

Heat Recovery based on Exhaust Air

Heating Domestic Hot Water Controlled Ventilation Preheated Supply Air



Ventilation, which means totally hygienic inside air, is a basic requirement for living in a healthy house.

Ventilation – health aspects

Since the early 1980s there has been much discussion about Sick Building Syndrome (SBS). This refers to allergic disorders, and even illness symptoms, which frequently occur in certain buildings and rooms. This can lead to chronic illness, reducing the person's ability to work and function in general. This in turn results not only in the individual losing his or her quality of life, but it also has a major detrimental impact on the economy and incurs huge costs.

Basically, the following potential risks jeopardising people's health are to be found inside buildings:

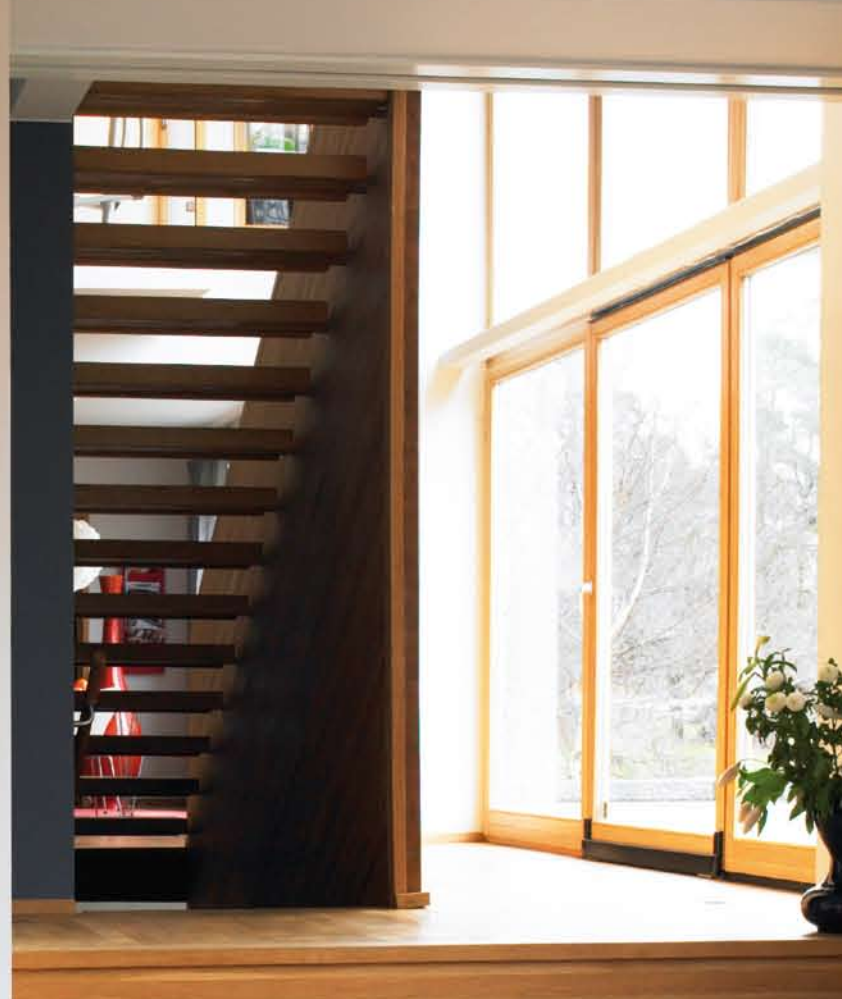
1. Toxic pollution caused by harmful chemical substances and dust.
2. Effects of noise, light, odours, dampness and climate.
3. Accumulation of microbes (bacteria, viruses, mould) in terms of infection risks.
4. Exposure to allergens.

These pollutants vary considerably according to the inside climate conditions, the state of ventilation and the design and use of the inside area. When energy-saving measures were introduced in the early 1970s, considerable efforts were made to improve the insulation used in the construction industry. This led to a reduction in the air exchange rate inside buildings. From a health and allergy perspective, the ideal air exchange rate would be 0.5 – 1.0, but in actual fact, air exchange rates in appropriately insulated houses are only between 0.3 and 0.5, which means that the polluted inside air is exchanged far too infrequently. Based on the reasons given above, an increase in the incidence of complaints affecting the population is inevitable.

This is where controlled domestic ventilation can have a particular role to play. Its purpose is to control temperature and dampness, while ensuring that the quality of the inside air is totally hygienic.

Complies with Building Regulations and is SAP compliant

90% of all new homes in Sweden have a exhaust air heat pump installed



Controlled domestic ventilation

Introduction

Nowadays we spend around 90% of the time indoors. This undoubtedly places great demands on the climate inside. The inside climate is affected considerably by odours, harmful substances, noise and temperature.

