170913 fw1.11_en

Installation and maintenance

| EP 450 | EP 510 | EP 540 | EP 600

VÄRMEBARONEN

Contents

Notes

Filled in when the boiler is installed!

Type: ☐ EP 450 ☐ EP 510 ☐ EP 540 ☐ EP 600

Serial number: ..... Installation date: .....

Plumber: .....

Tel: .....

Electrician: .....

Tel: .....

Other .....

.....

.....

.....

Settings

Installed power ..... kW Number of stages .....

Load guard ☐ yes ☐ no

Main fuse ..... A Primary transformer ..... (xxxx/5)

Current limit ..... A Margin ..... A

External temperature setpoint ☐ no ☐ 0 - 10 V ☐ 0 - 5 V ☐ 4 - 20 mA

External stage limit ☐ no ☐ 0 - 10 V ☐ 0 - 5 V ☐ 4 - 20 mA

Max. limit ..... °C Min. limit ..... °C

UTK - heating curve

P1 $T_{outside}$ = 20°C ..... °C P7 $T_{outside}$ = -10°C ..... °C

P2 $T_{outside}$ = 15°C ..... °C P8 $T_{outside}$ = -15°C ..... °C

P3 $T_{outside}$ = 10°C ..... °C P9 $T_{outside}$ = -20°C ..... °C

P4 $T_{outside}$ = 5°C ..... °C P10 $T_{outside}$ = -25°C ..... °C

P5 $T_{outside}$ = ±0°C ..... °C P11 $T_{outside}$ = -30°C ..... °C

P6 $T_{outside}$ = -5°C ..... °C Temperature adjustment ..... °C

Safety and handling

- Read these instructions carefully before installation and operation! Keep the instructions in the boiler!
- Check that the boiler has not been damaged during transport. Report any transport damage to the carrier.
- Check that the delivery is complete.
- All installation must be performed by an authorised person in accordance with the existing regulations.
- Risk of electric shock. Never leave the boiler door open!
- Never disable the safety equipment!
- The boiler must never be switched off electrically unless the heating system is full and the boiler vented.
- Correct installation in combination with correct adjustment and continuous service will produce high operational reliability and good heating economy.
- The boiler must not be modified, changed or converted in any way.
- Only authorised persons may work on the boiler.
- Disconnect the boiler from the power supply and lock the switches before service/repairs.
- Never carry out maintenance work/service on pressure-bearing parts when they are pressurised.
- The boiler may not be used by children or people with physical or mental impairments. Nor by children/people who lack knowledge about the boiler. Children may not play with the boiler and connect accessories.
- Always contact your installation engineer for service.
- The type and production number of the boiler must always be specified when contacting Värmebaronen. See the boiler's rating plate.
- Värmebaronen AB reserves the right to change the specification, in accordance with its policy of continuous improvement and development, without prior notice.
- Subject to amendments and printing and proofreading errors. Illustrations may differ from the actual product.

The following icons are used in these instructions to indicate important information:

Information that is important for optimum operation.

Tells you what you should or should not do to avoid personal injury.

Tells you what you should or should not do to avoid a component, the boiler, a process or the environment being damaged or destroyed.

Electrical hazard!

Function

Electric boilers for heating systems or industrial processes.

The boiler's power is divided into 30 power stages.

The boilers' control range is 20 - 95°C.

The output of the boilers can be limited down to one power stage.
The boiler meets the work environment authority regulations AFS 2016:1. Pressure bearing devices.

With factory-fitted safety equipment the boiler meets the Swedish Work Environment Authority's regulation AFS 2002:1, Section 17, on periodic monitoring of boiler systems, and EN 12828, see certificate. The boiler can then be installed without emergency protection.
The factory-fitted safety equipment comprises safety valves and high and low pressure guards.

Double circulation pumps and flow guards are not required. The boiler can cope with zero flow from a safety perspective.

A steam-collecting vessel is not required. The safety valves are fitted directly on the boiler's safety pipe.

Safety

The boilers have load-break switches which are acted on via shunt release by the boiler's thermal relay and pressure guards.
The boilers do not restart automatically after a power cut.

Reliability

With the fault management and measurement of cover boilers, which provides all, if the error to be able to faults in the beginning of quickly without unplanned downtime.

Alarm indication

Alarms are indicated on the boiler's control panel.
Connection for external indication of a buzzer alarm, alternating potential-free relay output.

Stainless immersion heaters

The immersion heaters are in stainless steel SS2353 with brass heads.

Pump maintenance operation

Connection for a circulation pump with a pump maintenance operation function.

External stage and power control

Connection for external blocking, 0 - 5 V, 0 - 10 V and 4 - 20 mA control of power.

External temperature setpoint

Connection for external setpoint in the form of 0 - 5 V, 0 - 10 V and 4 - 20 mA signal.

Output signal for present power and temperature

0 - 10 V signals for the number of power stages connected and boiler temperature.

Load guard

Protects the main fuses; secondary transformers are supplied with the boiler.

Reconnection after power cut

Power is reconnected after a power cut according to recommendation.

Power supply to external unit

Fused 230 V~ output for supply to an external unit.

Copper and aluminium

To facilitate installation, the boilers are fitted with terminals that make it possible to connect both aluminium and copper cables. No splicing from aluminium is required.

Outdoor temperature compensator, option

Controls the boiler temperature in relation to the outdoor temperature via an outdoor sensor.

Cooling fan

The boiler may be fitted with cooling fan(s) with air filters for use in areas with high temperatures or a dusty atmosphere. Fans are included with EP 450 and EP 510.

