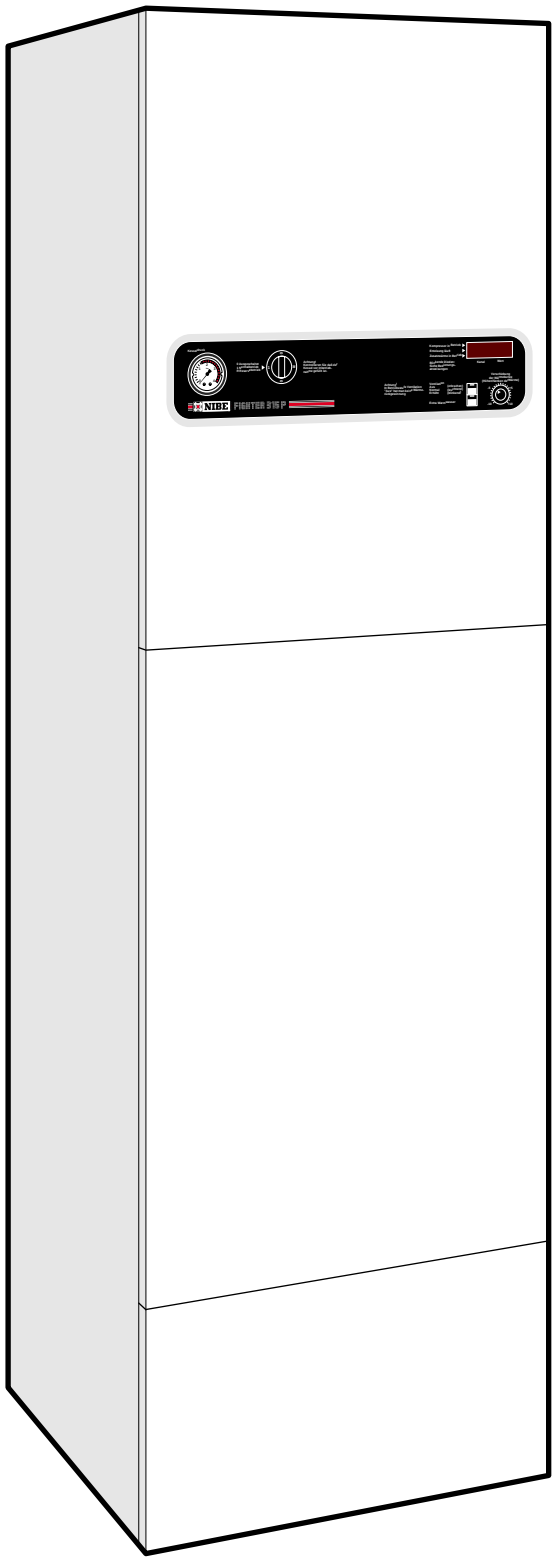
NIBE®

MOS GB 0013-1 011105
FIGHTER 315P

INSTALLATION AND MAINTENANCE MANUAL

FIGHTER 315P



To the house owner

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2 General

To get the best yield from the FIGHTER 315P heat pump you should read the section headed "To the house owner" in this installation and maintenance manual

The FIGHTER 315P is an exhaust air heat pump.

This means that it collects the energy in the ventilation air and uses it for hot water and space heating.

The FIGHTER 315P uses the environment-friendly refrigerant R290 (propane).

There are two versions of the FIGHTER 315P:

- FIGHTER 315P/E with built-in immersion heater

- FIGHTER 315P/G for docking with an external additional heat source

A microprocessor ensures that the heat pump is always working at optimum efficiency.

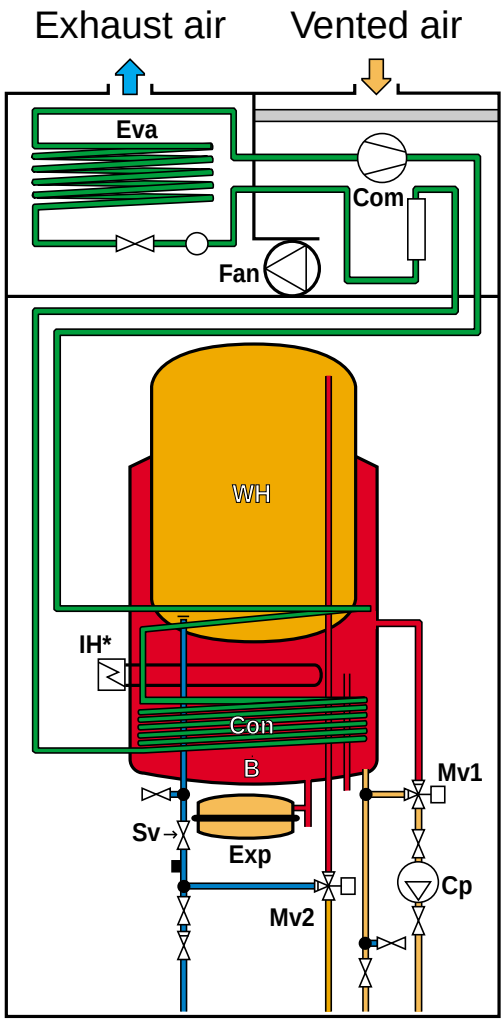
The FIGHTER 315P is a Swedish-made quality product which will last a long time and run reliably without unpleasant surprises.

To be filled in when the heat pump has been installed

Date of installation
Manufacturing number
Installers
Chosen power rating, immersion heater
Circulation pump setting
Fan rating
Chosen fan curve
Set damper angle
Setting, "Heating curve selection"
Setting, "Heating curve offset"
Initial pressure in expansion vessel

System description 3

Principle of operation



Eva		Evaporator
Fan		Fan
Com		Compressor
Con		Condenser
WH		Water heater
B		Boiler
IH	*	Immersion heater
Sv		Safety valve
Exp		Expansion vessel
Mv1		Shunt valve (mixer valve, heating)
Mv2		Mixer valve, service hot water
Cp		Circulation pump

* Only for FIGHTER P/E

The FIGHTER 315P is an exhaust air heat pump. It is available in two versions, the FIGHTER 315P/E and the FIGHTER 315P/G.

In the FIGHTER 315P/E, a built-in immersion heater provides additional energy and in the FIGHTER 315P/G additional energy is supplied by an external gas boiler.

The FIGHTER 310P comprises an electrically-heated boiler with an enamelled heat exchanger and a heat pump which recovers energy from the ventilation air. The recovered energy is supplied to the heat pump. The heat pump must be installed in a ventilation system intended for mechanical exhaust air.

When the exhaust air at room temperature passes through the evaporator, the refrigerant evaporates because of its low boiling point.

In this way the heat in the room air is transferred to the refrigerant.

The refrigerant is then compressed in a compressor, causing the temperature to rise considerably.

The warm refrigerant is fed to the condenser, which is in the boiler water. Here the refrigerant gives off its heat to the boiler water, so that its temperature drops and the refrigerant changes state from gas to liquid.

The refrigerant then goes via moisture filters and a sight glass to the expansion valve, where the pressure and temperature are reduced.

The refrigerant has now completed its circulation and returns to the evaporator.

The power rating of the immersion heater can be switched to 13.5 kW (FIGHTER 315P/E). The power rating set at the factory is 9.0 kW.

The power rating of the external gas boiler docked with the FIGHTER 315P/G must be as close as possible to the maximum heat demand, but must not exceed 13.5 kW.

4 System description

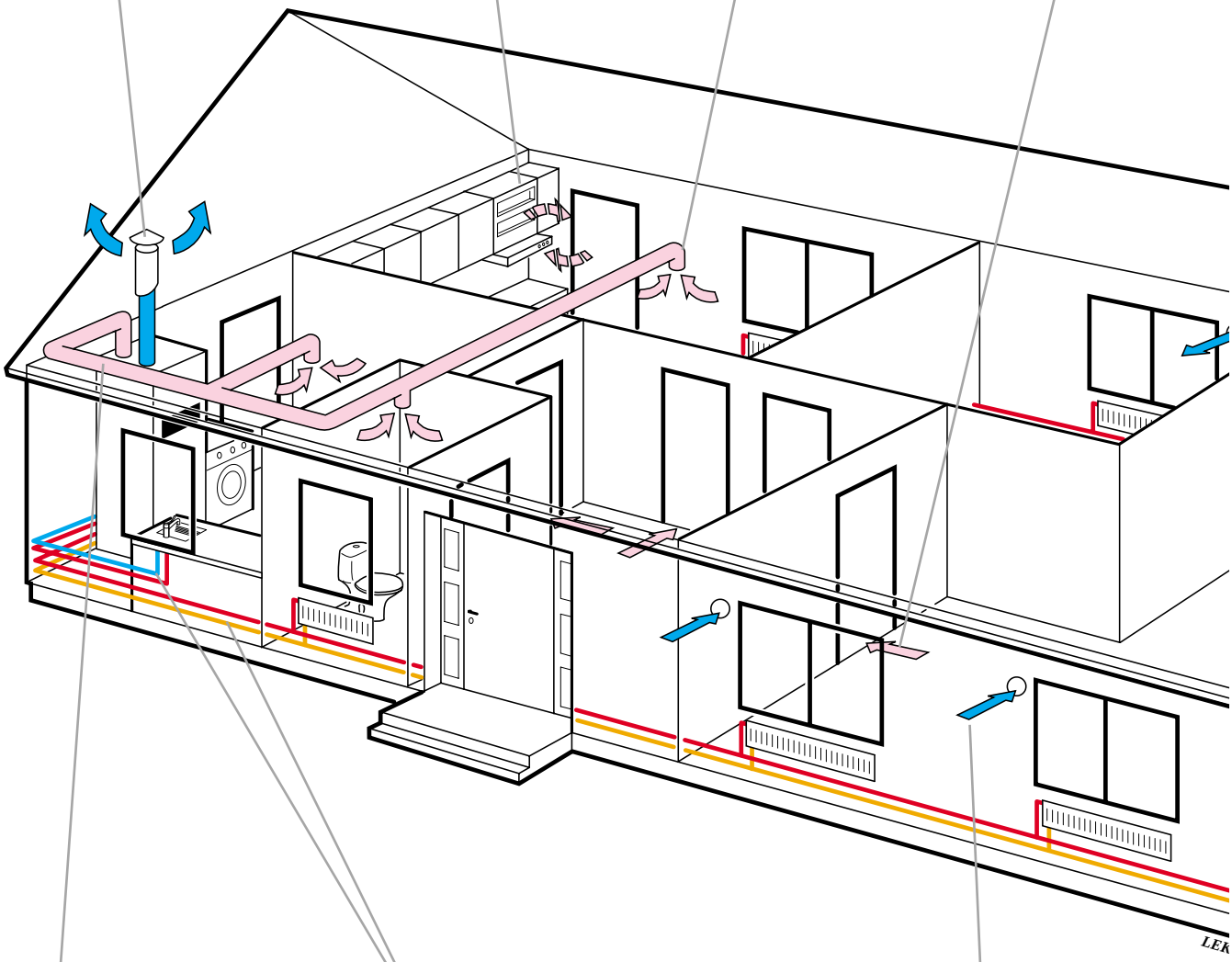
Principle of the system

C
When the room air has passed through the heat pump it is discharged. The temperature of the air has been significantly reduced, since the heat pump has extracted the energy in the room air.

G
Recirculating kitchen fan.

A
The warm room air is drawn into the duct system.

F
Air is transported from rooms with outside air devices to rooms with exhaust air devices.



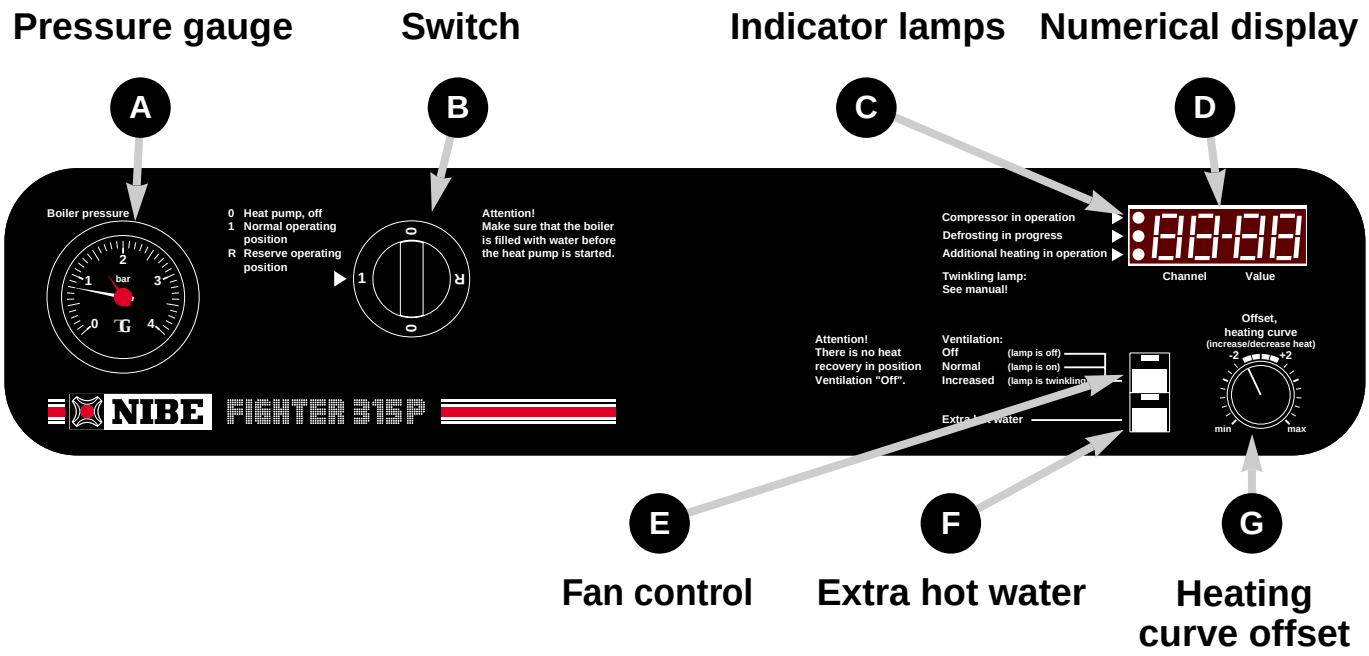
B
The warm room air is fed to the FIGHTER 315P.