In every building there is a certain amount of basic ventilation, even if it is only produced by air coming through windows, doors, pipe ducts and walls. This type of ventilation, in older houses in particular, provides the necessary exchange of air. Ventilation is also provided through opening windows and doors, perhaps also when one or more windows are opened at an angle. Strong wind pressure and a difference in temperature between inside and outside also increase the exchange of air. On the other hand, a weak wind or small temperature difference will reduce the required air exchange rate.

This uncontrolled ventilation also accounts for a significant part of the heating costs and causes a considerable proportion of non-renewable energy resources to be wasted.

Low-energy house

In contrast to this, there is the low-energy house concept. A construction design is used in this type of house which prevents heat from escaping through effective thermal insulation. This also means that low-energy houses benefit the environment. But even with this construction design, there is still the problem that the required hourly air exchange rate of 0.5 – 1.0 is not achieved.

To achieve the required air exchange rate either the windows would have to be opened, which would run counter to the whole low-energy house concept, or installing a controlled domestic ventilation system with heat recovery would have to be considered.

Controlled domestic ventilation

Controlled domestic ventilation can be used in both low-energy and older houses. In low-energy houses the controlled ventilation system guarantees the required air exchange rate, even with the doors and windows closed.

When older houses are renovated better thermal insulation could be used, along with fitting new windows to enable controlled domestic ventilation to achieve the necessary air exchange rate. These types of older building are often affected by street noise. A ventilation system would therefore be beneficial in these cases too.

Controlled domestic ventilation with heat recovery

When ventilation based on opening windows and controlled domestic ventilation without heat recovery are used, the energy from the inside air is not used. The ventilation heat requirement accounts, however, for a considerable part (40 – 50%) of the total heat requirement.

In contrast to this, controlled domestic ventilation with heat recovery reuses the energy from the exhaust air. Not only that, the additional heat generated internally from lighting, people and domestic appliances is also utilised through heat recovery.

Our FIGHTER exhaust air heat pumps facilitate heat recovery and supply the energy recovered from exhaust air for the domestic hot water and even the heating.

Not only does energy recovery ensure a healthy and comfortable form of heating, it also produces considerable savings in terms of heat energy, along with CO₂ emissions.

Reduced carbon housing to comply with the Code for Sustainable Homes

Can satisfy up to 33% renewable requirement for planning consent



NIBE FIGHTER 200P



Mechanical ventilation system with local outside air postflow using a heat pump, which heats domestic hot water and radiator water using exhaust air energy.



Technical description

In the FIGHTER 200P the controlled domestic ventilation system with heat recovery via a heat pump is combined with heating the domestic hot water and radiator water.

The FIGHTER 200P is a complete system to replace both the conventional gas condensing boiler, hot water tank and the separate heat recovery ventilation system.

The FIGHTER 200P is ideal for both low-temperature heating systems and underfloor and wall heating.

The FIGHTER 200P is controlled by a programmable room thermostat supplied. The FIGHTER 200P also has additional heating in the form of an integrated immersion heater of 3.0 kW. This only switches on automatically when required, as the basic heating function is provided by the heat pump.

The operator panel has all its switches and buttons arranged in a user-friendly manner, making it easy to operate.

Area of application

The FIGHTER 200P is designed for flats and single houses with small heating demand of about 2 – 4 kW (NE standard) with an average room height of 2.50 m.

Accessories

TLF wall vent

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product



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kiwa
approved
product



UK WATER SUPPLY
REGULATIONS

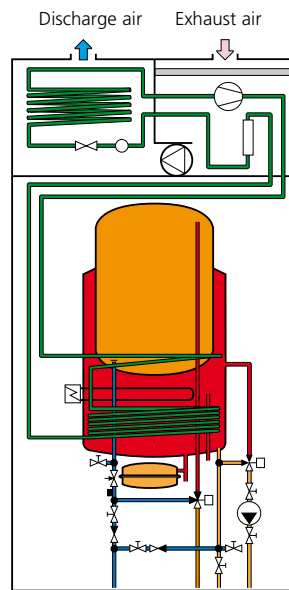
Structural design

The FIGHTER 200P is a complete heat pump unit for recovering thermal energy from exhaust air. Warm inside air is channelled from the connected rooms through the ventilation unit built into the system via a heat exchanger located in the heat pump circuit.

The heat recovered in this way is transferred via an indirect heating surface to a double-jacket tank. The domestic hot water tank has excellent corrosion protection in the form of double-layer enamelling and a sacrificial anode.

The hot water tank's double-jacket system means that radiator water and domestic hot water can be heated at the same time.

The unit comes complete with a central heating pump, heating pressure vessel and filling loop.



System diagram

C When the inside air has passed through the heat pump the discharge air is released into the open air. Before this, the heat pump has extracted so much energy from the exhaust air to produce heat for the radiators and domestic hot water that the temperature of the discharge air is only about 0° C (depending on the system).