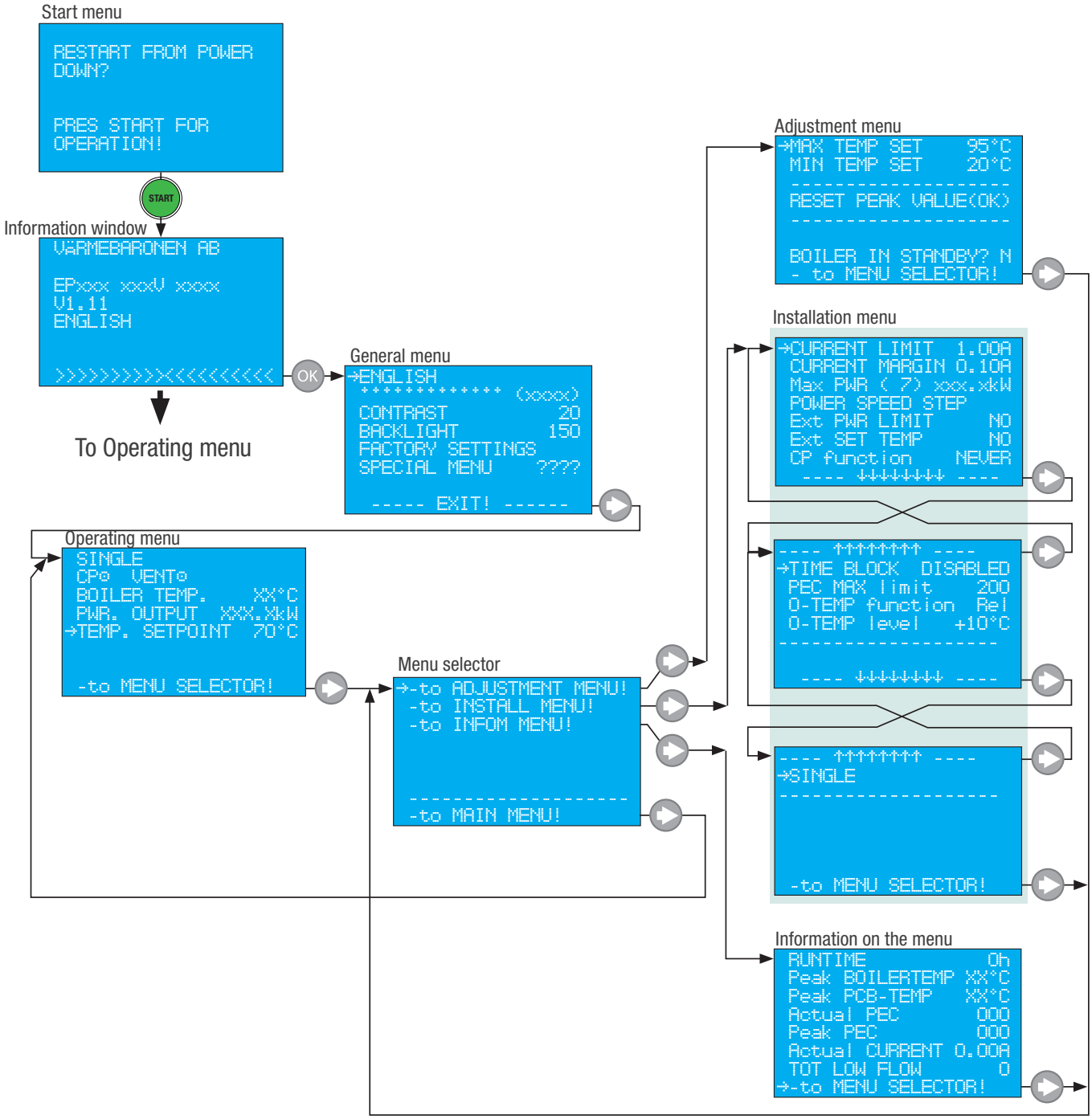
Series connection for greater power, option

If more power is needed, two boilers can be controlled in series

Temperature control in secondary circuit, option

When used with, for example, a heat exchanger, the temperature in the secondary circuit can control the boiler.

The menu, the standard



When electronics are switched on, the Start Menu is displayed.

If OK, the information window, is pressed when the arrows on the bottom row point towards the middle, the general menu will be displayed. If OK is not affected, the Operating menu is opened, which displays the boiler temperature, connected power and temperature set point.

An index arrow to the left on the line indicates that it contains information that can be changed.

▲ / ▼ moves the index arrow between the lines.

► selects the current line.

Change the content with ▲ / ▼.

Leave the line with OK.

A screen with the Menu selector is opened by moving to the bottom line with ▼ and pressing ► there.

From this you can access the adjustment menu, installation menu and information menu, or return to the operating menu.

The procedure is the same function in the other menus.

Displayed as follows:

→ ----- EXIT! ------ ► to the operating menu.

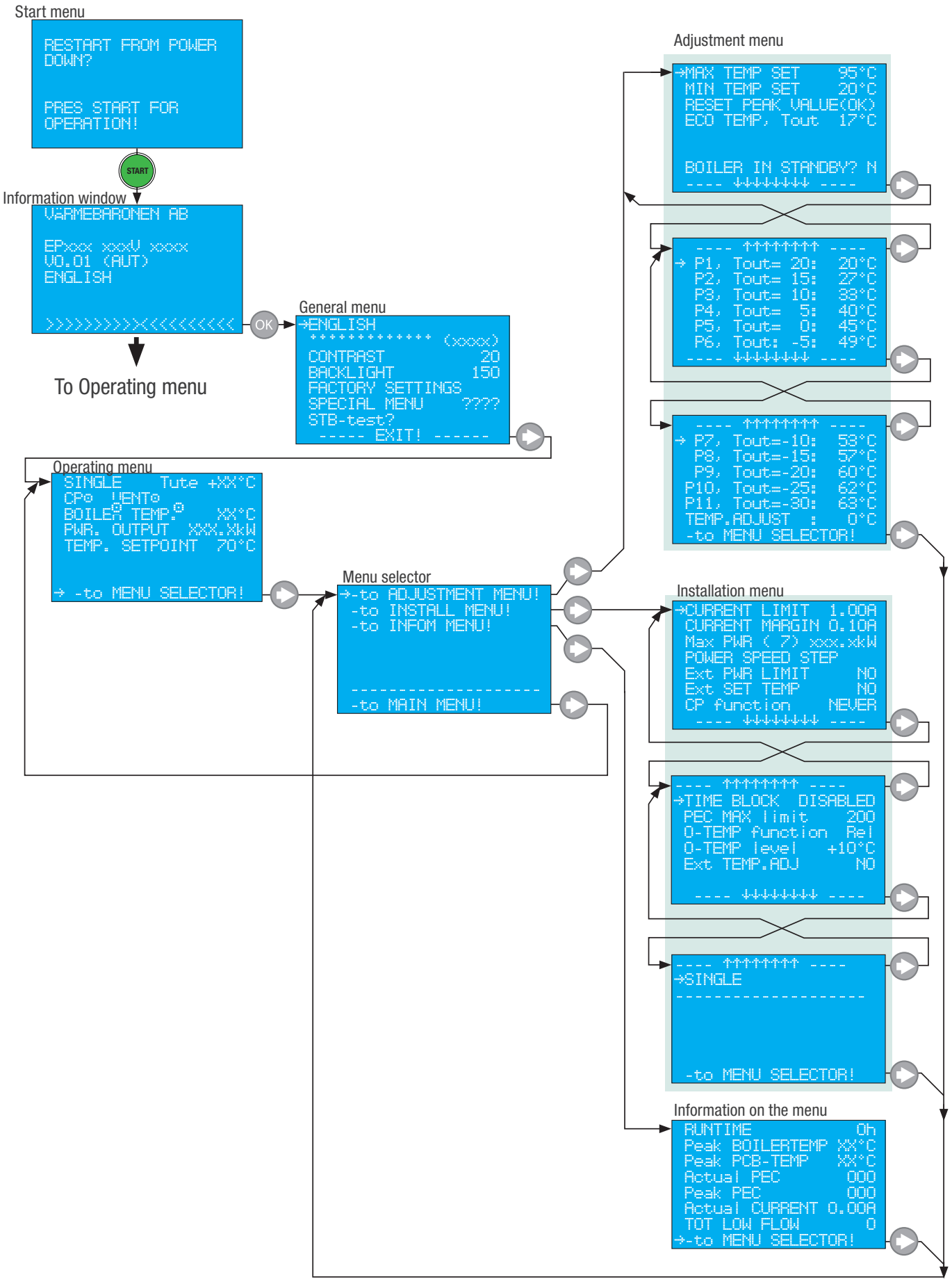
→---- ↑↑↑↑↑↑↑↑ ---- ► to the previous window.

