2010	Termix VMTD	41
Brežice	Slovenia	2008	Termix VMTD-F	100
Koroška	Slovenia	2007	Termix VMTD-F	165
Tara A	Slovenia	2008	Termix VMTD-F	110
Tara B	Slovenia	2008	Termix VMTD-F	100

Project/Location	Country	Project year	Installed product type	Project size (# pcs.)
Tara S2	Slovenia	2009	Termix VMTD-F	81
Rudnik	Slovenia	2007	Termix VMTD-F	125
Savski breg	Slovenia	2008	Termix VMTD-F	152
Smetanova	Slovenia	2009	Termix VMTD-F	108
Parquesur, Madrid	Spain	2010	Termix measuring units	41
Lerum	Sweden	2010	Akva Lux II TDP-F	32
Akasya	Turkey	2010	Akva Lux II TDP-F	450
Altinkoza	Turkey	2010	Termix VMTD-F	193
Anthill	Turkey	2010	Termix VMTD-F	803
Finanskent	Turkey	2010	Termix VMTD-F	156
Folkart	Turkey	2008	Termix VMTD-F	180
Günesli Evleri	Turkey	2010	Termix VMTD-F	170
Kiptas Icerenköy	Turkey	2009	Termix VMTD-F	167
Kiptas Masko	Turkey	2009	Termix VMTD-F	450
Maltepe Kiptas First Phase	Turkey	2008	Termix VMTD-F	890
Nish Istanbul	Turkey	2009	Termix VMTD-F	597
Savoy	Turkey	2010	Termix VMTD-F	298
Selenium	Turkey	2008	Termix VMTD-F	216
Selenium Twins, Istanbul	Turkey	2008	Termix VMTD-F	222
Topkapi Kiptas	Turkey	2008-2009	Termix VMTD-F	800
Caspian Wharf	United Kingdom	2010	VX-Solo	105
Dementia	United Kingdom	2010	Akva Vita TDP-F	21
Freemans, London	United Kingdom	2010	Termix VMTD-F	232
Greenwich Peninsula	United Kingdom	2010	VX-Solo	229
Indescon Court Docklands, London	United Kingdom	2009	Termix VMTD/Termix VVX	246/108
Kidbrooke, London	United Kingdom	2010	Termix VVX	108
Merchant Square	United Kingdom	2009-2010	Termix VVX	197
Stratford High Street	United Kingdom	2010	Akva Lux VX	111
Westgate, London	United Kingdom	2009-2010	Termix VVX	155

9. FAQ

Advises to design and installation

1. Wet rooms set up

The combining of wet rooms (bathroom, toilet and kitchen) within an apartment can not only save on costs with less construction and installation materials – financial benefits, such as higher rental income or appropriation, can also be generated with greater utility space.

A distance of 6 meters between the flat station and the furthest consumption point should not be exceeded to rule out delay times when turning on hot water. If more than that, circulation pump should be added to maintain the end user comfort.

2. Noise and fire prevention

The applicable noise and fire prevention regulations must be concerned during flat station in wall installation.

The flat station should be installed in order to preserve fire prevention sections. During design must be ensured that applicable regulations are complied and additional measures are used to ensure that neither noise nor fire prevention are impaired.

3. Heat insulation

Continuous and high quality insulation on hot pipelines is extremely important. This applies in particular to the distribution set up on systems with flat stations. As these pipes are in operation around the clock the entire year long, solid insulation without gaps is indispensable. Depending on the local regulations, a minimum insulation of 2/3 of the pipe diameter, but at least an insulation thickness of 30 mm, must be provided.

Insulation on the fittings at the distribution pipes is also ideal, as higher losses can also occur because of the turbulent flows caused by the optimum heat transfers. The use of factory manufactured insulating shells, offered by many manufacturers, is ideal for these kinds of valves. With manually produced insulating shells you must ensure that, in addition to the shell's insulation thickness, they also close tightly and no convection occurs in the gaps.

4. Thermosiphon with buffer connection

Instead of fault prone non return valves, the connections of the heat exchanger's load lines and the solar system on the buffer tank should be provided with a thermo siphon, whereby the siphon height should correspond with 10 times the pipe diameter.

5. Inflow speed with buffer tank

All supply pipes connected to a buffer tank should be configured for a maximum inflow speed of 0.1 m/s; this prevents turbulences in the buffer tank and mixing of the different temperature layers.

6. Temperature measurement in the buffer tank

When selecting the buffer tank you must ensure measurement connections (as immersion sensors) to measure the available water temperatures.

The use of a heat conduction paste is recommended when installing the temperature sensor for improved heat conductivity.

7. Radiators in general areas

The complete implementation of hydronic concept must not be forgotten when heating general areas (e.g. corridors, laundry room, drying room, hobby room, etc.). This means:

- Use of a differential pressure controller in the radiator connection pipe
- Radiator valve sets presetting
- Use of a return temperature limiter

A flat station is also a good solution if hot water is required in a general area (e.g. laundry room).

8. Rooms with more than one radiator

With radiator systems with flat stations, all radiators should be equipped with thermostatic valves. All radiator thermostats within a room should be set to the same value to ensure a constant room temperature.

Fluctuating room temperature could be prevented by using high quality radiator thermostats.

Some exceptions are radiators in reference rooms which, in combination with a room thermostat and a zone valve, are responsible for the heat supply for the entire apartment.

9. Connecting pressure measurement pipes

If a manometer or a measurement pipe is connected for pressure measuring, this connection should be made, if possible, on vertical pipelines.

If the pressure measurement can only be made on a horizontal pipe because of structural conditions, the connection must be made horizontally in the centre of the pipe.

If these guidelines are not observed with the arrangement of the pressure measurement pipes, trapped air (connection above) or dirt build ups (connection below) can cause erroneous measurements.

Commissioning of flat stations

All flat stations must be submitted to commissioning after the whole system is thoroughly rinsed. This should be documented as a test log (per unit). Danfoss provides appropriate commissioning for Danfoss flat stations.

Notes

ENGINEERING
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We mind your business

Danfoss is more than a household name in heating. For more than 75 years, we have been supplying customers all over the world with everything from components to complete district heating system solutions. For generations, we have made it our business to help you mind yours, and that remains our goal both now and in the future. Driven by our customers needs, we build on years of experience to be at the forefront of innovation, continually supplying components, expertise and complete systems for climate and energy applications. We aim to supply solutions and products that give you and your customers advanced, user-friendly technology, minimum maintenance, and environmental and financial benefits along with extensive service and support.

Most of it we make ourselves

All major component of the EvoFlat flat stations are designed and manufactured by Danfoss. This includes the new MicroPlate™ heat exchanger, temperature control and safety valves, self-acting and electronic controllers. All parts assembled on our own factories in Denmark that are certified after the ISO 9001 quality standard.

Here we ensure optimum performance and functionality both during installation and later during operation at our customers' site.

In this way we develop technically high quality products that you as our customer can rely on. In case of malfunction Danfoss will always be able actively to assist with problem solving.

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