G Extractor hood

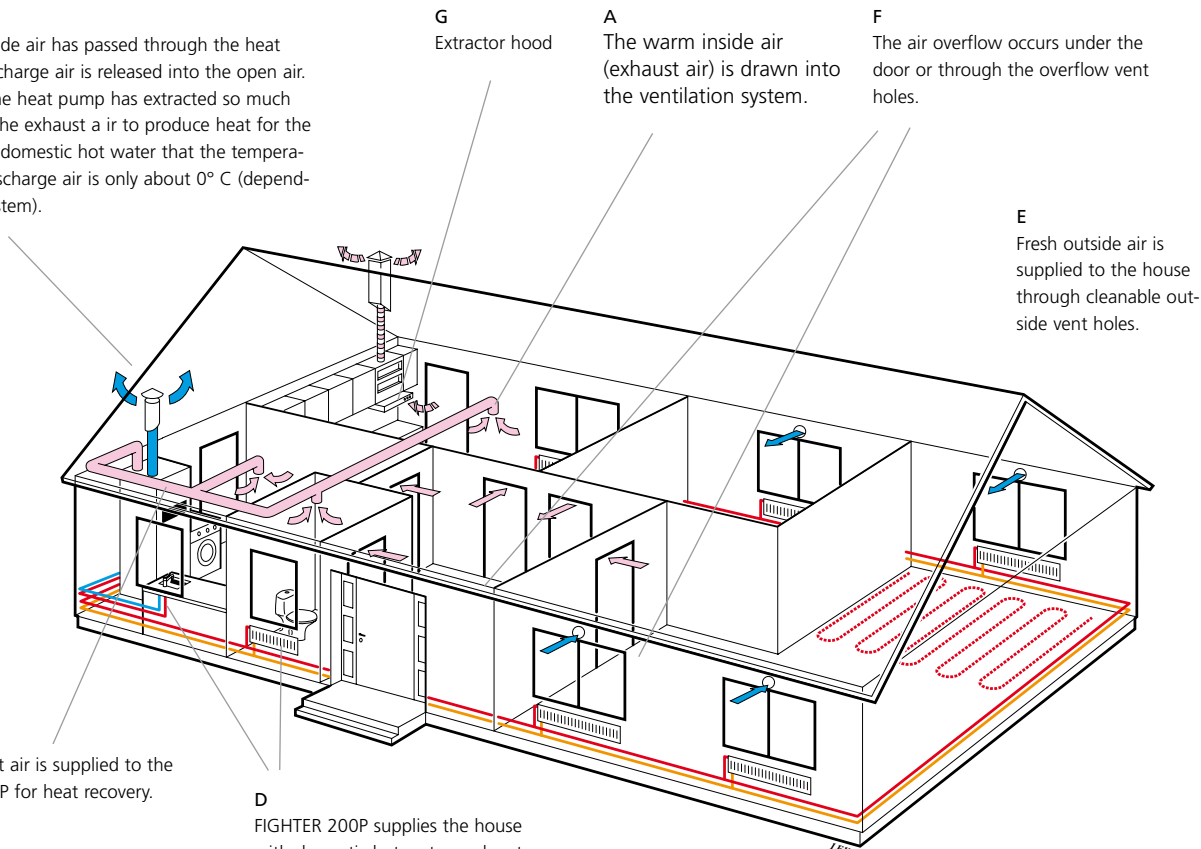
A The warm inside air (exhaust air) is drawn into the ventilation system.

F The air overflow occurs under the door or through the overflow vent holes.

E Fresh outside air is supplied to the house through cleanable outside vent holes.

B Warm exhaust air is supplied to the FIGHTER 200P for heat recovery.

D FIGHTER 200P supplies the house with domestic hot water and water for radiators.



NIBE FIGHTER 360P



Mechanical ventilation system with local outside air post-flow using a heat pump, which heats domestic hot water and radiator water using exhaust air energy.



Technical description

FIGHTER 360P is a exhaust air heat pump based on FIGHTER 310P. The pump has been enhanced and offers improved performance, communication and design. But still retains its simplicity and user-friendliness.

FIGHTER 360P consists of an electric boiler, a heat pump and a maintenance-free hot water heater.

Energy is recovered from the ventilation exhaust air and fed to the heating system and/or the water heater. FIGHTER 360P is designed for low temperature radiators and underfloor heating systems.

FIGHTER 360P has a well-arranged control panel with an informative display. Information about the operational conditions, set values etc. of the pump is clearly seen on the screen.

FIGHTER 360P has a newly developed control system prepared for communication with computers and central monitoring systems in the house or on the Internet.

The exhaust air pump is equipped with a adjustable 8.0 W electric heater and power guard. The new design of FIGHTER 360P gives a lower sound level and a higher ventilating capacity. The fan has ten output steps that are easily increased or reduced through the control panel or external signal.