→---- ↓↓↓↓↓↓↓↓ ---- ► to the following window.

→t||| MENYNVÄLJAREN! ► to the menu selector.

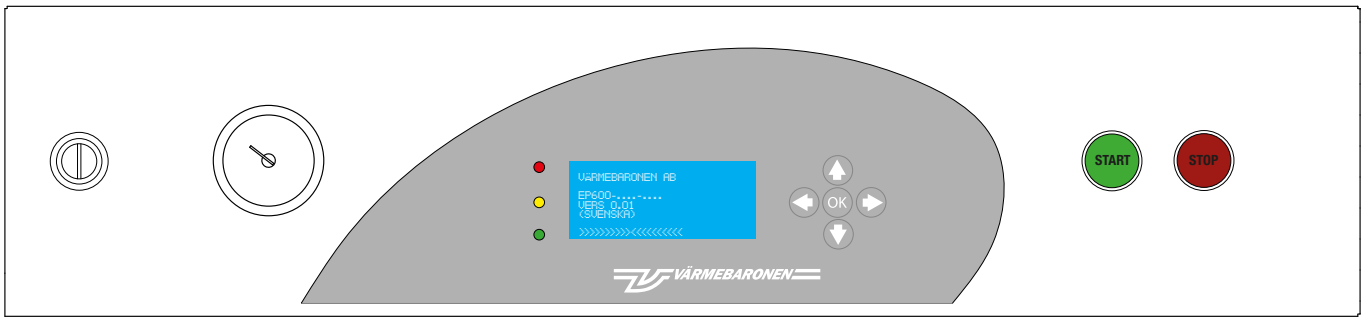
Menus - with outdoor temperature compensation (UTK)

Outdoor temperature compensator, UTK, is an option!



Operation and maintenance

Control panel



red indicator
Off: normal.
Flashing: serious fault.
The display shows the cause when OK is pressed.

yellow indicator
Off: normal.
Flashing: warning.
The display shows the cause when OK is pressed.

green indicator
On: normal.
Flashing: something is preventing power increase/decrease.
The display shows the cause when OK is pressed.

START Used to restart the boiler after a power cut.

STOP Breaks the power supply to the boiler by tripping the boiler's load-break switch.
The voltage to the control circuit is not broken!

moves the index arrow upwards, between the lines containing parameters that can be changed.
Set/change the content with the UP/DOWN arrow.
Parameters with a large setting range have a fast move function when the button has been pressed for a while.

moves the index arrow downwards between the lines containing parameters that can be changed.
Set/change the content with the UP/DOWN arrow.
Parameters with a large setting range have a fast move function when the button has been pressed for a while.

Press the RIGHT arrow to select the highlighted line.
Set/change the content with the UP/DOWN arrow.

-

OK Confirms a change and jumps back to the current menu.
Changes made take immediate effect when you press OK.

Display
Shows status, alarms, etc. The display returns to the Operating menu a minute after any button has been pressed.

Manometer
Shows the water pressure in the boiler/heating system.

Operation and maintenance

Before the boiler can be started, all the conditions for operation must be met. Check:
That no tools or similar have been left behind the busbar system. Power cables' connections; tighten them.
That the boiler and heating system are full of water and vented and that the air vents are open so that they can let air out.
That necessary valves are open.
The circulation pump is working with the correct flow direction.
That any safety valves are working.
That safety equipment is working as intended.

Start - first operation

Switch on the power to the boiler and follow the instructions given in the window. During start, the following is displayed:

```
BOILER TEMP.      0°C


SWITCH IN O-POSITION
OR TRIPPED!

SET SWITCH IN ON-
POSITION
```

If all conditions are correct, this screen is displayed for a short time when 'START' has been pressed.

Standard boiler

```
VÄRMEBARONEN AB

EPxxx xxxV xxxx
V1.11
ENGLISH


>>>>>>>>>><<<<<<<<<<
```

Boiler with UTK function

```
VÄRMEBARONEN AB

EPxxx xxxV xxxx
V1.11 (AUT)
(ENGLISH)


>>>>>>>>>><<<<<<<<<<
```

The operating menu is then displayed.

```
 SINGLE    Tute +XX°C
 CPo  VENTo
 BOILER TEMP.    XX°C
 PWR. OUTPUT  XXX.XkW
→TEMP. SETPOINT  70°C


 -to MENU SELECTOR!
```

If the bottom line of the screen switches between:

```
→-to MENU SELECTOR!
```

and

```
 PRESS OK FOR INFO!
```

the cause is displayed when OK is held down. See 'Alarm - warning - information'.