D
The FIGHTER 315P supplies the house with both hot water and room heating.

E
Outside air is drawn into the house.

Front panel 5

Upper (visible) part of front panel



A Pressure gauge

This shows the pressure in the radiator circuit. The gauge is graduated 0 – 4 bar. Normal pressure is 0.5 – 2.5 bar.

B Switch

with three positions 0 - 1 - R:

0 Heat pump off.

1 Normal mode. All control functions active.

R Standby. Used on starting and in the event of malfunctions.

C Indicator lamps

Top lamp

Lit Compressor running.

Unlit Compressor not running.

Middle lamp

Lit Defrosting (automatic).

Unlit Normal mode.

Bottom lamp

Lit Immersion heater running.

Flashing Parts of the immersion heater blocked by external control (load sensor etc).

Unlit Electrical module not running.

D Numerical display

In normal mode the boiler temperature is displayed here. The two digits on the left indicate the “channel number” and the two on the right the reading/setting of that channel.

In the event of a malfunction, an error message is displayed alternately with channel number and value. See “Dealing with malfunctions” – “Indications on the numerical display”.

E Fan control

Pressing the “Ventilation” button increases the ventilation for six hours (“party setting”). In this mode, the built-in lamp flashes.

Pressing the button again shuts off the ventilation. In this mode, the built-in lamp is unlit.

NOTE: In this mode the compressor does not run, so there is no heat recovery.

Pressing the button again returns the ventilation to normal operation. In this mode, the built-in lamp is constantly lit.

F Extra hot water

Pressing the “Extra hot water” button raises the boiler temperature to about 60 °C, giving increased water capacity for about 24 hours. In this mode, the built-in lamp is constantly lit.

Pressing the button again gives a permanent function which raises temperature of the hot water at regular intervals. In this mode, the built-in lamp flashes.

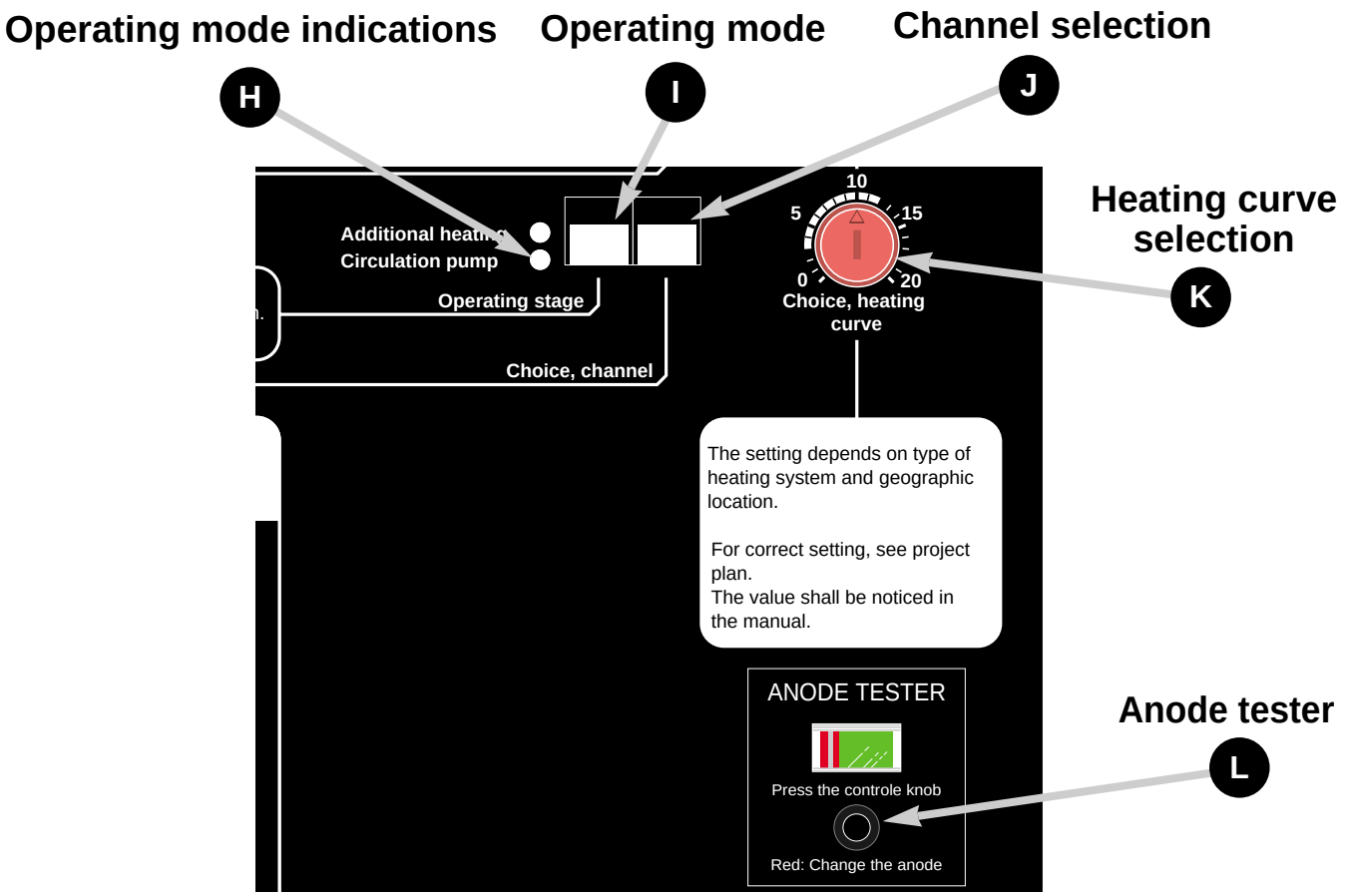
Pressing the button again resets the above functions.

G Heating curve offset

With the “Heating curve offset” button you can change the offset of the heating curve and thus the room temperature.

6 Front panel

Lower (hidden) part of front panel



H Operating mode indications

The two lamps beside the operating mode switch indicate the selected operating mode. Do not confuse this with the lamp indications on the numerical display.

Top lamp "Immersion heater"

Lit The immersion heater can be switched on when necessary, ie when the compressor alone cannot meet the heating demand.

Unlit Immersion heater off.

Bottom lamp "Circulation pump"

Lit Circulation pump running.

Unlit Circulation pump not running. In this mode the shunt valve is also closed.

I Operating mode

When the heat pump is started, all functions (immersion heater, circulation pump and automatic heating control system) are running.

Pressing the "Operating mode" button once disables the immersion heater.

Pressing it once more stops the circulation pump as well.

Pressing it yet again reconnects the immersion heater and the circulation pump.

J Channel selection

Use the "Channel selection" button to browse forward through the display window channels to see the required reading or setting.

Available readings/settings include:

1 Boiler temperature
2 Flow temperature
3 Outside temperature
5 Discharged air temperature

Normally, the display shows Channel 1. When you have browsed through the channels, channel **1** returns after a while.

Channels 9 – 21 are for service purposes only.

K Heating curve selection

Use the "Heating curve selection" knob to set the automatic heating control system; see under "Room temperature".

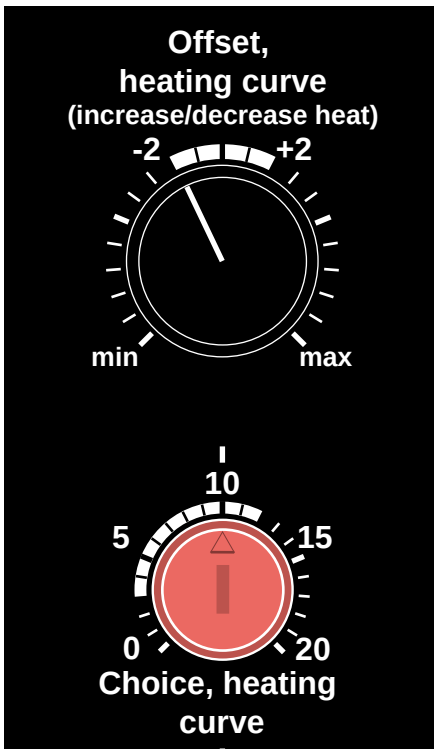
L Anode tester

The nature of the anode can be seen by pressing the anode test button.

Room temperature 7

Automatic heating control system

The indoor temperature depends on several different factors. During the warmer seasons of the year, radiation from the sun and heat given off by people and equipment is enough to keep the house warm. When it gets colder outside, the heating system must be started up. The colder it gets, the hotter the radiators / underfloor heating must be. This adjustment is automatic in FIGHTER 315P, but first the boiler must be given the correct basic setting.



Setting the heating

The heating is set with the “Heating curve selection” knob and with the “Heating curve offset” knob on the panel; see under “Setting up the automatic heating control system”.

If you do not know the correct settings for the heating system in question, the settings below can be used.

Low-temperature* radiator system:
Set “Heating curve offset” to 11.
Set “Heating curve offset” to –2.

Underfloor heating system** installed in concrete floor deck:
Set “Heating curve offset” to 7–8.
Set “Heating curve offset” to –1.

Underfloor heating system** installed in wooden floor deck:
Set “Heating curve offset” to 8.
Set “Heating curve offset” to –1.

If the room temperature is not as required, further adjustment may be necessary.

NOTE: Wait for 24 hours between settings for the temperature to stabilise.

Later adjustment of the setting

Cold weather (outside temperature <5 °C)

If the room temperature is low, increase the heating curve setting by one step.

If the room temperature is high, reduce the heating curve setting by one step.

Warm weather (outside temperature >5 °C)

If the room temperature is low, turn the “Heating curve offset” knob one step clockwise.

If the room temperature is high, turn the “Heating curve offset” knob one step anticlockwise.

* A “low-temperature radiator system” is a system in which the flow temperature needs to be 55 °C on the coldest day.

** There may be great differences between underfloor heating systems in terms of design.

Changing the room temperature

Changing the room temperature manually

If you want to temporarily or permanently lower or raise the indoor temperature relative to the previously set temperature, turn the “Offset, heating curve” knob anticlockwise or clockwise respectively. One scale marking corresponds to a change of about one degree in the room temperature.

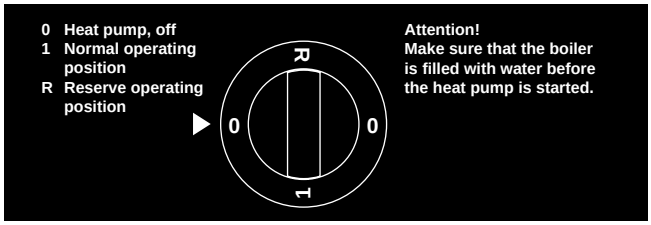
NOTE: An increase in the room temperature may be slowed down by the radiator thermostats or the underfloor heating, so that the settings of these thermostats will have to be increased.

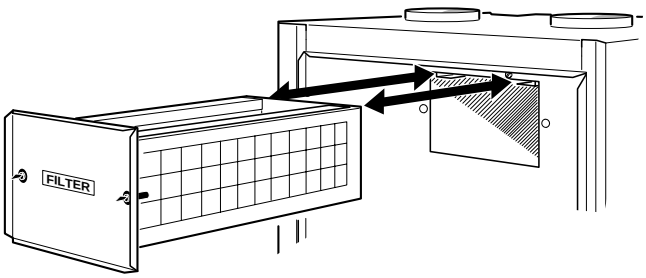
8 Maintenance routines

The heat pump and its ventilation duct system require some regular maintenance. The steps below should be followed.

Numerals in brackets refer to the section headed “Component locations”.

Cleaning the air filter



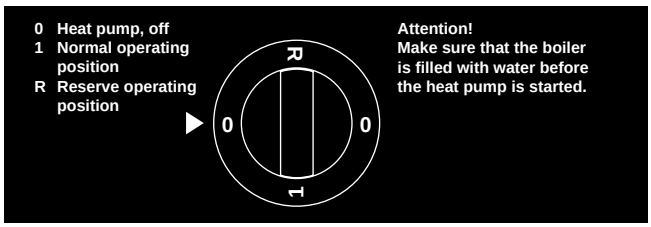


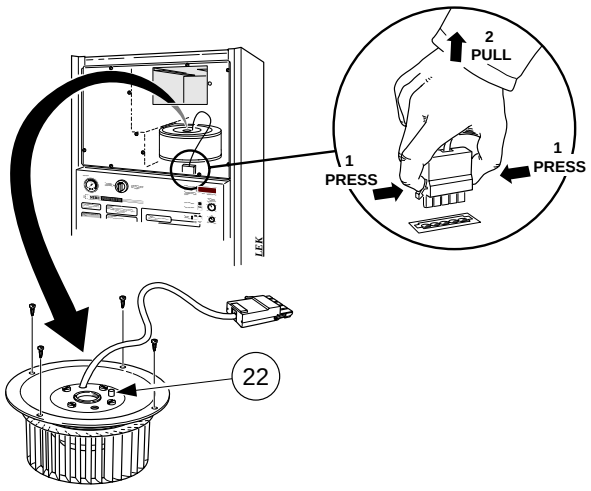
The heat pump air filter should be cleaned regularly (about three times a year) by taking it out and shaking off any dirt. If the filter is very dirty, turn it upside-down and wash it carefully with water.

- Set the switch to “**0**”.
- Open the upper front cover by pulling it out by the lower edge, then lifting it up.
- Release the filter holder by turning the two black knobs a quarter of a turn anticlockwise.
- Pull out the holder, take out the filter and shake off any dirt. Check that the filter is not damaged. New original filters can be ordered from NIBE.
- Install in the reverse order.

The interval between cleaning operations varies and depends on the amount of dust in the exhaust air. The intervals must not be so long that an alarm code **“A-01**” appears on the numerical display. If this happens, the filter is clogged and must be cleaned without delay.

Cleaning the fan





Clean the fan once a year by taking it out of the heat pump and carefully brushing the vanes clean.