The newly developed monitoring program in the compressor in FIGHTER 360P selects the most favourable temperature conditions at the time, which in turn improves the energy saving qualities of the heat pump.

Area of application

The FIGHTER 360P is designed for single and two-family houses and with heat demand of about 4 – 5 kW (NE standard) with an average room height of 2.50 m and maximum area of 160m².

Accessories

Room sensor

TLF wall vent

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product



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product



UK WATER SUPPLY REGULATIONS

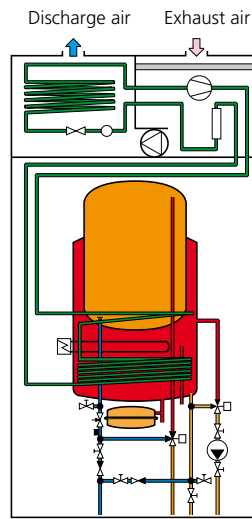
Structural design

The FIGHTER 360P is a complete heat pump unit for recovering thermal energy from exhaust air. Warm inside air is channelled from the connected rooms through the ventilation unit built into the system via a heat exchanger located in the heat pump circuit.

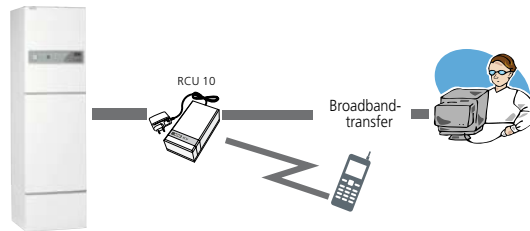
The heat recovered in this way is transferred via an indirect heating surface to a double-jacket tank. The domestic hot water tank has excellent corrosion protection in copper.

The hot water tank's double-jacket system means that radiator water and domestic hot water can be heated at the same time.

The unit comes complete with a central heating pump, heating pressure vessel and filling loop.



Communication unit which enables control and supervision of the heat pump over a local network or via the internet.



System diagram

C When the inside air has passed through the heat pump the discharge air is released into the open air. Before this, the heat pump has extracted so much energy from the exhaust air to produce heat for the radiators and domestic hot water that the temperature of the discharge air is only about 0° C (depending on the system).

G Extractor hood

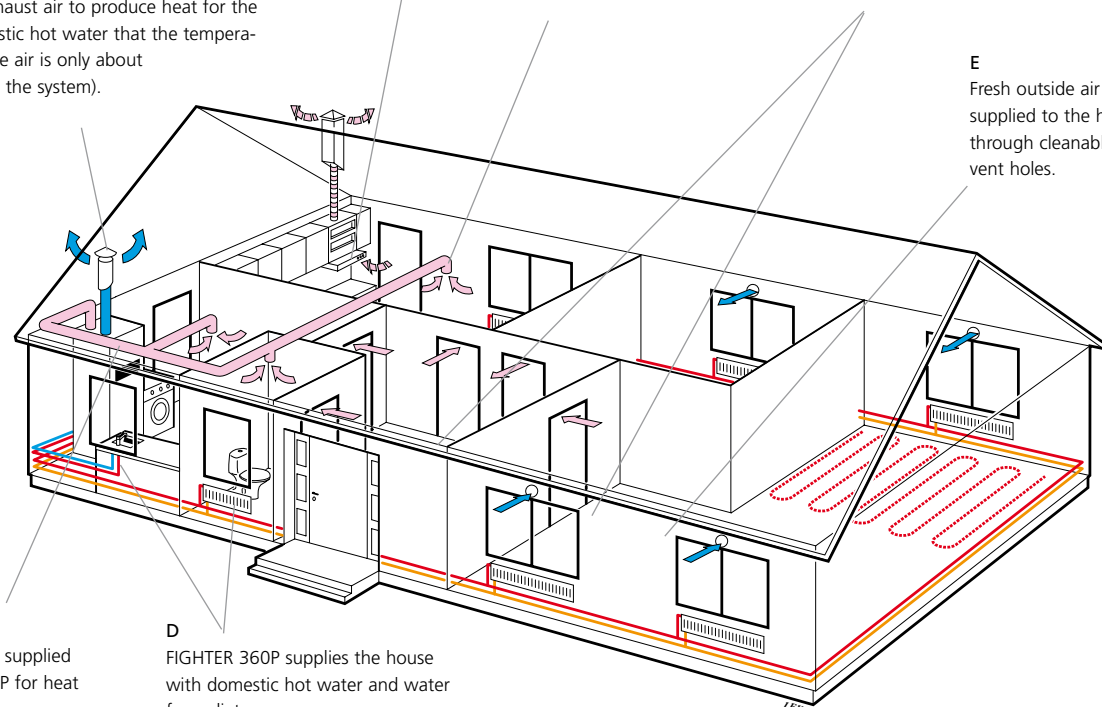
A The warm inside air (exhaust air) is drawn into the ventilation system.