When the boiler is first operated, the following parameters must be checked/adjusted. More information is available under each menu. Note the settings in 'Notes'

Installation menu

Load guard

```
→CURRENT LIMIT  1.00A
→CURRENT MARGIN 0.10A
```

Power limiting

```
→Max PWR (3O)  63.0kW
```

External limit

```
→Ext PWR LIMIT     NO
```

External set point

```
→Ext SET TEMP      NO
```

Circulation pump

```
→CP function    NEVER
```

Delayed connection after power cut

```
→TIME BLOCK  DISABLED
```

Over temperature

```
→O-TEMP function  Rel
→O-TEMP level    +10°C
```

Adjustment menu

Max. and min. temperatures

```
→MAX TEMP SET    95°C
→MIN TEMP SETT   20°C
```

Boiler with UTK

```
→ P1 (Tout:+20): 20°C
  P2 (Tout:+15): 27°C
  P3 (Tout:+10): 33°C
  P4 (Tout: +5): 40°C
  P5 (Tout:  0): 45°C
  P6 (Tout: -5): 49°C
→ P7 (Tout:-10): 53°C
  P8 (Tout:-15): 57°C
  P9 (Tout:-20): 60°C
 P10 (Tout:-25): 62°C
 P11 (Tout:-30): 63°C
 TEMP.ADJUST.  :  0°C
```

Operating menu

Boiler temperature, only standard boiler

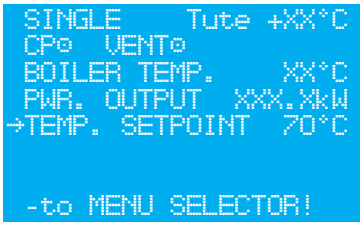
```
→TEMP. SETPOINT  70°C
```

Pressure guards

If the boiler was supplied with safety equipment, see 'Alarm - pressure guards', High-pressure guard and Low-pressure guard.

Operating menu, Adjustment menu

Operating menu



“SINGLE”, information, changes with series operation, option.

CP⚙ : pump in operation.
CP : flashing, pump paused.
See ‘CP function’ in the installation menu.

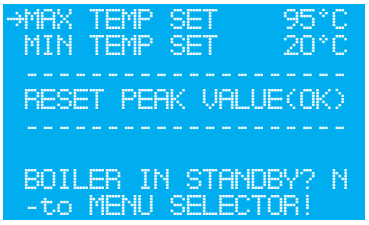
VENT⚙ : cooling fan in operation.
VENT : cooling fan paused.

Information, current boiler temperature.

Information, current connected power.

Setting, desired boiler temperature, 20 - 95°C, setpoint.
The setting range is affected by max. and min. limits.

Adjustment menu



Max. and min. limits of the range for setting the boiler’s temperature setpoint.

Max. limit:	55 - 105°C.
Min. limit:	20 - 50°C.

Resetting all the high values in the information menu.

Set boiler in standby position (switched off).

Adjustment menu - with outdoor temperature compensation (UTK)

Adjustment menu - boiler with UTK - Window one

```
→MAX TEMP SET     95°C
 MIN TEMP SET     20°C
 RESET PEAK VALUE(OK)
 ECO TEMP, Tout   17°C


 BOILER IN STANDBY? N
 ----  ↓↓↓↓↓↓↓↓  ----
```

```
→MAX TEMP SET     95°C
```

```
→MIN TEMP SET     20°C
```

Setting range for temperature setpoint.

Max. limit:	50 - 105°C.
Min. limit:	20 - 45°C.

```
→RESET PEAK VALUE(OK)
```

Resetting the values in the information menu.

```
→ECO TEMP(Tout) +17°C
```

Lowest temperature at which no heating is required. All boiler power disconnected, the circulation pump is stopped.

Alternative `→CP function  ECO` ***in the Installation menu muts be selected for the ECO-function top be active and for temperature setting to be carried out***

```
→BOILER IN STANDBY? N
```

Set boiler in standby position (switched off).

Window two

Setpoint at outdoor temperature:

```
  ----  ↑↑↑↑↑↑↑↑  ----
→ P1, Tout= 20:   20°C
  P2, Tout= 15:   27°C
  P3, Tout= 10:   38°C
  P4, Tout=  5:   40°C
  P5, Tout=  0:   45°C
  P6, Tout= -5:   49°C
 ----  ↓↓↓↓↓↓↓↓  ----
```

20°C →
15°C →
10°C →
5°C →
0°C →
-5°C →

Window three

Setpoint at outdoor temperature:

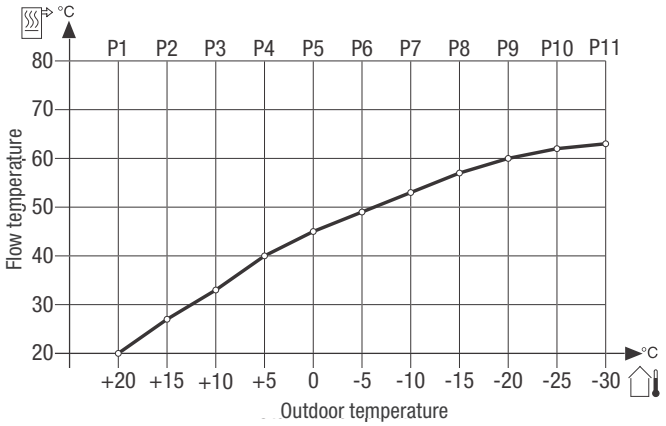
```
  ----  ↑↑↑↑↑↑↑↑  ----
→ P7, Tout=-10:   58°C
  P8, Tout=-15:   57°C
  P9, Tout=-20:   60°C
 P10, Tout=-25:   62°C
 P11, Tout=-30:   68°C
 TEMP.ADJUST  :    0°C
 -to MENU SELECTOR!
```

-10°C →
-15°C →
-20°C →
-25°C →
-30°C →

```
→TEMP.ADJUST  :    0°C
```

Alternative temperature, against normal temperature, +/- adjustment of setpoint, parallel displacement. The change is affected by a contact function connected to terminal block J2, see point 32 “Control circuit”.