- Set the switch to “0”.
- Open the upper front cover by pulling it out by the lower edge, then lifting it up.
- To open the inner cover, unscrew the nine screws in the outer edges of the cover.
- Take out the fan and fan cable as shown.
- After removing the fan check the condensation tray under the evaporator. At the same time, check that the condensation hose connection is not blocked.
- Install in the reverse order.

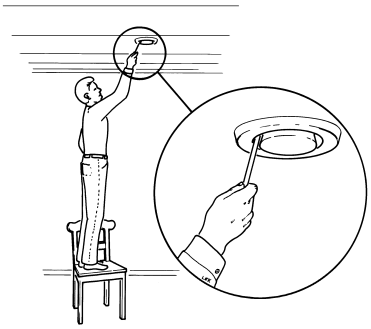
NOTE:

Avoid distorting the fan blades as this causes imbalance.

Do not use water or detergents.

Maintenance routines 9

Cleaning the ventilation devices

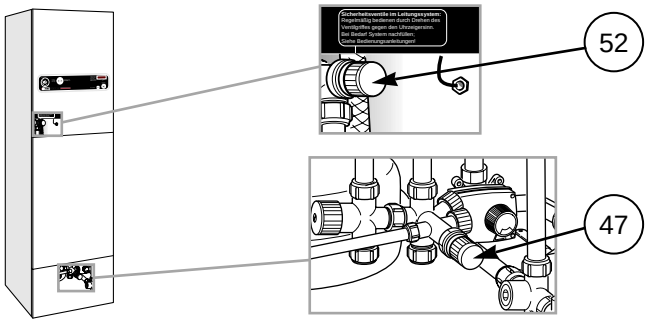


The ventilation devices of the house must be regularly cleaned with a small brush to maintain the correct ventilation.

The settings of the devices must not be changed.

NOTE: If you take down more than one ventilation device for cleaning, do not mix them up.

Checking the safety valves



The FIGHTER 315P has two safety valves, one for the heating system and one for the water heater.

The heating system safety valve (52) must be completely tight, but the hot water safety valve may occasionally release some water after hot water has been used. This is because the cold water which enters the water heater to replace the hot water expands when heated, causing the pressure to rise and the safety valve to open.

Both safety valves must be checked about four times a year. Check one valve at a time as follows:

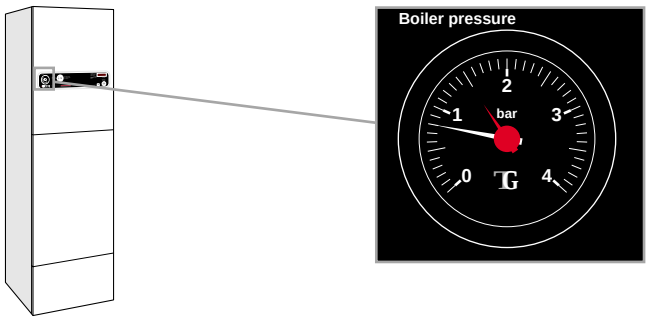
- Open the valve.
- Check that water flows through the valve.
- Close the valve.

Vented air temperature



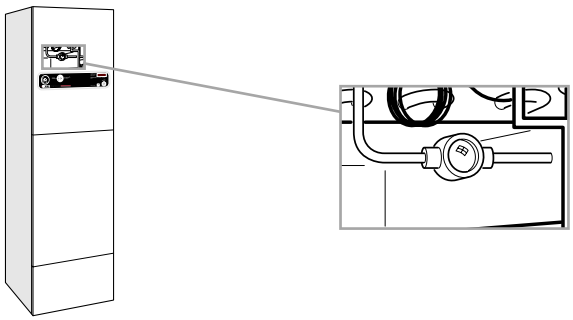
Check that the temperature of the vented air (Channel 5) is markedly lower than the room temperature when the compressor is running. See also “Dealing with malfunctions” – ”High vented air temperature”. It is normal for the vented air temperature to vary.

Pressure gauge



The pressure gauge reading should be between the initial pressure of the expansion vessel (normally 0.5 bar) and 2.5 bar. See “Commissioning and adjusting”

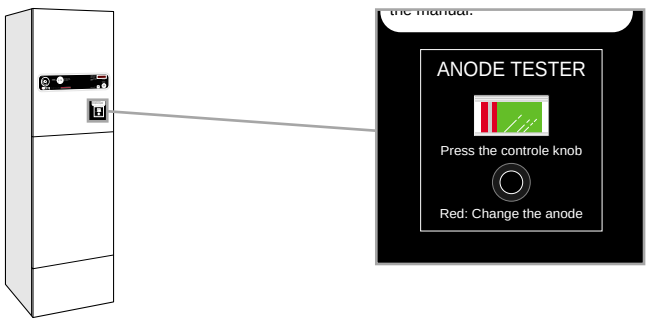
Sight glass



The sight glass is provided for service personnel.

When the compressor is running, some refrigerant leakage may be visible in the sight glass (64). It must be completely clear, ie there must be no bubbles. For the first few minutes after the compressor starts there may be some bubbles, but after this the system should stabilise and no further bubbles should be seen. Small bubbles may appear at high evaporation, (Channel 4) and high condensation (Channel 8).

Anode test



The anode should be checked regularly (at least four times a year). This is done by pressing the anode test button.

If the pointer remains in the red field, the anode has been used up and no longer provides any protection. It must be replaced without delay.

10 Dealing with malfunctions

If there is a malfunction, the first step is to check the following points:

No hot water or water not hot enough

NOTE: The hot water capacity can be increased for 24 hours by pressing button (18).

- Large amounts of hot water were used.
- Circuit or main MCB tripped.
- RCD (if fitted) tripped.
- Mixer valve setting too low (45).
- Switch (8) is set to **"0"**.
- MCB (7) tripped. See "Dealing with malfunctions" – "Resetting an MCB".
- Temperature limiter (6) tripped. (Contact service)
- Switch (25) not correctly set.
- Filler valve (46) to heater fully or partly closed.
- Fan (and therefore compressor) shut off.
- Check the external gas boiler (FIGHTER 315P/G).
- Check external controls.

Low room temperature

- Circuit or main MCB tripped.
- RCD (if fitted) tripped.
- MCB (7) tripped. See "Dealing with malfunctions" – "Resetting an MCB".
- Temperature limiter (6) tripped. (Contact service)
- Automatic control system settings not correct (40).
- Circulation pump (16) stopped. See "Dealing with malfunctions" – "Starting the pump".
- Air in boiler or system.
- Valves (44) and (50) in the radiator circuit closed.
- Initial pressure in expansion vessel too low. This is indicated by low pressure on the pressure gauge (42). Contact the installer.
- Fan (and therefore compressor) shut off.
- Check the external gas boiler (FIGHTER 315P/G).
- Check external controls.

High hot water temperature

- Mixer valve setting too high.

High room temperature

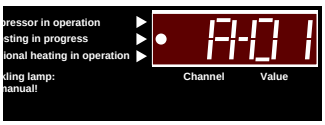
- Automatic control system settings not correct.

Ventilation poor or absent

- Defrost mode, lamp (31) constantly lit; see "Indications on the numerical display".
- Filter (63) clogged (possibly replace).
- Exhaust air device blocked or throttled down too much.
- Circuit or main MCB tripped.
- RCD (if fitted) tripped.
- MCB (7) tripped. See "Dealing with malfunctions" – "Resetting an MCB".
- Fan shut off.

Numerical display readings

Fault code A-01 on the numerical display

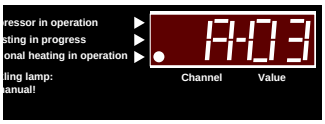


- Exhaust air filter badly clogged (possibly replace). Looking after the filter properly saves money. If this fault code appears, the filter is badly clogged.

When the cause of the fault has been put right, the fault code must be cleared from the display by switching the heat pump off and on again.

Fault code A-03 on the numerical display

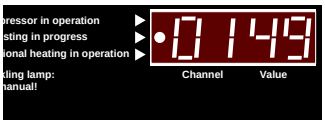
A pressure switch in the refrigerant circuit has tripped; see "Resetting pressure switches".



- **High-pressure pressure switch:** Settings for "Heating curve selection" and "Heating curve offset" too high (can also be seen on Channels 6 and 7 on the numerical display). See "Room temperature".
- **Low-pressure pressure switch:** Ventilation flow too low or not enough refrigerant.

When the cause of the fault has been put right, the fault code must be cleared from the display by switching the heat pump off and on again.

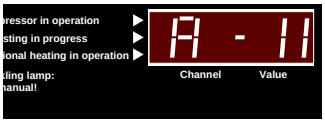
Middle lamp lit



- Defrosting.

When there is too much ice on the evaporator, defrosting takes place. After this, the compressor starts automatically if heating is needed. Frequent defrosting is a sign of clogged ventilation devices or dirty filters. See "Maintenance routines" – "Cleaning air filters".

Fault code A-11

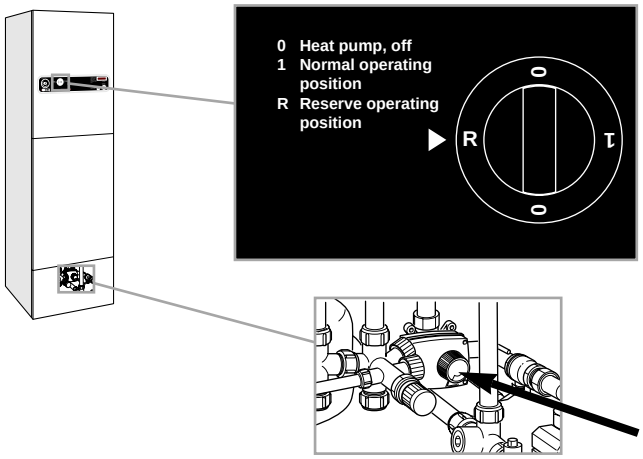


When codes A-03 and A-01 are active at the same time, this code is displayed.

If the malfunction cannot be put right with the aid of the above instructions, a service technician should be called. If necessary, set the switch to "R" (hand shunting is required).

Dealing with malfunctions

Switch setting “R”



When the switch is set to **“R”** the compressor and electronic controls of the heat pump are off.

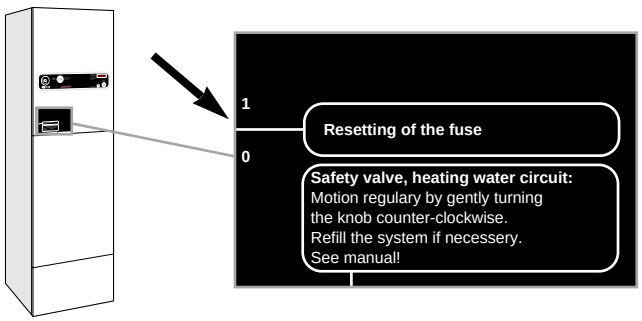
The immersion heater is controlled by a separate thermostat.

The numerical display is off. The automatic heating control system is inoperative. This means that hand shunting is needed. To do this, push in the shunt motor knob and turn it to the required position.

NOTE!

On returning to normal mode, remember to restore the shunt knob to its original position by turning it until it “jumps out”.

Resetting the miniature circuit-breaker (MCB)



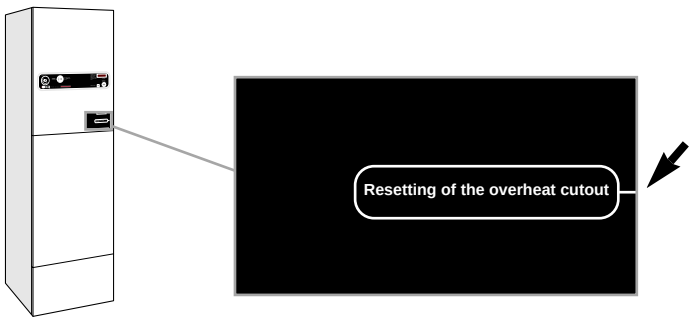
The MCB is accessible behind the upper front access panel and is located to the left of the panel.

Normal mode of the MCB is “1” (up).

NOTE!

If the MCB trips repeatedly, call a service technician to investigate the cause.

Resetting the overheat cutout



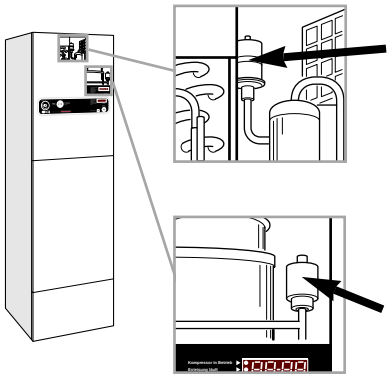
The overheat cutout is accessible behind the upper front access panel and is located to the right of the panel.

To reset the overheat cutout press its button firmly.

NOTE!

If the overheat cutout trips repeatedly, call a service technician to investigate the cause.

Resetting pressure switches



Low-pressure pressure switch

Normally this switch resets automatically so it does not have a reset button.

High-pressure pressure switch

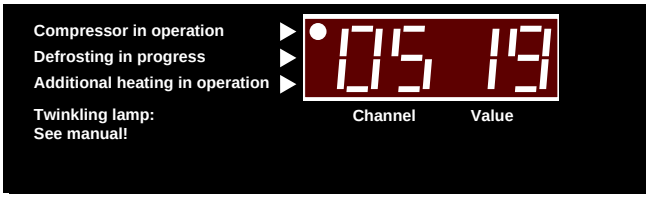
To reset a tripped pressure switch, press the button on the top of it; see diagram. The pressure switches can be reached through the filter access panel opening.

NOTE!

If the pressure switches trip repeatedly, call a service technician to investigate the cause.

12 Dealing with malfunctions

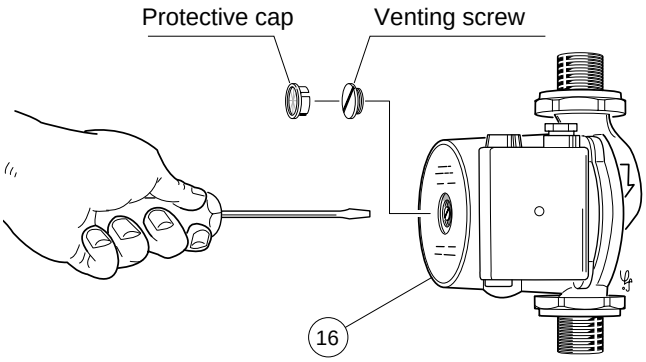
High vented air temperature



If the vented air temperature (which can be seen in Channel 5) is insignificantly lower than the room temperature when the compressor is running, there is probably a fault in the refrigerant circuit or its control system. Call a service technician.