F The air overflow occurs under the door or through the overflow vent holes.

E Fresh outside air is supplied to the house through cleanable outside vent holes.

B Warm exhaust air is supplied to the FIGHTER 360P for heat recovery.

D FIGHTER 360P supplies the house with domestic hot water and water for radiators.



NIBE FIGHTER 410P



Mechanical ventilation system (central supply air) combined with a heat pump, which heats the domestic hot water and radiator water using exhaust air energy and preheats the fresh supply air.



Technical description

In the FIGHTER 410P the controlled domestic ventilation with heat recovery via a heat pump is combined with heating the domestic hot water, supply air and providing heating.

The weather-controlled microprocessor continually ensures the system's efficient operation and guarantees a constant room temperature as part of this. This is set by adjusting the radiator thermostats. The FIGHTER 410P has additional heating in the form of an integrated immersion heater, which switches on automatically between 2x3.0 and 3x3.0 kW, only when required, as the basic heating function is provided by the heat pump.

The operator panel has all its switches and buttons arranged in a user-friendly manner, making it easy to operate.

The FIGHTER 410P is ideal both for low-temperature radiator systems and underfloor heating.

Area of application

The FIGHTER 410P is designed for single and two-family houses and with heat demand of about 4 – 6 kW (NE standard) with an average room height of 2.50 m.

If it were possible to switch off the heating circuit this system would operate as a supply air and hot water tank as a result of heat recovery.

Accessories

- Docking kit
- Room sensor
- 4.5 kW extra immersion heater kit
- TLF wall vent

kiwa
approved
product



UK BUILDING REGULATIONS

kiwa
approved
product



UK WATER SUPPLY REGULATIONS

Structural design

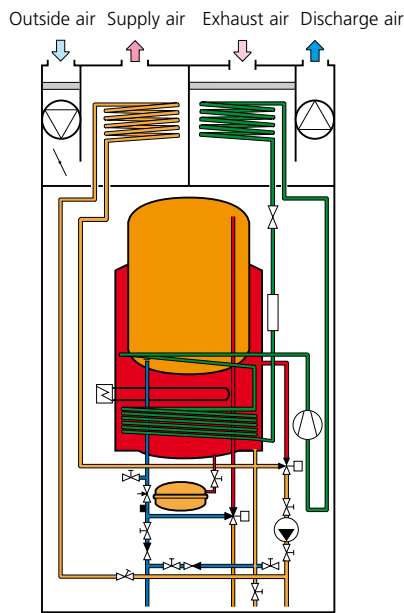
The FIGHTER 410P is a complete heat pump unit for recovering thermal energy from exhaust air. Warm, oxygen-poor air is channelled from the connected rooms where the exhaust air is through the ventilation unit built into the system via a heat exchanger located in the heat pump circuit.

The heat recovered in this way is transferred via an indirect heating surface to a double-jacket tank. At the same time the recovered heat is channelled via another heat exchanger to both the supply air and the heating circuit.