Heating curve



Each setpoint, P1 - P11, is adjustable over the range 20 - 80°C

Installation menu

Window one

Load guard

Setting values are calculated, for example:

Main fuse: 800 A

Current transformer: 1000/5

Boiler, EP 510: 17 kW/stage/24.5 A. See “Technical data”.

Current transformer’s conversion ratio:

$$\frac{1000}{5} = \mathbf{200}$$

Current limit

$$\frac{\text{size of main fuse current}}{\text{transformer's conversion ratio}} = \frac{800\ \text{A}}{200} = \mathbf{4}$$

Margin

$$\frac{\text{size of power stage in amperes}}{\text{current transformer's conversion ratio}} = \frac{24.5\ \text{A}}{200} = \mathbf{0.12}$$

Selection of the power with which the boiler is to operate. The figures in brackets show the number of stages.

Quick increase/reduction of power in connection with checks and acceleration of the delay when it is active. If the delay is active, the display shows

Release the button and press it again if you want quick increase/decrease.

Stage limit with external signal, 0 - 100% of selected power, “Max. POWER”.

NO: internal limit.
0-5V: limit with 0 - 5 V.
0-10V: limit with 0 - 10 V or potential-free blocking.
4-20mA: limit with 4 - 20 mA.

Temperature setpoint via external signal.

NO: internal setpoint.
0-5V: nominal value with 0 - 5 V (0 - 170° C).
0-10V: nominal value with 0 - 10 V (0 - 170° C).
4-20mA: nominal value with 4 - 20 mA (0 - 170°C).

Operating method for circulation pump supplied with power by the boiler:

NEVER: no pump operation/pump switched off

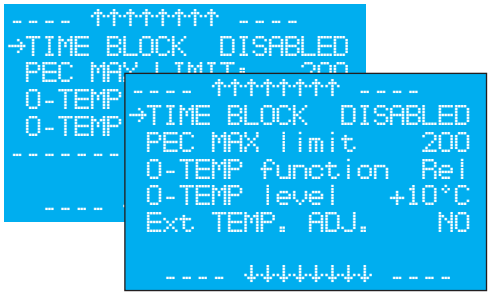
AUTO: The pump starts before power is connected and stops one minute after all power has stepped out. If the pump is not in operation, it is run once daily. In the event of over temperature, the pump starts and is in operation until the over temperature situation ends, even if all power is disconnected.

ALWAYS: Pump always in operation.

ECO: Only with UTK, option.
Pump stop with maintenance operation, when the outdoor temperature meets the set temperature according to →ECO TEMP, Tout 17°C in the Adjustment menu

Installation menu

Window two



→TIME BLOCK DISABLED

Limits power connection after a power cut which has lasted longer than three minutes. See 'Delayed power connection' under 'Operation and maintenance', options:

Switched off: no function.

Activated: delayed power connection.

→PEC MAX limit 200

Limit value, 0 - 500 quality factor, for PEC function alarm.

→O-TEMP function Rel

→O-TEMP level +10°C

Over temperature function:

Rel: over temperature, 5 - 15°C, relative to setpoint.

Abs: absolute value for over temperature, 105 - 106°C

Temperature level for the over temperature function, range:

5 - 15°C when relative to setpoint is selected.

35 - 105°C for absolute temperature.

with UTK →Ext TEMP. ADJ. NO

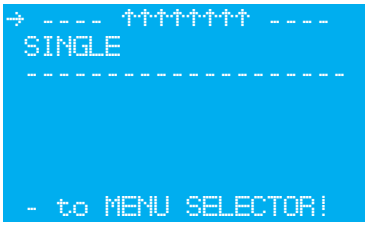
Will the function be used with closing or open contact,

alternative: No

J2→O open

J2→C closed

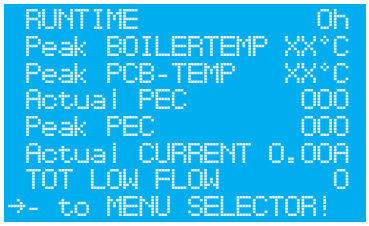
Window three



→SINGEL

Information, changes with series operation, option.

Information on the menu



The time in hours for which the electronics were powered.

The highest boiler temperature since the electronics were last switched on.

The highest temperature of the relay circuit board since the electronics were last switched on.

Result of leakage current measurement. The value, 1 - 500, is a quality factor, i.e. the lower the value the better.

Requires that the load guard current transformer is installed. The displayed current is the highest loaded phase.

With direct measurement the actual current is displayed. During secondary measurement, the current measured by the secondary current transformer, 1 - 5 A, is displayed. The actual current value is obtained by multiplying the read off value by the primary transformer's conversion ratio.

Number of low flow detections. If the boiler temperature changes in an undesired way, the control detects this and takes action to prevent unnecessary contactor operations and to reduce the risk of the boiler's temperature guards being tripped. Check the flow through the boiler!

General menu

This menu is only available on start after the electronics have been without power.

Press OK when this screen is shown, while the arrows in the bottom row disappear towards the centre.

This window will then be displayed:

Language selection.

Information to manufacturer.

Adjusting window contrast.

Adjustment of the backlighting of the window.

Reset to factory setting.
YES = OK
NO = OTHER BUTTON

Manufacturer settings.

Only boiler with UTK function. Used to control the boiler's temperature guards.

Operation and maintenance

Restart after power cut

The boiler does not restart automatically after a power cut. To start the boiler, follow the instructions in the display.

Power connection

The boiler uses binary power increase. Thirty stages are achieved by connecting and disconnecting the power groups.

Delayed power connection after power cut

Power connection can be time restricted after a power cut, that was longer than three minutes. When the delay is active, the green indicator on the control panel flashes. Information may be displayed in the display. The delay can be temporarily disabled. See the Installation menu.

Quick increase/reduction

For quick increase/reduction, see the Installation menu. Increase/reduction can be limited by temperature, load guard or the permitted number of power stages.

Load guard

The load guard protects the main fuses against overload by reducing the boiler's power. When the overload ceases, the power is reconnected.

PEC function

The boiler has earth fault measurement, PEC, which indicates any fault in the immersion heaters at an early stage. This function can be used to remedy any fault without unplanned stoppages.