When the compressor is not running, the vented air temperature is about the same as the room temperature.

Helping the circulation pump to start



- Shut down the FIGHTER 315P by turning the switch (8) to “0”.
- Remove the protective cap and slacken the venting screw with a screwdriver. Some water may come out so hold a cloth over the screwdriver blade.
- Push the screwdriver in and turn the pump rotor.
- Tighten the venting screw.
- Start the FIGHTER 315P and check whether the circulation pump is working.
- Refit the cap.

It is often easier to start the circulation pump with the FIGHTER 315P running, and switch (8) set to “1”. If you try to start the circulation pump with the FIGHTER 315P running, be prepared for the screwdriver to “grab” when the pump starts.

General points for the installation engineer 13

Transport and storage

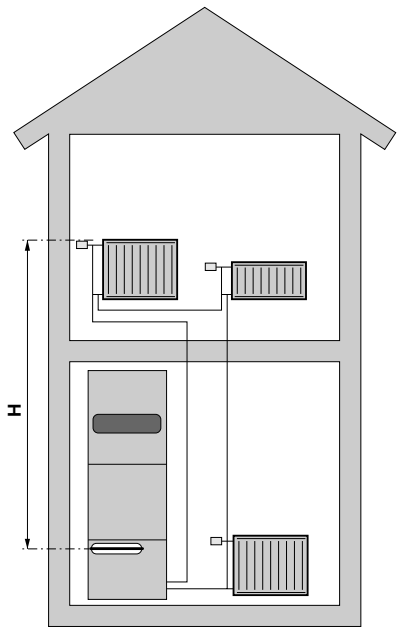
The heat pump must be transported and stored upright and dry.

Handling



The refrigerant in the heat pump (R290, propane) is a potential fire hazard. To reduce the risk of leakage, take special care to avoid damaging the refrigerant system when handling, installing, servicing, cleaning and scrapping the heat pump.

Maximum boiler and radiator volume



The volume of the expansion vessel (85) is 12 litres and it is pressurised as standard to 0.5 bar (5 metres wg). As a result, the maximum permitted height “H” between the vessel and the highest radiator is 5 metres; see diagram.

If the standard initial pressure in the pressure vessel is not high enough it can be increased by adding air via the valve in the expansion vessel. The initial pressure of the expansion vessel must be stated in the inspection documents.

Any change in the initial pressure affects the ability of the expansion vessel to handle the expansion of the water.

The maximum system volume excluding the boiler is 300 litres at the above initial pressure.

Erecting the heat pump

The heat pump should preferably be erected with its back about 10 mm from an outside wall in a utility room or similar, to minimise noise nuisance. If this is not possible, a wall that backs on to a bedroom or some other room where noise would be a problem should be avoided. Wherever the unit is located, any wall that backs on to a bedroom should be fitted with sound insulation.

NOTE: The distance between the heat pump and the wall should be at least 10 mm.

Pipework must be routed so that it is not fixed to an internal wall that backs on to a bedroom or living room.

Applicable building codes must be complied with.

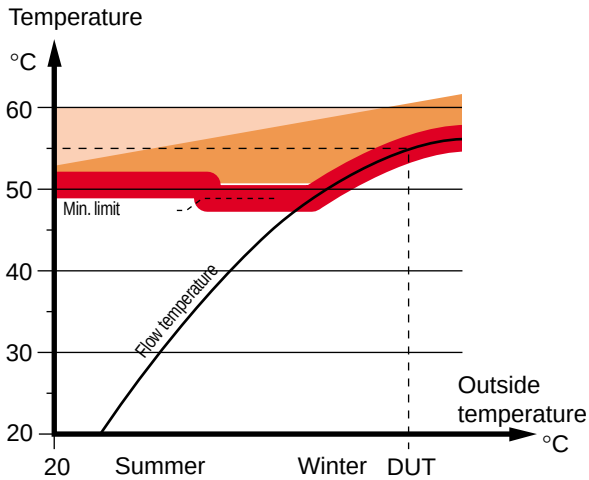
Inspection of the installation

Current regulations require the heating installation to be inspected before it is put into service. The inspection must be done by a suitably qualified person. The installation inspection must be documented.

The above applies to installations with a sealed expansion vessel. If the heat pump or the expansion vessel is replaced, the installation must be inspected again.

Temperatures in FIGHTER 315P

Normal temperature levels in boiler or water heater.



DUT: Design basis outside temperature

Hot water temperature "Extra hot water"

Hot watertemperature "Normal"

Boiler temperature

The temperature of the hot water in the water heater may vary between about 50 and 65 °C.

Use the mixing valve (45) to set the required limit on the temperature at the taps. The “Extra hot water” knob (18) on the front panel is used to increase the hot water capacity.

14 Pipe connections

General

The pipework must conform to current regulations.

The system requires low-temperature dimensioning of the radiator circuit.

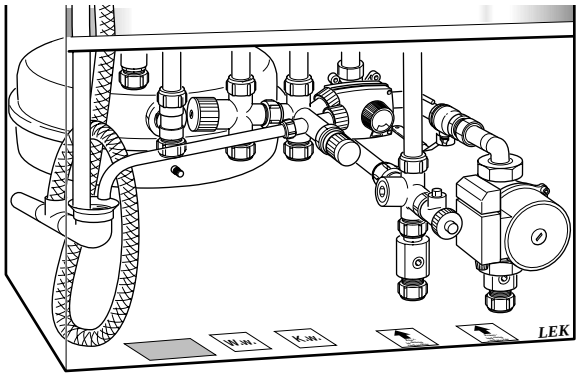
At DUT, the highest recommended temperatures are 55 °C on the flow line and 45 °C on the return line.

When the circulation pump is running, the flow in the radiator circuit must not be completely stopped. In other words, in a system where the radiator flow might stop because all the thermostatic valves close, there must be a bypass valve to protect the circulation pump.

The total volume is 240 litres, with 170 litres in the water heater and 70 litres in the double-jacket space.

The pressure vessel in the FIGHTER 315P is approved for max 9.0 bar (0.9 MPa) in the water heater and 2.5 bar (0.25 MPa) in the double jacket space.

NOTE: Overflow water from the evaporator collection tray and safety valves goes via non-pressurised collecting pipes (down in the heat pump) to a drain so that hot water splashes cannot cause injury.



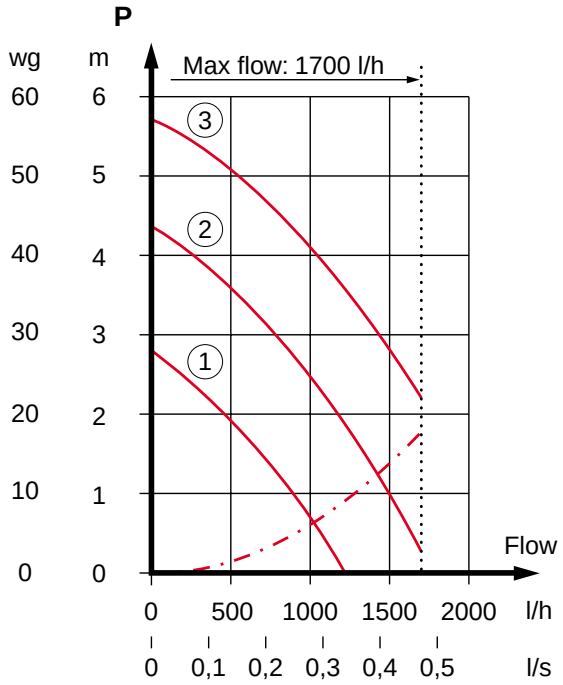
NOTE!

The pipework must be flushed before the heat pump is connected, so that any contaminants do not damage the components.

Docking

Gas boilers and accumulator tanks with tariff-controlled immersion heaters can be docked to FIGHTER 315P.

Pump and pressure drop diagram



Available pump capacity
(less the internal pressure drop of the boiler)

Internal pressure drop in boiler
(including fittings)

Ventilation connection

Ventilation flows

The FIGHTER 315P must be connected so that all ventilation air except kitchen extractor air passes through the evaporator (62) of the heat pump. The lowest ventilation flow according to current standards is 0.5 air exchanges per hour. For optimum heat pump performance the ventilation flow should not be less than 100 m³/h. (28 l/s).

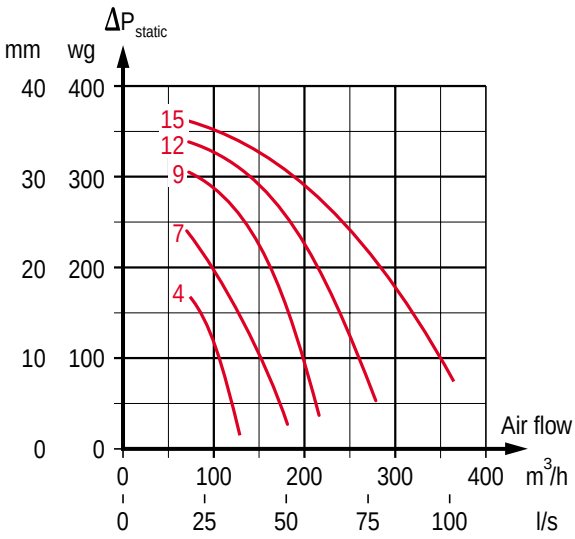
The FIGHTER 315P has a ventilation opening at the bottom. As a result, an air flow of about 7 m³/h (1.9 l/s) is taken directly from the room where the heat pump is installed.

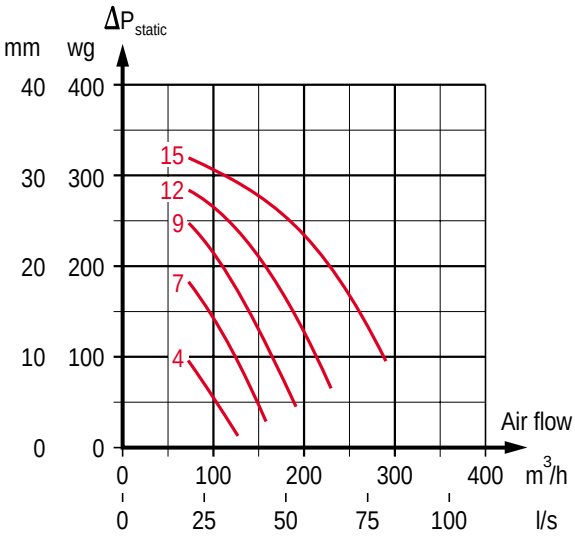
Changing the ventilation capacity is described under “Electrical connection” – “Setting the fan capacity”. See also "Circuit diagram". The numbering of the curves refers to the connection pins of the fan transformer. A 105 W fan is available as an accessory.

Fan diagram

The diagram below show the available ventilation capacity. A 105 W fan is available as an accessory.

(NOTE: The capacitor must be changed).





Installing the ducting

To prevent fan noise being transferred to the exhaust air devices, it may be a good idea to install a silencer in the duct. This is especially important if there are exhaust air devices in bedrooms or if a larger than standard fan is installed.

Because the heat pump contains a flammable refrigerant in the form of propane (R290), the air ducting system must be earthed. This is done by making a sound electrical connection to the exhaust air and vented air ducts with the two earthing cables supplied. The cables must then be connected to the earthing studs on top of the top cover. The cables supplied can be used to ensure bonding between the heat pump and the ventilation ducts.

All connecting spigots have rubber seals. Connections should be made via flexible hoses, which must be installed so that they are easy to replace. The vented air duct must be provided with diffusion-tight insulation over its entire length. Provision must be made for inspection of the duct. Make sure that there are no reductions of cross-sectional area in the form of creases, tight bends etc, since this will reduce the ventilation capacity. All joins in the ducting must be sealed and pop-riveted to prevent leakage.

The leaktightness class of the ducting system must be at least class B.

NOTE!

A duct in a masonry chimney stack must not be used for vented air.

Kitchen extractor fan duct

Do not connect a kitchen extractor fan duct to the FIGHTER 315P.

Adjusting

To obtain the necessary air exchange in every room of the house, the exhaust air devices must be correctly positioned and adjusted. A defective ventilation installation may lead to reduced heat pump efficiency and thus poorer operating economy, and may result in damage to the house.

Enhanced ventilation

To obtain “enhanced ventilation”, the ventilation button must be pressed.

This provides a higher level of ventilation (“party setting) for about six hours. In this mode, the built-in lamp flashes.

When the button is pressed again, the ventilation is shut down completely. In this mode, the built-in lamp is unlit.

NOTE: In this mode the compressor is shut down, so there is no heat recovery.

Pressing the ventilation button again return the ventilation system to normal operation.

In this mode, the built-in lamp is lit.

16 Electrical connections

Connecting

NOTE!

The electrical installation and any service work must be done under the supervision of a qualified electrician. The electrical installation and wiring must conform to current regulations.

All electrical equipment except the outside sensor is connected at the factory.

Disconnect the heat pump before testing the insulation of the house wiring.

NOTE!

Switch (8) must not be moved from "0" until the boiler has been filled with water.

If this is done, electrical components may be damaged.

The supply to the heat pump is connected to terminal (9) via a strain relief clamp. The heat pump must be connected under the supervision of a qualified electrician. The cable entry conduit is dimensioned for cable with a maximum diameter of 19 mm.

FIGHTER 315P must not be connected without the consent of the electric power supplier.

The power is controlled via a contactor which is operated by a microprocessor.

The microprocessor, circulation pump (16), compressor and their wiring are protected internally by a miniature circuit-breaker (MCB) (7).

Temperature limiter (FIGHTER 315 P/E)

The temperature limiter (6) cuts off the supply to the immersion heater if the temperature rises to between 90 and -100 °C; it can be manually reset by pressing the button on the temperature limiter.