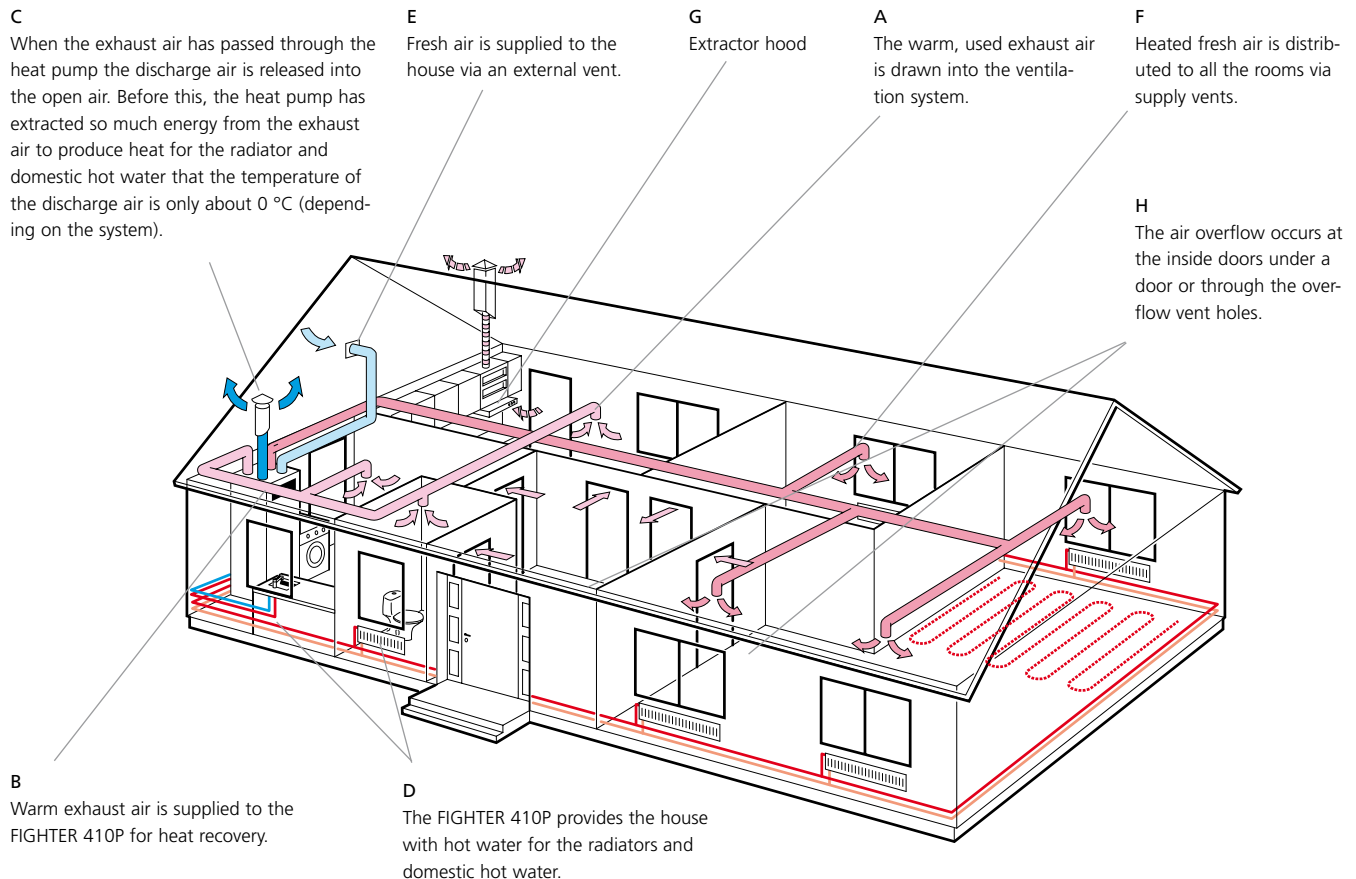
A copper lining or stainless steel is used for the domestic hot water tank to prevent corrosion.

The hot water tank's double-jacket system not only helps to heat the radiator water and domestic hot water, it also heats the fresh supply air at the same time via the supply air heat exchanger.

The unit comes complete with a central heating pump, heating pressure vessel and filling loop.



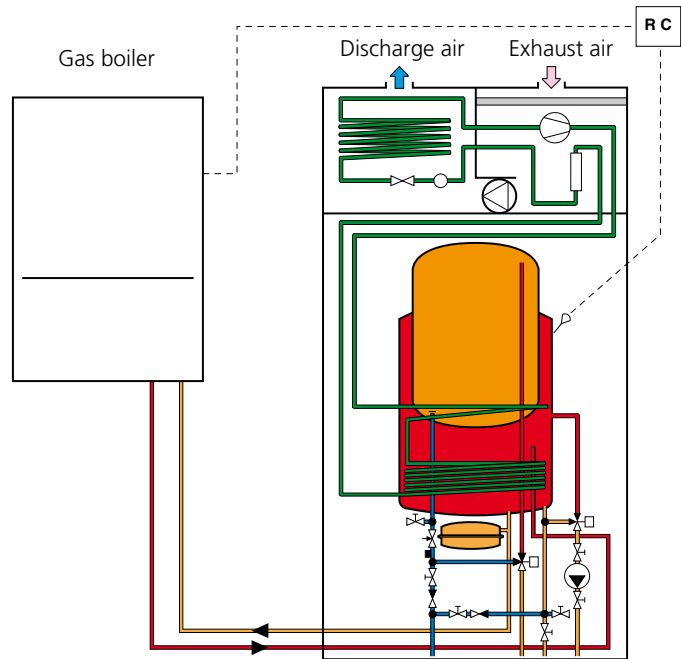
System diagram



Additional heating using a gas condensing boiler or similar heating systems.