The break value for the PEC function is adjustable.

Safety valves

To maintain the safety function, the heating system's safety valves must be operated regularly.

Over temperature protection

To supplement the temperature guards, the control electronics has over temperature protection. The aim of this is to prevent the temperature guards from being tripped where possible. The protection disconnects all power in the event of a temporary temperature increase that may occur as a result of reduced flow following a pump stoppage, for example.

Maintenance

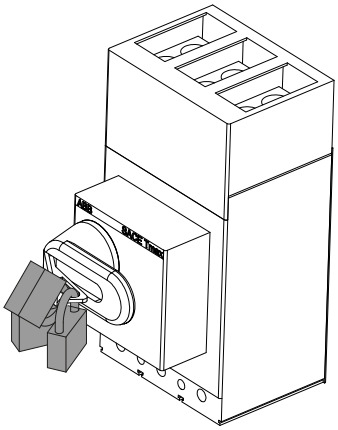
After 500 hours of operation, the cable connections must be tightened with a torque wrench.

Check the power cables' connections every 2 years.

The control voltage is not broken by the load-break switches! External voltage may occur.

Draining

Always cut the power to the boiler and lock the switches before the boiler water is drained!



Action in the event of a risk of freezing - frost protection

When it is extremely cold, no part of the heating system must be switched off as there is a risk of bursting.

If you suspect that any part of the heating system is frozen, contact an installation engineer.

The boiler must not be in operation if you suspect that any part of the heating system is frozen. Call an installation engineer!

If the heating system must be switched off for long periods the system should be drained, or the heating system water can be mixed with maximum 30% glycol. When using a glycol mixture the boiler power is reduced, or the through flow in the boiler can be increased.

If the heating system's water is mixed with glycol, it is important to check that the glycol contains a suitable quantity of corrosion-protection additive. When glycol breaks down, one of the by-products is carbonic acid, which increases the risk of corrosion.

Operation and maintenance

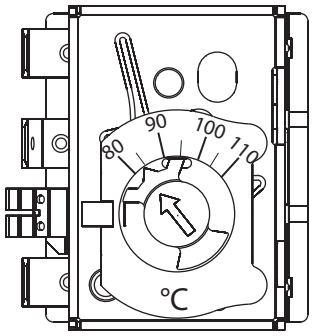
Venting - water pressure

Regularly check that the water pressure is correct. Air may be left in the system for a while after installation, for which reason it should be vented a few more times.

> ***The pressure in a heating system varies with the temperature. Do not add water unnecessarily!***

Check on temperature guards

Stop the flow through the boiler.
Adjust the break temperature to 80°C, on the back of the temperature guard.



Standard boiler:

Set boiler temperature set point to 90°C.
When the boiler temperature reaches the break temperature, the temperature guards should be triggered together with the load break switch.

Boiler with UTK:

Press the STOP button so that the load break switch trips.
Reset the load break switch so that this window is displayed:

```
VÄRMEBARONEN AB

EPxxx xxxV  xxxx
V1.10
(ENGLISH)


>>>>>>>>><<<<<<<<<
```

Press OK when the arrows on the bottom row point towards the middle, so that this window is displayed:

```
→ENGLISH
 ************ (xxxx)
CONTRAST          20
BACKLIGHT        150
FACTORY SETTINGS
SPECIAL MENU    ????
STB-test?
 ----- EXIT! ------
```

Activate the function by selecting:

```
STB-test?
```

This window will then be displayed:

```
 SINGLE    Tute +XX°C
 CPo  VENTo
 BOILER TEMP.    XX°C
 PWR. OUTPUT  XXX.XkW
→TEMP. SETPOINT 70°C
 --------------------
 STB-TEST! STB-TEST!
```

When the boiler temperature reaches the break temperature, the temperature guards should be triggered together with the load break switch.

Do not forget to readjust the temperature guards break temperature to 105°C when inspection is finished.
The break temperature must not be set lower than the boiler temperature control's highest temperature!

Pressure guard(s) - option

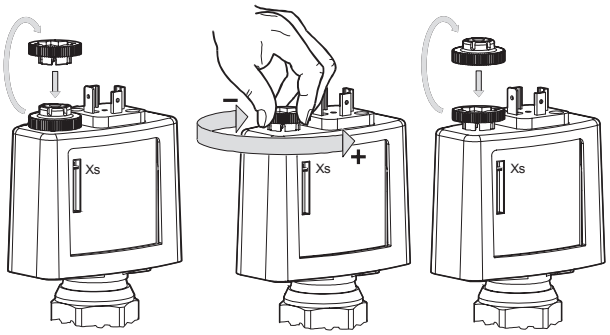
High pressure guard

Set so that the trigger pressure is between the boiler's normal operating pressure and the safety valves' opening pressure.

Low pressure guard

Set so that the trigger pressure is slightly below the system pressure when the system is not heated.

Adjustment



Alarm - warning - information

At the same time as one of the indicators, red, yellow or green, is flashing, the bottom line of the window alternates between:

```
→-to MENU SELECTOR!
```

and

```
PRESS OK FOR INFO!
```

When OK is held down, the cause of the flashing indicator is shown.

Red indicator flashing - Alarm

Buzzer alarm via output pt 28 in “Control circuit”.

Requires action and manual reset.

R1 `TEMPsensor! J1`

Reason: Short-circuit, interruption or not connected.

Pt100 boiler temperature sensor (option) J1, point 34 in “Control circuit!”.

Action: Check, replace.

R2 `TEMPsensor! J2`

Cause: Short-circuit, interruption or not connected.

Pt100 temperature sensor (option) J2, point 35 in “Control circuit”.

Action: Check, replace.

R3 `TEMPsensor! J12`

Cause: Short-circuit, interruption or not connected.

Boiler temperature sensor J12, point 30 in “Control circuit”.

Action: Check, replace.

R4 `TEMPsensor! J14*J9/3`

Cause: Short-circuit, interruption or not connected.

Temperature sensor, J14+J9/3, option,in secondary circuit in connection with secondary control, point 32 or 33 in “Control circuit”.

Action: Check, replace.

R5 `TEMPsensor! J13`

Cause: Short-circuit, interruption or not connected.