NOTE!

Reset the temperature limiter, as it may have tripped during transport.

Power rating set at the factory

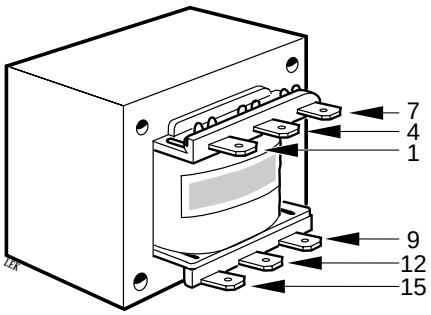
The power rating set at the factory for immersion heaters (1) and (24) is 9 kW.

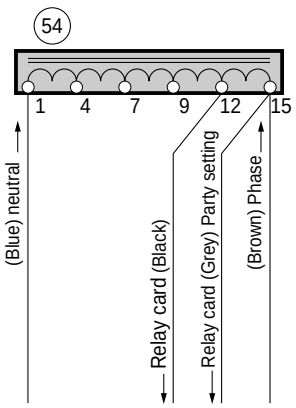
Switching between different power ratings is done by lowering the front panel (see under "Service" – "Lowering the front panel"), and moving certain cables as described under "Electrical diagram", "Changing the power rating".

Setting the fan capacity

The fan capacity is selected by connecting a black cable (normal ventilation) from relay board (41) to the required terminal on the fan transformer (54). It is convenient to do this when adjusting the ventilation. See under "Ventilation connection" - "Fan diagram" and "Service" - "Lowering the front panel".

NOTE: If both wires are connected to position 15 on the fan transformer, it will not be possible to increase the ventilation. In other words, pressing the "ventilation button" has no effect.





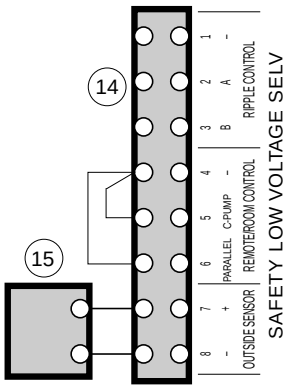
Connection (No.)	Voltage (V)
4	115
7	140
9	160
12	185
15	230

Electrical connections 17

Connecting the outside sensor

The outside sensor must be installed in a shaded location on a wall facing north or north-west, where it will not be affected by the morning sun, for example. Connect the sensor (15) with two wires to terminal block (14) refs 7 and 8.

If a conduit is used it must be sealed to prevent condensation in the sensor capsule.

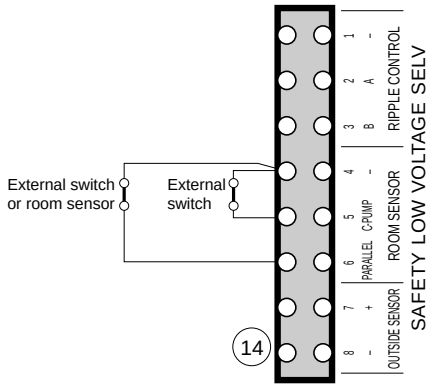


Remote/room control

A night tariff timer or room sensor can be connected to terminals (4) and (6) of terminal block (14) (remove the jumper link first). The timer or room sensor must have a floating contact and be designed to open the circuit when a lower temperature is required.

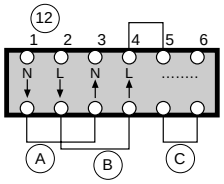
The microprocessor in the FIGHTER 315P corrects the originally “Heating curve offset” setting three steps down.

An external contact to switch off the circulation pump can be connected to terminals (4) and (5) of terminal block (14) (remove the jumper link first). For example, a maximum thermostat can be connected to sense the flow temperature and shut off the circulation pump, if the flow temperature goes too high. The switch contact or thermostat must have a floating contact and be designed to open the circuit when the circulation pump must be switched off.

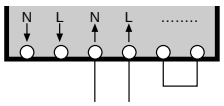


External supply to compressor

The heat pump compressor can also be controlled by an external switch, by replacing jumper link C at terminal (12) with a floating break contact (3A, 230 V~, motor duty).

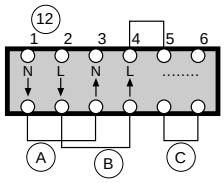


NOTE: With this arrangement. some parts of the electrical system are live, even when switch (8) is at “0”.

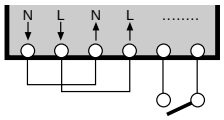


External compressor control

The heat pump compressor can be supplied with power by removing jumper links A and B from terminal block (12). A separate power supply (230 V~, 3A, motor duty) must be connected to “3” and “4”.



NOTE: With this arrangement. some parts of the electrical system are live, even when switch (8) is at “0”.



External compressor- / immersion heater supply

Power can be supplied separately to the compressor and immersion heater on the one hand and the circulation pump, fan and microprocessor on the other, as follows:

(See circuit diagram for FIGHTER 315P/E) Remove the jumper link between positions (5) and (6) on terminal block (12), and the jumper link between (4) and (5) on the same terminal block.

The following reconnections must be made:

- Cable 9.L1 – 7 from position (L1) on terminal block (9) to position (6) on terminal block 12).

- Cable 11.6 – 12.2 from position (6) on terminal block (11) to position (L1) on terminal block 9).

- Cable 9.N – 29.6 from position (N) on terminal block (9) to position (5) on terminal block 12).

- Cable 12.6 – 29.6 from position (6) on terminal block (12) to position (4) on terminal block 12).

Positions (5) and (6) on terminal block (12) now supply the circulation pump, the fan and the control system, whilst terminal block (9) supplies the compressor and the immersion heater. With this arrangement, external control of the compressor must not be used.

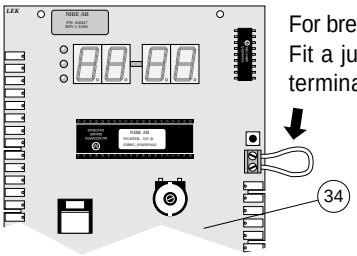
Because of the great variety of electrical connections made by the electric power suppliers, we have not mentioned here all the possible connection arrangements for the FIGHTER 315P.

18 Electrical connections

Ripple control and load sensor

The power steps of the immersion heater can be disconnected by means of a load sensor or a ripple control relay. This can be done either with floating make (NO) or break (NC) contacts, connected to terminal block (14). The required contact function is chosen with a jumper on the PCB behind the front panel (see below). The heat pump is supplied with no jumper in place, ie for make (NO) contact function.

With this arrangement, an open external contact does not cause power disabling.

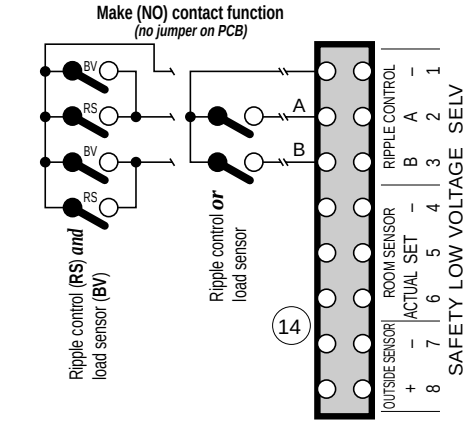


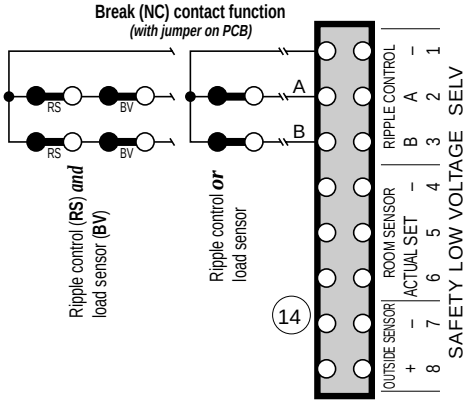
For break (NC) contact function: Fit a jumper to the connection terminal block.

The table below describes power disabling.

Operated external contact	Disable power step
A	Contactor 69 (black circuit)
B	Contactor 67 and 69 (white and black circuit)
A + B	Contactor 10, 67 och 69 (Brown, white and black circuit)

If both a load sensor and ripple control will be used, the contact functions must be the same for both (both make or both break). The contacts must be connected in parallel for make (NO) contact function and in series for break (NC) contact function.





Commissioning and adjusting 19

Preparations

- Check that switch (8) is set to **"0"**.
- Check that valves (44) and (50) are fully open and that the temperature limiter (6) has not tripped (press the button firmly). Applies to FIGHTER 315P/E only.

Filling the heating system

- Connect a hose between a cold water tap and the filler valve (80). Open the cold water tap.
- Open the filling valve (51). The boiler part of the heat pump and the radiator system are now filled with water. (The water heater need not be full at commissioning.)
- After a while the pressure gauge (42) will show rising pressure. When the pressure reaches 2.5 bar (about 25 metres WG) a mixture of air and water starts to emerge from the safety valve (52). Close the filling valve (51).

Venting the heating system

- Vent the electric boiler through the safety valve (52) and the rest of the heating system through the relevant venting valves.
- Keep topping up and venting until all air has been removed and the pressure is correct.

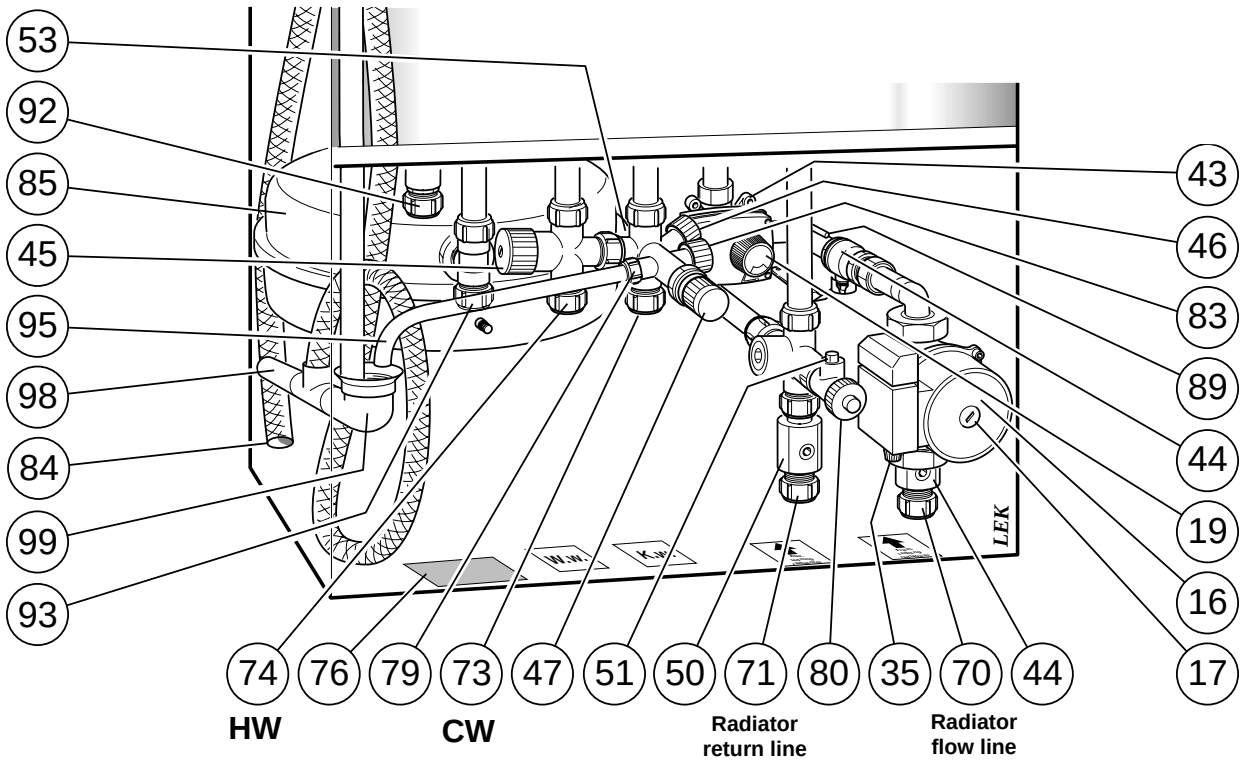
Starting

- Set switch (8) to "R". In this mode the electronics are disconnected, so the display window is not lit. The thermostat (3) opens at 68 °C in this mode.
- Set the shunt (19) by hand (press the knob in and turn it).
- When the room temperature goes above 16 °C, set switch (8) to "1". NOTE: There is a delay of about 20 minutes before the compressor starts.
- Reset the shunt (19) by hand (turn the knob until it "jumps out").
- Set the dimensioned capacity on switch (16) of the circulation pump (35). See "Pipe connections" – "Pump and pressure drop diagram". Make sure that the switch is not in an intermediate position.

Setting the ventilation

Ventilation flows and fan transformer settings are given on the ventilation drawing.

- To change fan capacity, move the exhaust air fan connection cable on the fan transformer (54) if necessary. To ensure the lowest possible noise level, set the fan for the lowest possible capacity.
- Make sure that all outside air devices are fully open.
- Set correct ventilation flows on the exhaust air devices of the house.



20 Commissioning and adjusting

Later adjustment

During the initial running period, air is given off by the heating water, and venting may be necessary. If bubbling sounds can be heard from the heat pump, the entire system requires further venting. **NOTE:** Safety valve (52) also acts as a manual venting valve. Operate it with care, since it opens quickly. When the system is stable (correct pressure and all air eliminated) the automatic heating control system can be set as required. See under “Room temperature” – “Setting the automatic heating control system” and “Front panel”.

Draining the hot water system

The hot water can be drained off through drain valve (51) using an R20 (3/4") hose coupling. Remove the cover (80) from the valve (51). Screw on the hose coupling and open valve (51).

Open safety valve (52) to let air into the system.

Filling the water heater

To fill the water heater, open a hot water tap and then fully open filling valve (46). This valve must remain open in service. When water comes out of the hot water tap, close the tap (there is no need for the water heater to be filled at commissioning).