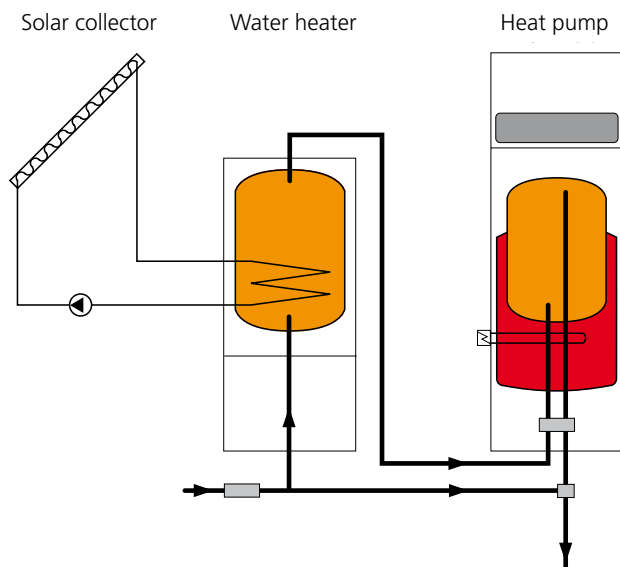
The FIGHTER 200P / 360P and 410P can be docked with gas condensing boilers. From an energy point of view, the gas condensing boiler should be chosen as additional heating when the required heating capacity is >6 kW. The capacity of the additional heating devices selected should not, however, exceed the maximum permissible capacity (13.5 kW). The chimney design must comply with the relevant local regulations.

The gas condensing boiler supplies the heating circuit with heated radiator water and is controlled by the FIGHTER's microprocessor.



Additional heating in conjunction with solar collectors

The FIGHTER 200P/ 360P and 410P can also operate in conjunction with solar collectors. Solar energy can be used to heat up domestic hot water (as shown in the drawings). As the domestic hot water in the accumulator tank is preheated by the solar collectors, the FIGHTER's energy consumption decreases by the corresponding amount. During the transition period solar energy can also be used as a backup for the heating.



Operating principle for the FIGHTER 315P combined with solar collectors. This solution can be modified, as appropriate, if a gas condensing boiler is to be docked.



NIBE EXHAUST AIR HEAT PUMP

Mechanical ventilation system with local outside air post-flow using a heat pump, which heats domestic hot water and radiator water using exhaust air energy.

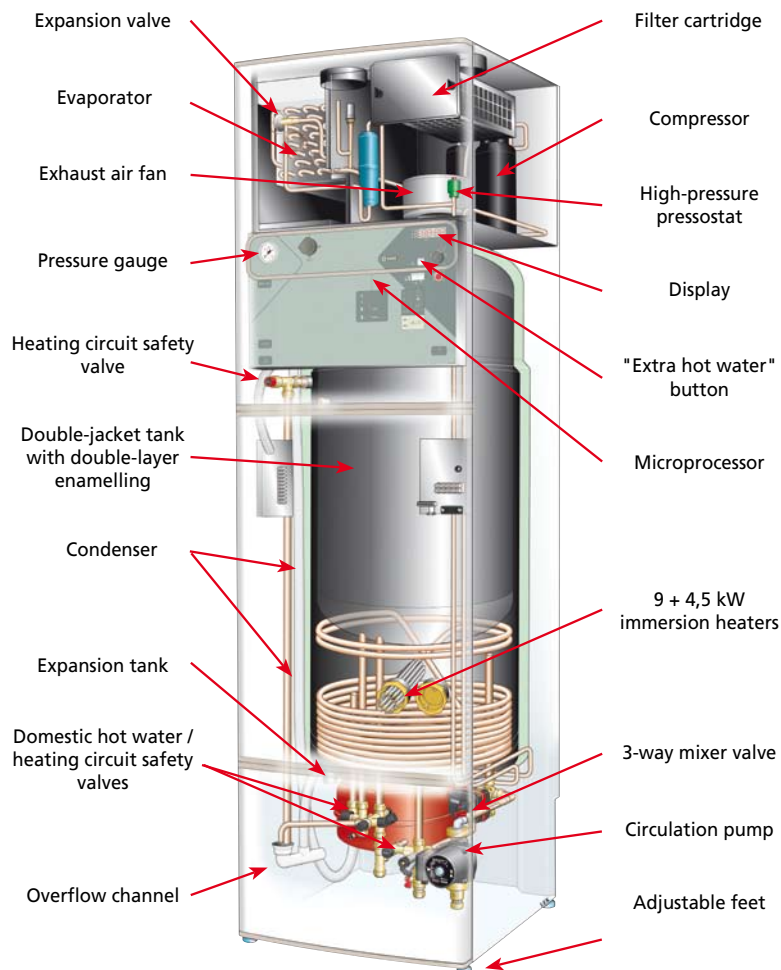
Accessories

Room sensor (360P and 410P only)

ETS additional electrical system

for FIGHTER 410P only

A second immersion heater increases the heating capacity from 9 kW to 13.5 kW.