Temperature sensor cooling fan, option, J13, point 28 in “Control circuit”.

Action: Check, replace.

R6 `TEMPsensor! J3`

Included only in boiler with outdoor temperature compensator.

Cause: Short-circuit, interruption or not connected.

Outdoor temperature sensor, J3, point 35 in “Control circuit”.

Action: Check, replace.

R7 `TEMP SENS MAINBOARD!`

Cause: Short-circuit or interruption.

Temperature sensor on power circuit board.

Action: Check, replace power circuit board

R8 `TEMP SENS PANEL!`

Cause: Short-circuit or interruption.

Temperature sensor on panel circuit board.

Action: Check, replace panel circuit board

R9 `HIGH PE-CURRENT,PEC!`

Cause: The PEC value is higher than the break limit set.

Action: Check Current PEC value in the Operating menu

Highest PEC value, Information menu

PEC alarm limit in Installation menu.

If the current PEC value is higher than the alarm limit when no power is connected, there is no fault in the boiler.
The alarm limit should then be raised approximately 50 above the highest measured PEC value. The external earth fault should be identified and remedied.

If the current PEC value is lower than the alarm limit, the fault may be in the boiler. Check:

- Acknowledge the alarm by cutting the control voltage for 10 seconds.
- Increase boiler power while reading off the current earth fault value.
- Check the insulation of each immersion heater in the power group issuing the PEC alarm to find out which immersion heater is faulty.
- If the boiler works normally when power is connected without tripping a PEC alarm, the earth fault is external.

Alarm - warning - information

R10 HIGH TEMP.MAINBOARD!

Cause: High temperature of power circuit board.

Action: Check the cause. Highest permitted ambient temperature is ≤ 30°C.

R11 HIGH TEMP.PANEL!

Cause: High temperature of panel circuit board

Action: Check the cause.

Highest permitted ambient temperature is ≤ 30°C.

R12 LOW WATERLEVEL.TANK!

Cause: Low water level in the boiler

Action: Check the reason, add water and vent the system.

R13 SEE MANUAL!

Cause: A guard, high, low or temperature, has tripped without the power switch being tripped.

Action: Check the cause.

Yellow indicator flashing - warning

Automatic reset when the cause has ceased.

Y1 PE-CURRENT! PEC

Cause: Increasing values in earth fault current, PEC.

Action: See R9, High earth current, PEC.

Y2 OVERTEMPERATURE!

Cause: The boiler temperature is higher than the boiler temperature value.

Action: Check that the boiler has sufficient flow and that all necessary valves are open.

Check the setting for over temperature.

Y3 WATER LEVEL!

Cause: Variations in the signal from the boiler's level sensor.

Action: Check the reason, add water and vent the system.

Y4. LOW FLOWRATE!

Cause: Function to prevent unnecessary contactor operations and reduce the risk of the temperature guard tripping.

Action: Check the water flow through the boiler.

Green indicator flashing - information

Something is preventing power increase/decrease.
Automatic reset when the cause has ceased.

G1 TIME BLOCK!

Cause: Delayed power connection after restart after power cut.

G2 LOAD MONITOR!

Cause: Load guard limits power increase/decrease.

G3 Ext ANALOG PWR LIM.!

Cause: The boiler's power increase/decrease is limited by an external setpoint or stage limit.

G4. LIMITING SET TEMP!

Reason: The boiler temperature is restricted by min or max limit.

Alarm - load-break switches and safety guards

When a guard in the safety circuit is triggered, the display shows which guard or guards has/have been triggered.
The boiler's load-break switches are always triggered when a guard is triggered.
A buzzer alarm is issued from the boiler and a red indicator flashes on the boiler's panel.

H pressure guards, high pressure guards, items 47 and 48.

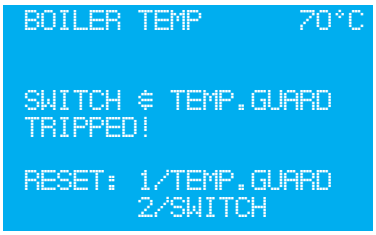
L pressure guard, low pressure guard, item 49.

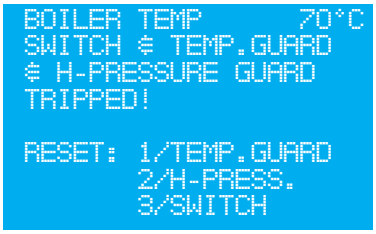
Temperature guards, items 6 and 7.

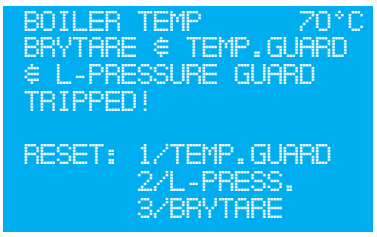
Switches, load-break switches, items 9 and 10.

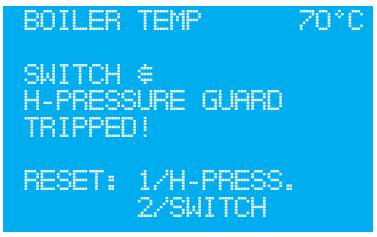
> ***Always check the cause of a guard being triggered!***
> ***If the guards are triggered repeatedly, the cause must be remedied!***

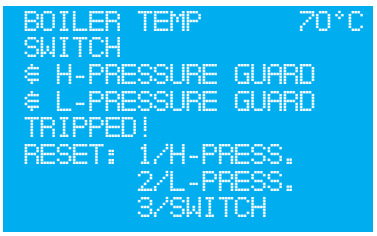
Reset must take place in the order displayed in the window!
Depending on the cause, the following may be displayed:

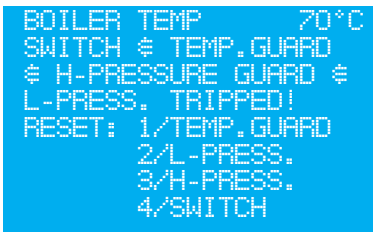










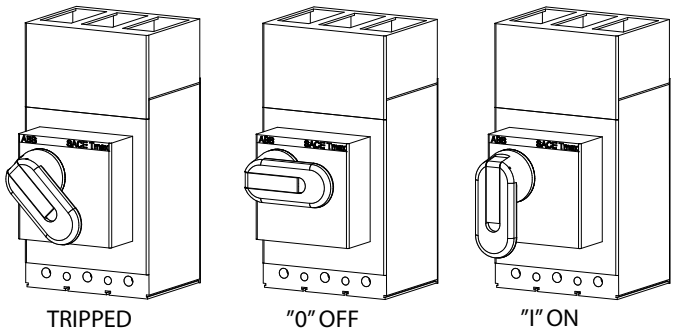


Boiler shares safety equipment
In a system in which the boiler shares safety equipment with other boilers in the system and this safety equipment is triggered, only this window can be displayed.