Draining the water heater

The combined safety and drain valve (47) and (83) is located next to the mixing valve (45), pointing upwards at angle. This is how to drain the water heater:

- Disconnect the overflow pipe from the drain connection (79) and connect a hose to a draining pump instead. Where no draining pump is available, the water can be released into the overflow funnel (99).
- Open drain valve (83).
- Open a hot water tap to let air into the system. If this is not enough, undo a pipe coupling on the hot water side and pull out the pipe.

Setting with diagrams

The heating control system of the FIGHTER 315P is controlled by the outside temperature. This means that the flow pipe temperature is controlled relative to the actual outside temperature.

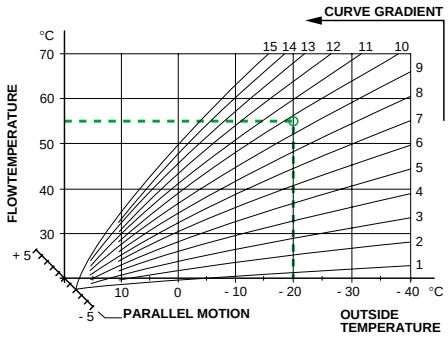
The relationship between outside temperature and flow temperature is set with the “Heating curve selection” and “Offset, heating curve” control knobs.

The diagram is based on the design basis outside temperature of the location and the design basis flow temperature of the heating system. The slope of the automatic heating control system curve can be read off where these two values “meet”.

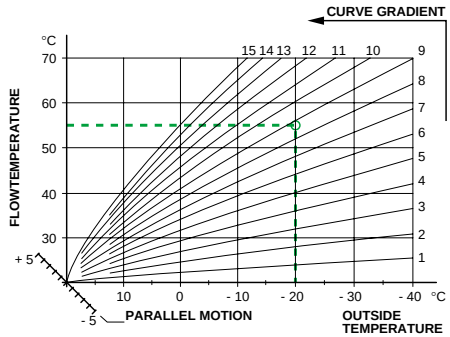
Set “Offset, heating curve” accordingly. A suitable value for underfloor heating is -1 and for a radiator system -2.

See also “Room temperature”.

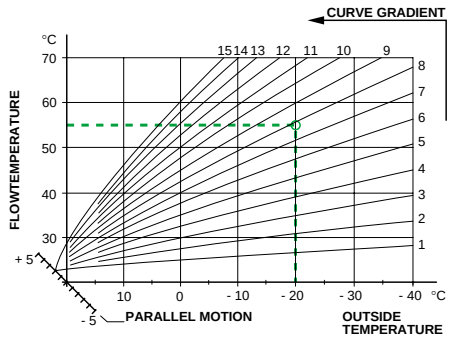
Heating curve offset -2



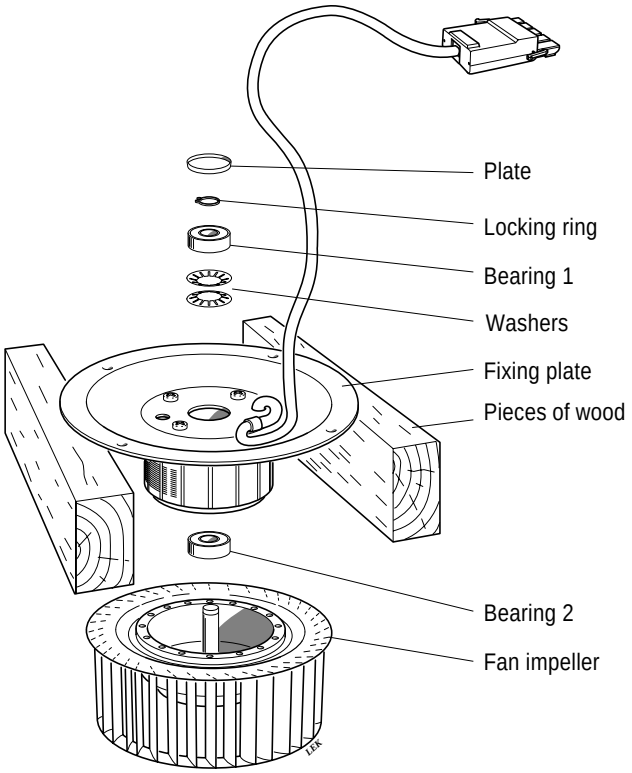
Heating curve offset 0



Heating curve offset +2



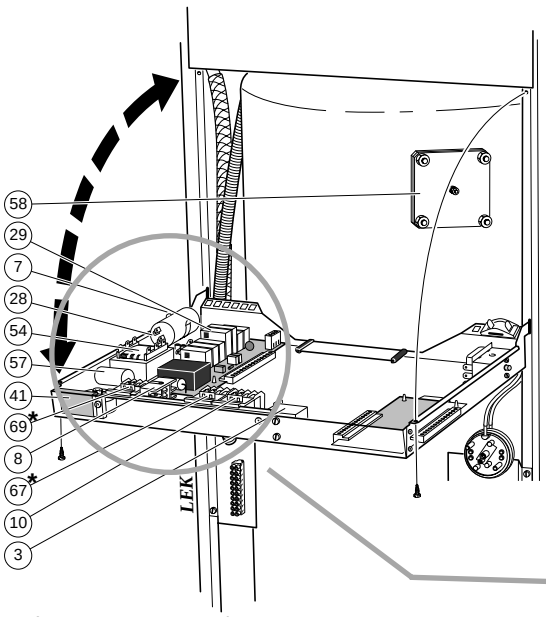
Replacing fan bearings



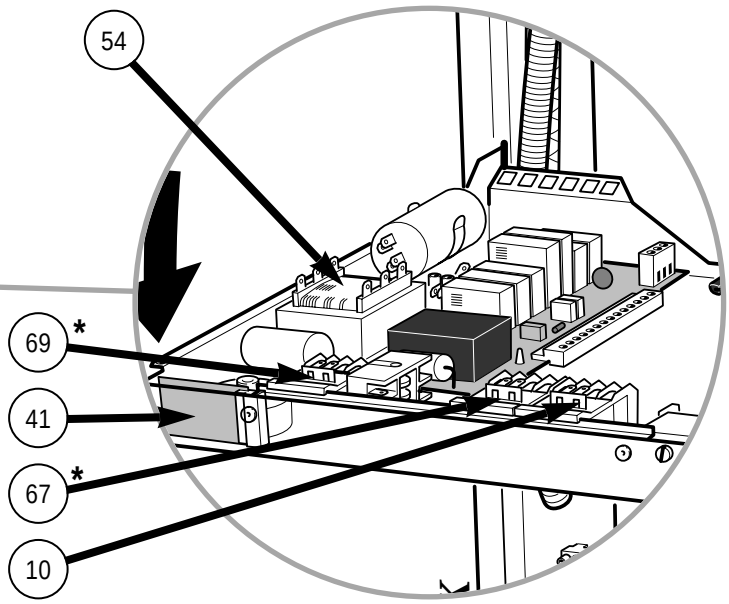
After several years service the fan bearings may become noisy. If this happens, they can easily be replaced.

- Remove the fan as described under “Maintenance routines” – “Cleaning the fan”. The small plate can be removed with a sharp object.
- Remove the locking ring and place the fan on two pieces of wood (against the fixing plate).
- Carefully tap the end of the fan impeller shaft with a hammer and drift to remove the fan impeller.
- Pull off the two bearings.
- Fit new standard bearings of type 608 - 2RS or alternatively 608 - 2Z (choose the same bearing as the original ones). The bearings are stocked by good hardware stores. Be sure to install the spring washers with the “tops” facing each other, as shown.
- Install the fan in the reverse order.
- Secure the fan with the screws and plug in the connector.

Lowering the front panel



To lower the front panel, unscrew the two screws at the top of the panel. The panel can then be lowered to the horizontal position (where it rests on stops on either side of the front panel).

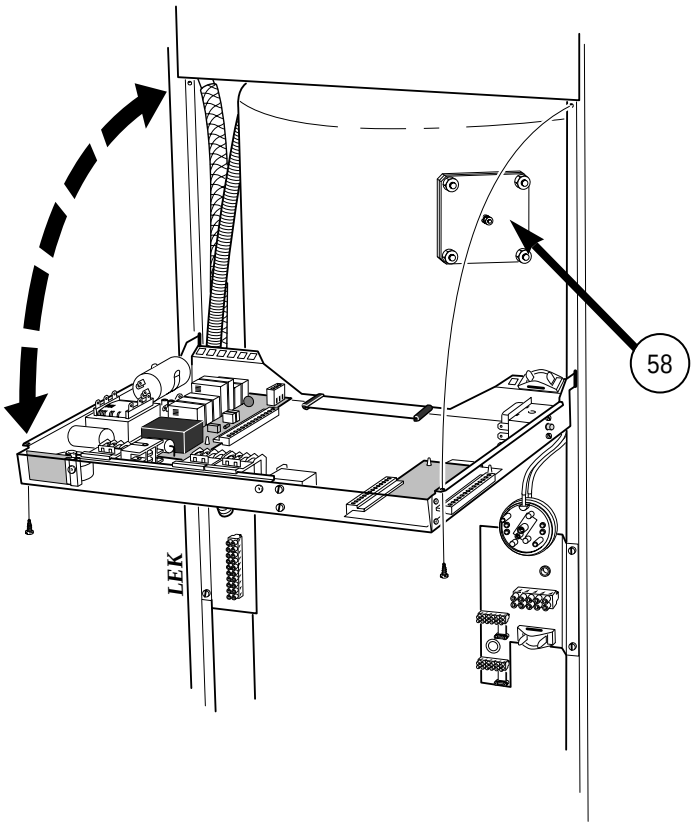


* Only FIGHTER 315P/E.

Refrigerant system

Work on the refrigerant system must be done by authorised personnel in accordance with the relevant legislation on refrigerants, supplemented by additional requirements for flammable gas, for example, product knowledge as well as service instruction on gas systems with flammable gases.

Replacing the anode



At the top of the water heater there is an anode mounted on an inspection cover (58). This is the procedure for changing the anode:

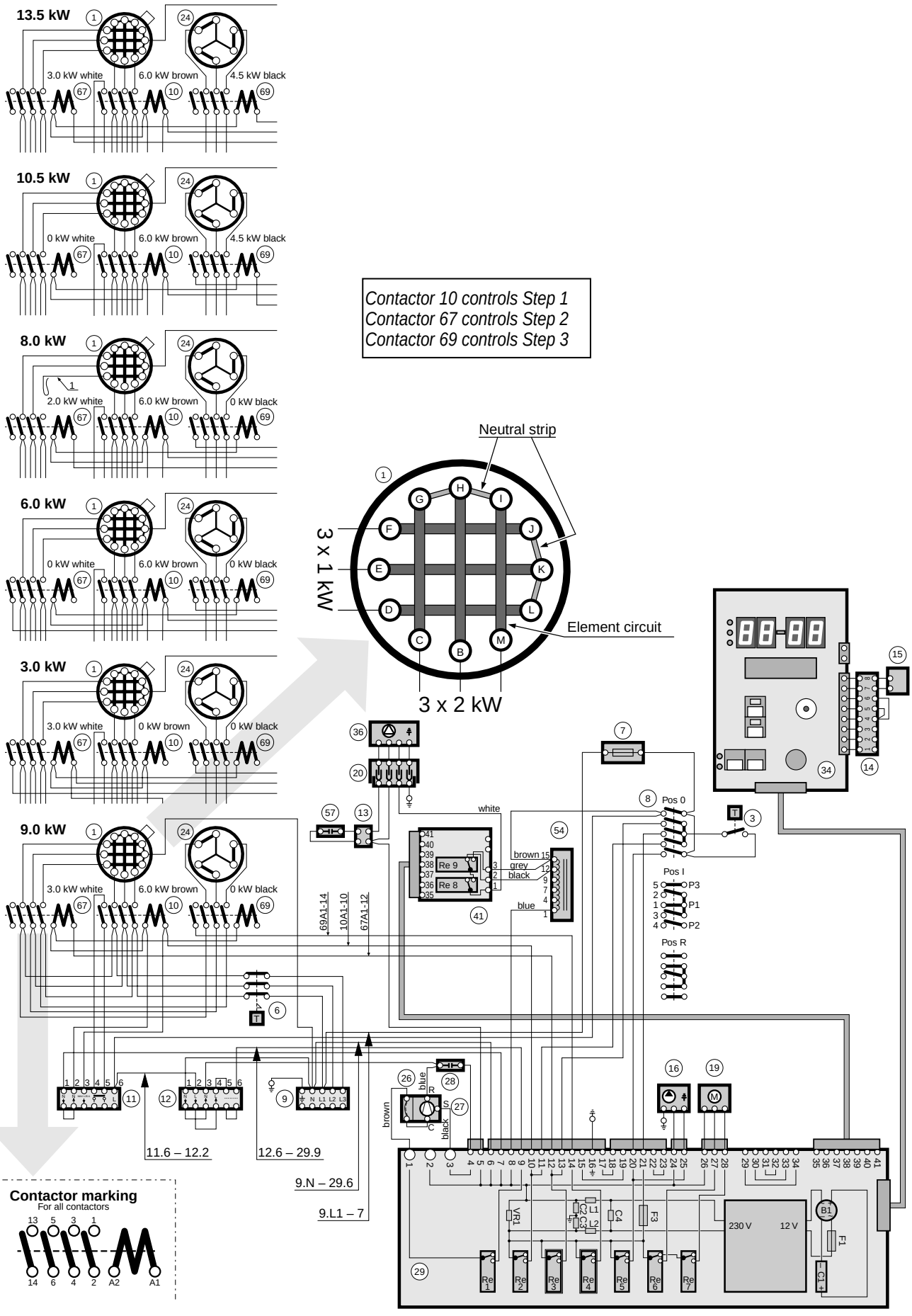
- Remove the heat pump fuses in the meter cabinet.
- Drain the water heater. See “Commissioning and adjusting”- “Draining the water heater”.
- Lower the front panel as shown.
- Remove the inspection cover (58).
- Replace the anode in the inspection cover.
- Refit in the reverse order.

There will be no need to replace the anode if a DC anode is fitted.