Technical data

| Product | | FIGHTER 200P Single phase | FIGHTER 360P Single phase | FIGHTER 410P Single phase |
|-------------------------------|-------|------------------------------|------------------------------|------------------------------|
| Height | mm | 2095 | 2095 | 2095 |
| Width | mm | 600 | 600 | 600 |
| Depth | mm | 610 | 615 | 610 |
| Net weight | kg | 195 | 205 | 200 |
| Water capacity, outer jacket | Liter | 70 | 70 | 70 |
| Water capacity, cylinder | Liter | 170 | 170 | 170 |
| Voltage | | 230 (1-phase+N) | 230 (1-phase+N) | 230 (1-phase+N) |
| Refrigerant | | R290 (Propane) | R290 (Propane) | R290 (Propane) |
| Compressor rated output (Pel) | W | 550 | 550 | 650 |
| COP at A20/w35 | | 3,4 | 3,4 | 3,4 |
| Immersion heater rated output | kW | 3,0 | 8,0 | 9,0 |
| Optimum ventilation flow | l/s | 28 | 31 | 31 |
| Savings/year* | kWh | 4000 – 7500 | 6000 – 8500 | 6000 – 8500 |
| Corrosion protection | | Cu | Cu | Cu |

* In accordance with EN 255 incoming air 20°C hot water flow at 35°C.

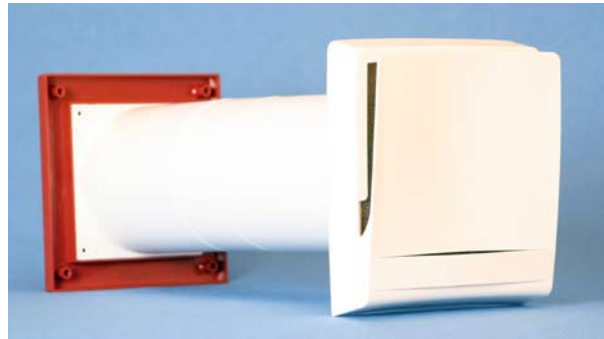
Ventilation system

Any ventilation system should be designed and installed in accordance with Building Regulations, England & Wales Approved Document F1 and Scotland Technical Standard Section 3.14 Ventilation. Only this will ensure hygienic room air and prevent any dampness to the building structure.

To be able to ensure a high degree of efficiency and an extremely comfortable living environment, we recommend that the installation of any ventilation system should be planned and this plan be strictly followed by the ventilation engineer.

We recommend that the exhaust air is extracted via metal spiral seam pipes with fitting seals approved to sealing class D, From the bathroom, toilet, kitchen and utility room. At the same time, fresh air should enter the building via NIBE wall vents into the living room, bedrooms and other living area. Factors such as street noise, exhaust fumes, wind, general noise, cold and pollen

can be taken into account choosing the right outside air vent. This ensures a controlled ventilation system with heat recovery and offers a high degree of comfort.



TLF wall vent

Calculation example

Calculation based on apartments built in the UK:

| | U-value | Size m ² | Size m ² |
|-----------------------|---------|---------------------|---------------------|
| Floor | 0,2 | | |
| Ceiling | 0,15 | | |
| Walls | 0,25 | | |
| Window | 1,7 | 2 | 2 |
| Door | 1,5 | 2,1 | 2,1 |
| No of windows (flats) | 3 | 5 | 7 |
| Number of occupants | 2 | 3 | 4 |
| DHW, kWh | 3000 | 4000 | 5000 |

Fighter 200P

| Size (m ²) | 50 | 70 | 90 |
|------------------------|---------|---------|-----|
| Heat demand | 1,85 kW | 2,49 kW | N/A |
| Annual COP | 2,6 | 2,61 | N/A |
| No. wall vents | 3 | 3 | N/A |

Fighter 360P

| Size (m ²) | 80 | 120 | 160 |
|------------------------|---------|---------|---------|
| Heat demand | 3,36 kW | 4,67 kW | 6,00 kW |
| Annual COP | 2,14 | 2,62 | 2,85 |
| No. wall vents | 3 | 4 | 5 |

Fighter 410P

| Size (m ²) | 80 | 120 | 160 |
|------------------------|---------|---------|---------|
| Heat demand | 3,39 kW | 4,73 kW | 6,10 kW |
| Annual COP | 1,99 | 2,44 | 2,65 |
| No. wall vents | 3 | 4 | 5 |

Commissioning and maintenance

Commissioning should be carried out by either an installation company as defective installation of the ventilation system may not only reduce the heat pump system's efficiency, but also result in damage to the building. In addition, this technical expert will be able to use his or her sensitive measurement devices to ensure that ventilation is effective and draught-free.

Maintenance involves periodically cleaning and replacing the integrated filter. Safety valves should also be inspected regularly.



MADE IN SWEDEN

NIBE Energy Systems Limited is a subsidiary of NIBE Heating with its headquarters in Markaryd in Sweden. NIBE is one of Europe's leading manufacturers in the domestic heating sector.

We supply homes with products that provide domestic hot water and ensure a comfortable indoor climate. We offer high-tech solutions for heating, ventilation, cooling and heat recovery that reflect today's demand for sustainable construction.



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