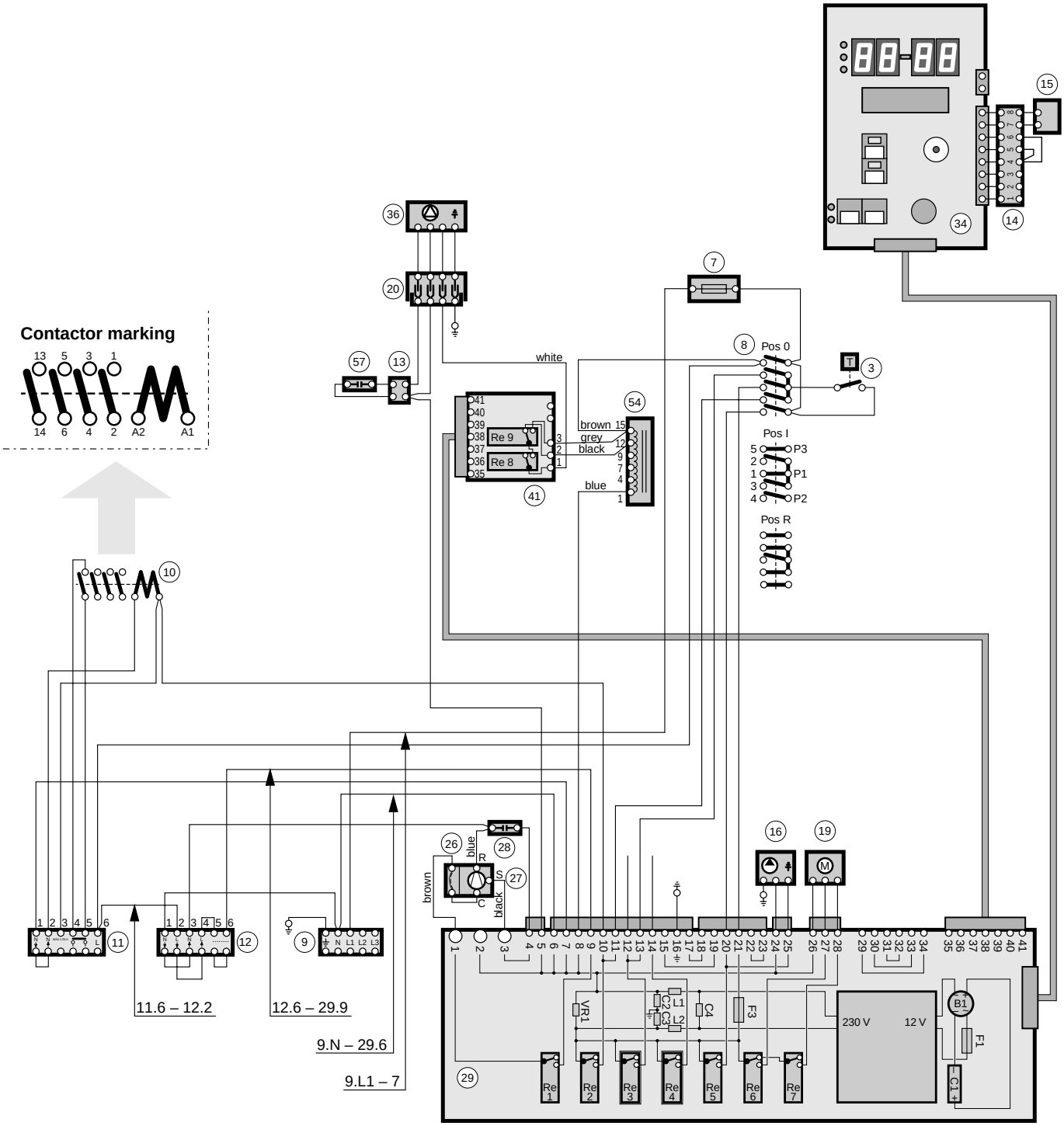
NOTE!

Protect electrical and electronic components from damp!

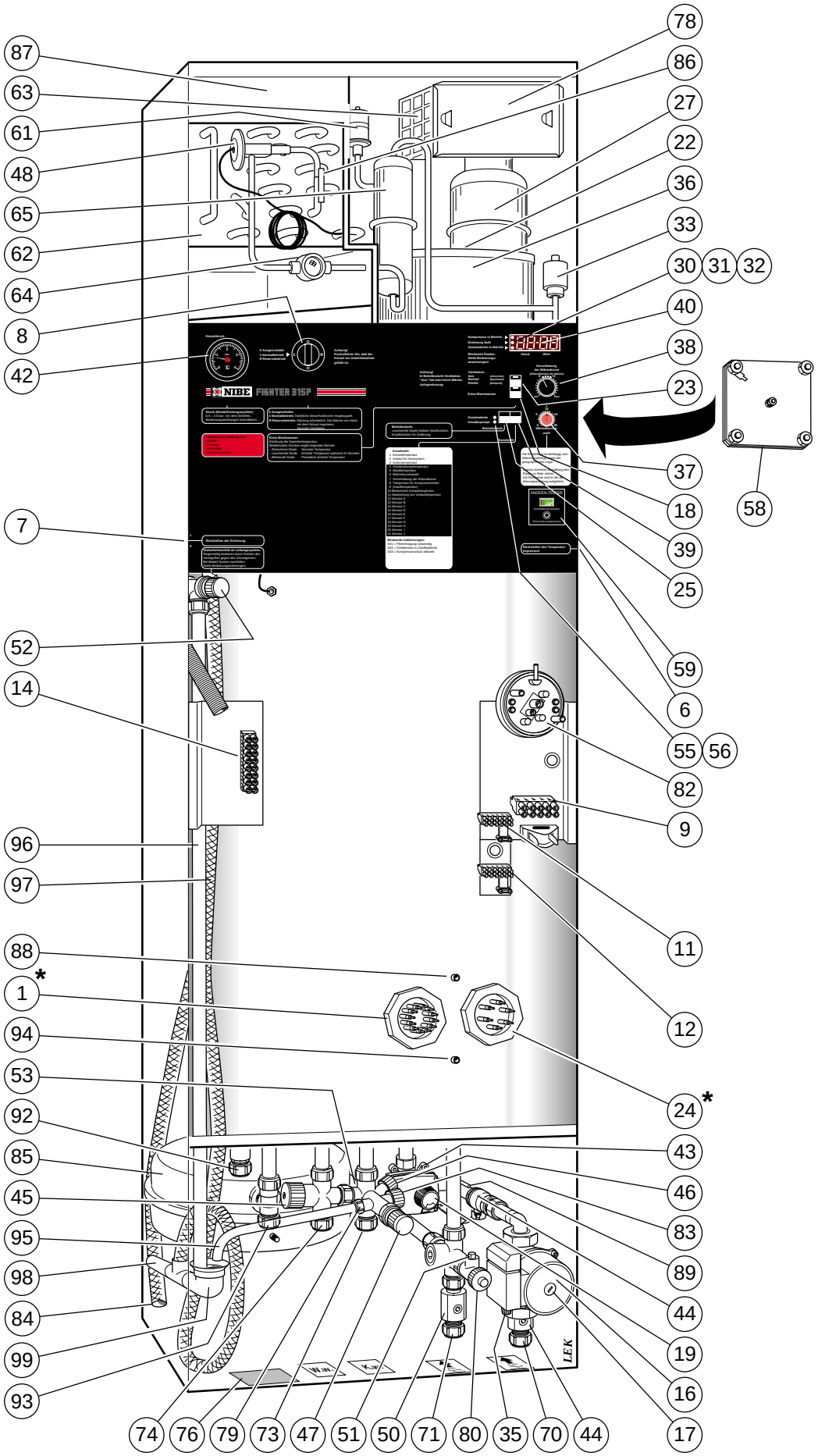
Circuit diagram (FIGHTER 315P/E)



24 Circuit diagram (FIGHTER 315P/G)



Component locations



* Only FIGHTER 315P/E.

26 List of components

1 Immersion heater, 9 kW (FIGHTER 315P/E)
3 Operating thermostat, backup heating “R”
6 Temperature limiter STB
7 MCB, circulation pump, automatic heating control system and compressor
8 Switch, positions 0 - 1 - R
9 Terminal block, power supply
10 Contactor, stage 1
11 Terminal block, docking
12 Terminal block for external compressor supply/control
13 Terminal block for exhaust air fan
14 Terminal block for outside sensor
15 Outside sensor
16 Circulation pump
17 Air screw, circulation pump
18 Pushbutton, “Extra hot water”
19 Shunt motor with handwheel
20 Electrical connection for exhaust air fan
22 Motor protection device, exhaust air fan
23 Pushbutton switch for adjustable fan capacity
24 Immersion heater, 4.5 kW (FIGHTER 315P/E)
25 Selector switch, operating modes 1 - 2 - 3
26 Motor protection device, compressor
27 Compressor
28 Starter capacitor, compressor
29 Relay card with PSU
30 Indicator lamp, “Compressor”
31 Indicator lamp, “Defrost”
32 Indicator lamp, “Immersion heater”
33 High-pressure pressure switch
34 Microprocessor board with numerical display
35 Capacity setting, circulation pump
36 Fan, exhaust air
37 Knob, “Heating curve selection”
38 Knob, “Heating curve offset”
39 Pushbutton, “Channel selection”
40 Display with control card behind
41 Low-pressure pressure switch
42 Pressure gauge, boiler
43 Shunt valve
44 Shutoff valve, pump and flow line, radiator circuit
45 Mixing valve
46 Filling valve, water heater
47 Safety valve, water heater
48 Expansion valve
50 Shutoff valve, return line, radiator circuit
51 Drain valve, heating system
52 Safety valve, heating system
53 Vacuum valve (concealed)
54 Fan transformer, capacity switching
55 Indicator lamp, “Immersion heater”
56 Indicator lamp, “Circulation pump”
57 Starter capacitor for exhaust air fan, 3µF
58 Inspection cover with anode
59 Anode test
61 Low-pressure pressure switch
62 Evaporator
63 Air filter
64 Sight glass
65 Moisture filter with tank
67 Contactor, step 2 (FIGHTER 315P/E)
69 Contactor, step 3 (FIGHTER 315P/E)

		Connection	Setting-out dimensions A	B	C
70	Flow line, radiator circuit	Compression ring Ø 22 mm	100	465	80
71	Return line, radiator circuit	Compression ring Ø 22 mm	145	465	190
73	Cold water connection	Compression ring Ø 22 mm	175	465	290
74	Mixed water outlet from water heater	Compression ring Ø 22 mm	255	465	345
76	Type plate				
77	Side access panel, valve connection				
78	Exhaust air filter access panel				
79	Drain and overflow water connection, water heater	R 15 male (with compression ring nut removed)			
80	Filling and draining connection, heating system	R 15 male			
82	Filter sensor				
83	Drain, water heater				
84	Ventilation opening				
85	Expansion vessel				
86	Temperature sensor, evaporator				
87	Temperature sensor, vented air (concealed)				
88	Temperature sensor, electric module operation				
89	Temperature sensor, flow line				
90	Ventilation connection, exhaust air	Ø 125 mm	2095	295	160
91	Ventilation connection, vented air	Ø 125 mm	2095	295	485
92	Flow line connection, external boiler				
93	Return line connection, external boiler				
94	Temperature sensor, heating circuit				
95	Overflow pipe, water heater safety valve				
96	Overflow pipe, heating system safety valve				
97	Condensate drain, fan box				
98	Overflow water discharge	PVC pipe, 32 mm (outside diameter)			
99	Collecting funnel, overflow water				

Technical data

Specifications

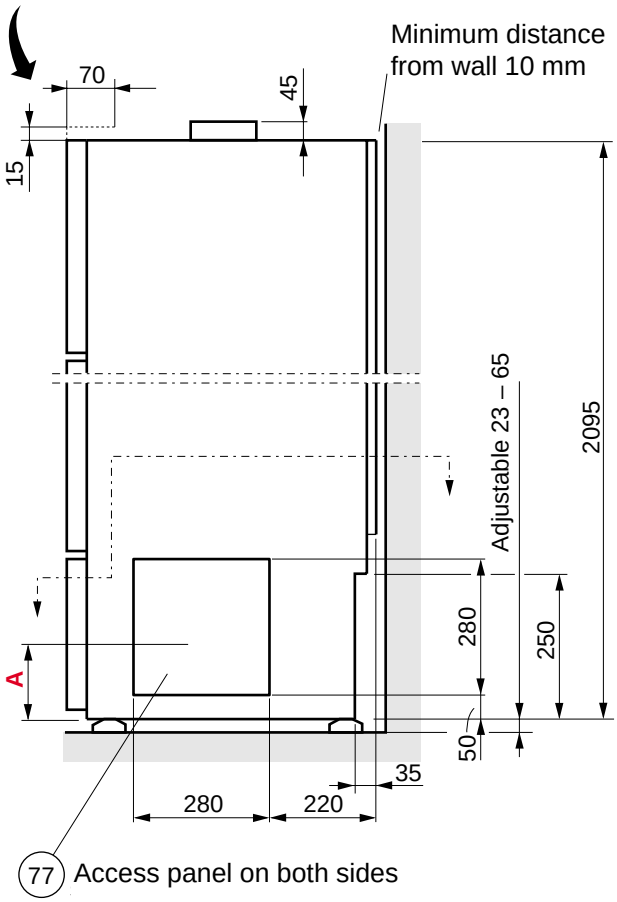
IP 21

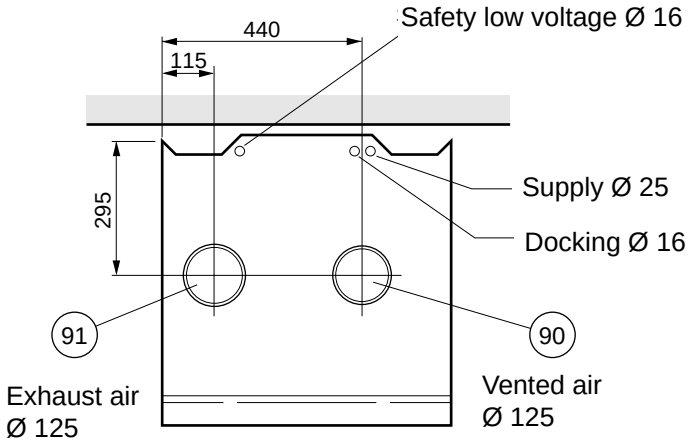
Height	2 095	mm	
Width	600	mm	
Depth	610	mm	
Weight	195	kg	
Total volume	240	liter	
Volume, double jacket	70	liter	
Volume, water heater	170	liter	
Supply voltage	230	V~	
Power rating, immersion heater, FIGHTER 315P/E	9	kW	(switchable)
Rated power, circulation pump	99	W	(can be set)
Rated power, exhaust air fan	130	W	
Rated power, compressor	550	W	
Protection	IP21		
Max pressure in storage heater	0.9	MPa	(= 9 bar)
Max pressure in double jacket vessel	0.25	MPa	(= 2.5 bar)
Refrigerant quantity	420	g	
Break pressure, high-pressure pressure switch	2.45	MPa	(24.5 bar)
Break pressure, low-pressure pressure switch	0.15	MPa	(1.5 bar)
Cut-in temperature, compressor	49	°C	(controlled by a separate sensor)
Refrigerant type	R290		(Propane)
Cut-out temperature, compressor	52	°C	
Cut-in temperature, immersion heater	47 – 57	°C	
Cut-out temperature, immersion heater	50 – 60	°C	
Hysteresis, automatic shunt	0	°C	
Sound level in room where installed	45 – 50	dBA	
SA type approval no.	T1719/1		

28 Technical data

Dimensions and setting-out coordinates

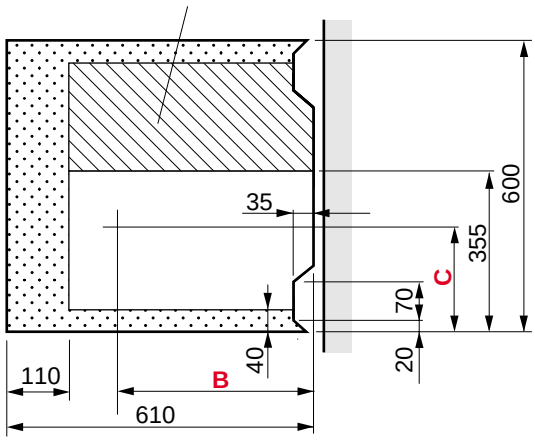
Space required for removal of upper front access panel





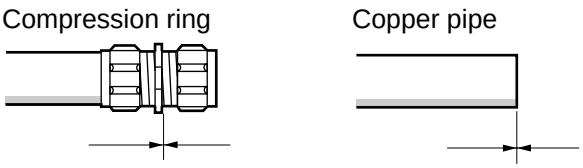
A clear space of 500 mm is needed in front of the heat pump for servicing.

When running pipes in the hatched area, make sure there is space to change the expansion vessel.



A, **B** and **C**: See “Connection” in “Component list”.
Pipes must not be run from the floor in the area indicated by dots.

Principle of dimensioning



Docking to gas boiler (FIGHTER 315P/G)

The FIGHTER 315P/G is suitable for docking with a gas boiler. Additional heat is transferred from a gas boiler.

The output of the gas boiler must not be greater than the maximum permitted output of the heat pump, ie 13.5 kW. A gas boiler with an output of up to 8 kW can be connected with Ø15/13 copper pipe. A boiler with a higher output must be connected with Ø22/20 copper pipe. Connections (92) and (93) must be used.

The loading flow must be adjusted to give a temperature rise in the boiler of 10 - 15 deg C. An adjusting valve should therefore be installed in the loading circuit.

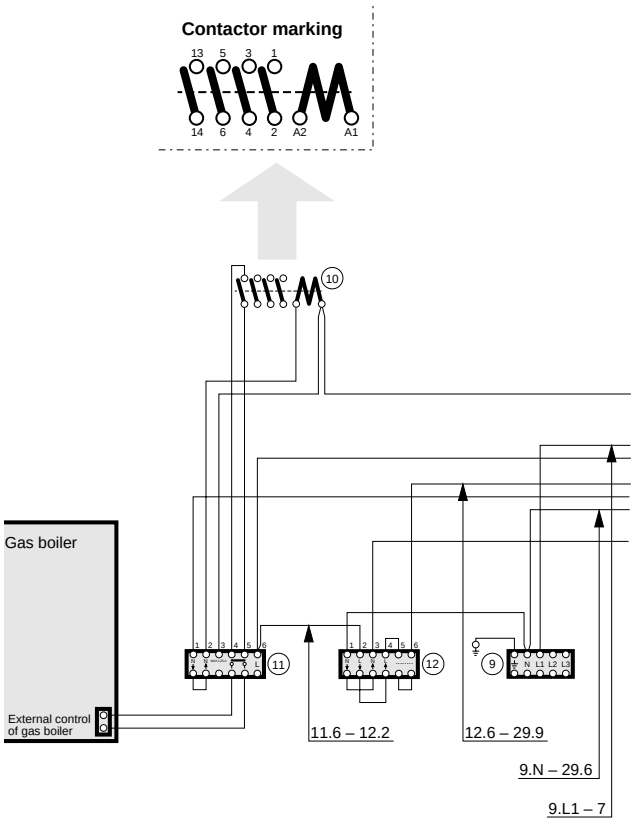
The flow must not exceed 800 l/h if stable operation is to be maintained.

To avoid malfunctions, the temperature from the gas boiler must not exceed 60 °C.

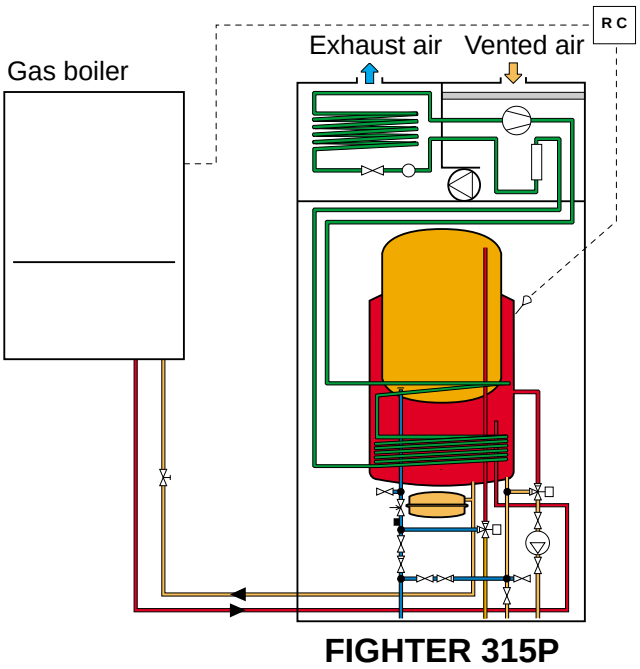
The electrical connection between the gas boiler and the heat pump is provided by a two-core cable. When the contactor relay of the heat pump closes, the gas boiler and its circulation pump start. When the relay opens, the gas boiler and its circulation pump stop.

The cable must be connected at terminal block (11). See the wiring diagram.

Circuit diagram

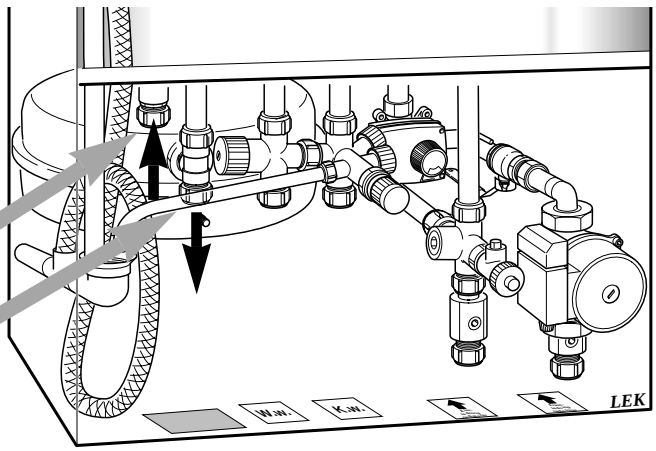


Schematic



FIGHTER 315P

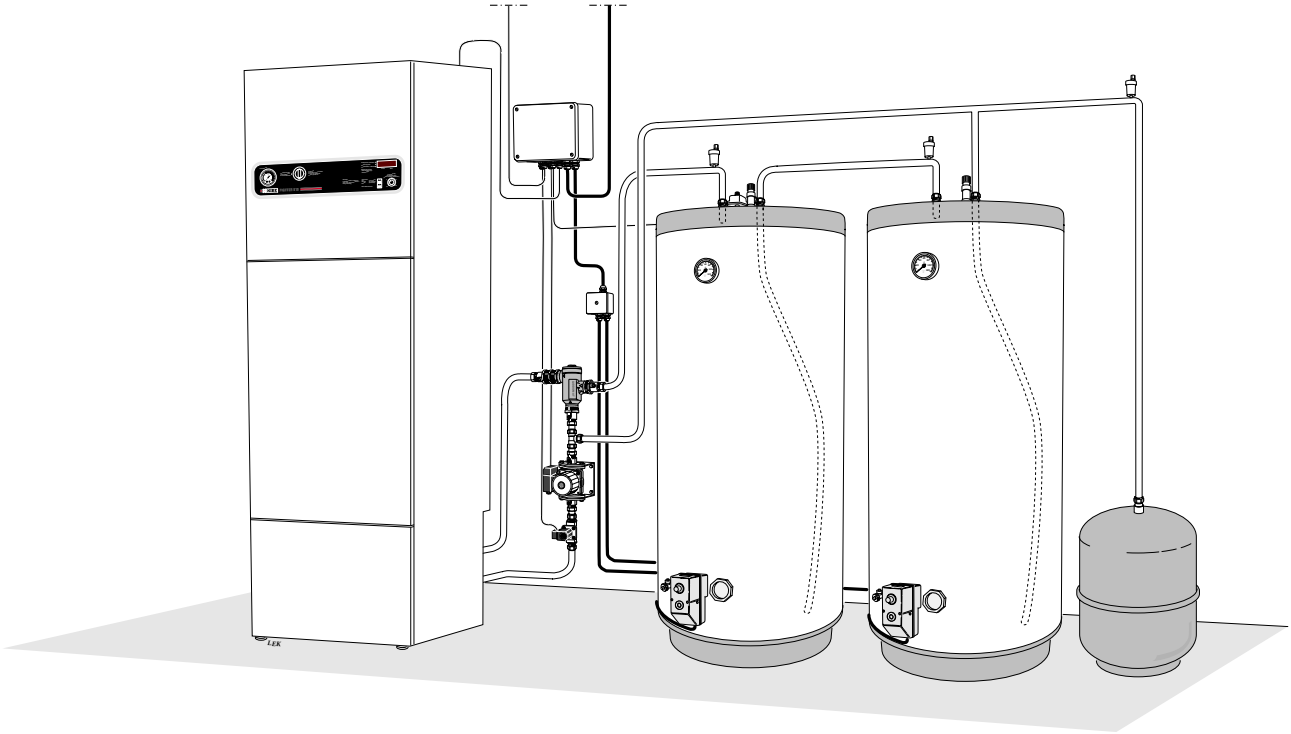
Pipe connections



(92) Docking connection, in

(93) Docking connection, out

Docking with accumulator tank (FIGHTER 315P/E)

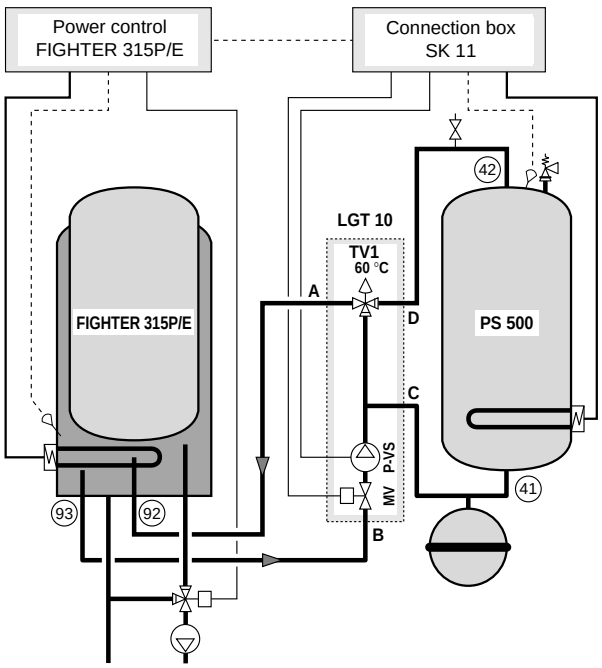


System description

In order to be able to benefit by special tariffs, the FIGHTER 315P/E can be combined with an accumulator tank (with an immersion heater to supply during periods of cutoff).

Energy is supplied when a circulation pump starts and pumps the externally heated water to the heating circuit of the FIGHTER. This continues until the desired temperature is reached in the FIGHTER.

The size of the accumulator tank must be chosen to suit the requirements of the particular situation.



Description of operation

Low tariff

During low tariff periods the FIGHTER 315P/E provides ventilation, radiator heating and service hot water without any input from the accumulator tank.

If additional energy is needed, it is supplied by the immersion heater in the FIGHTER 315P/E.

The accumulator tanks are heated independently of the FIGHTER 315P/E until the required tank temperature is reached.

At other times (high tariff)

The fan and compressor in the FIGHTER 315P/E work as usual. If additional energy is needed, it is taken from the accumulator tanks. In very cold weather or if large amounts of hot water are used, the immersion heater in the FIGHTER is switched on to cover the extra energy demand.

Equipment

Apart from the FIGHTER 315P/E, the system comprises one or more PS 500 accumulator tanks, connection box SK11, a “laddomat” LGT 10 and a docking kit PSP 11 (for one accumulator tank) or PSP 21 (for two accumulator tanks). Apart from the connecting parts, the docking kit comprises one or two immersion heaters and a thermostat, which must be installed high up on the accumulator tank.

NOTE!

Connection box SK11 is not approved for more than 16 A, so that the total power rating of the electrical components of the accumulator tanks must not exceed 11 kW.

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