Alarm - load-break switches and safety guards

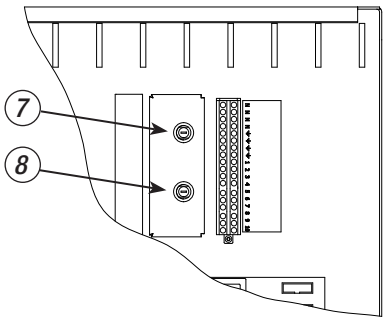
Load-break switch
When a guard trips the load-break switch will moved to "tripped" position. The switch is also tripped by the "STOP" button on the boiler panel.
The switch is reset by turning the knob to "O off" and then to "I on".

The version of the switch is dependent on the boiler model. The procedure is not always the same!



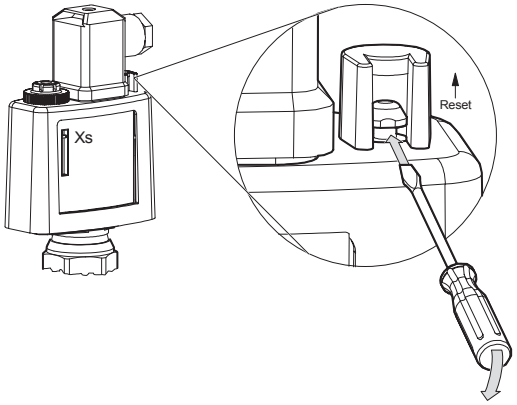
The version of the switch is dependent on the model of boiler

Temperature guards
The boilers temperature guard trips the boiler if the temperature exceeds 105°C.
Resetting is by pressing the button on the temperature guards, when the boiler temperature falls below 80°C.



Pressure guard(s) - option

Reset



General

Installation must take place according to existing regulations and standards.

Installation must take place according to existing rules and standards.

The boiler must be placed indoors, standing.
The boiler can be placed directly on the floor, the location must be dimensioned for the boiler's weight when it is filled with water.
At least 1 metre free space must be retained in front of the boiler, note the ceiling height for future replacement of the immersion heaters.
The room should have a floor drain.

Adjust the foot bolts so that the boiler is horizontal.

Pipes must be routed so that it is possible to open the front and remove the roof plate for service.

Valves must be fitted between the boiler and the heating system.

Expansion system - The safety pipe, the boiler must be connected to an expansion system.
An electric boiler fitted with a closed expansion vessel must undergo an installation inspection prior to first operation. The inspection must be carried out by a person who is qualified for the task. The boiler or expansion vessel may not be replaced without another inspection.

The boiler is not intended for use with oxygenated water.

As frost protection, the water in the system may be mixed with maximum 30% glycol. Check that the glycol contains a suitable quantity of corrosion protection additive. When glycol breaks down, one of the by-products is carbonic acid, which increases the risk of corrosion.

Water quality

Tap water is usually classified from the point of view of hygiene. Good water classified on this basis is not automatically suitable for a heating system. To avoid problems, the water should be analysed from a technical point of view and any deviations from standard values should be adjusted.

If the volume of the heating system is low, it can be filled with water that was not classified as good system water. When the water is heated, some oxygen and carbonic acid are emitted to the expansion vessel or vent valves. The remainder will react with the metals in the system. This corrosion is generally insignificant. It is important for the system to be leak-proof so that the water does not need to be replaced with new water and the water is not oxygenated during installation.

In practice, it is impossible to protect large systems against leaks and oxygen admission. In such cases, an oxygen-consuming agent can be added so that there is always a slight surplus in the system. These agents often contain corrosion-limiting additives.

Water quality - in respect of suitable tap water:

The alkalinity should exceed 60 mg/l to avoid corrosion.

Contents of carbonic acid over 25 mg/l increase the risk of corrosion.

Sulphate contents over 100 mg/l may accelerate corrosion. If the sulphate content is higher than the alkalinity, there is a risk of copper corrosion.

Hard water causes boiler scale and is not suitable in a heating system. The hardness must be approx. 5 - 6 dH°.
Very soft water may cause corrosion damage.

Chloride contents over 100 mg/l make the water aggressive, particular when combined with lime deposits.

Low pH values may cause corrosion damage. The pH value should be 7.5 - 8.5.

The incidence of carbonic acid in combination with low pH and hardness values makes the water aggressive.

The water must not contain sludge or other impurities.

Flow requirements

The boiler must have a constant, sufficiently high flow to function satisfactorily. The flow must be dimensioned so that it is within specified limits.

Insufficient water flow can result in the following:

- The difference between the temperature setting and the actual temperature achieved in the boiler increases.
- Irregular control with increased wear on the boiler's contactors, with reduced service life as a result.

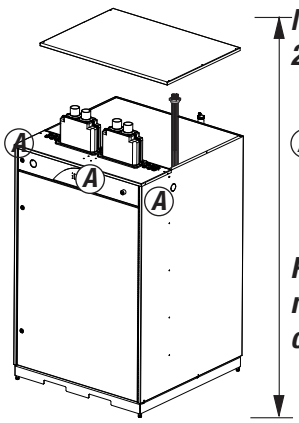
Excessive water flow can result in the following:

-Vibrations in the immersion heaters with noise and reduced service life as a result.

- Unnecessary wear on the system's components.

Recommended flow produces a Δt of 10°C at the boiler's maximum power. See Technical data.

Do not drill into the boiler's cover plates. Cuttings can damage the boiler's electrical equipment! M6 bolts are available for fixing cable trays.



Min ceiling height, 2430 mm

Ⓐ = M6 bolts for fixing cable trays, etc.

Pipes, cable ducts, etc. may not be laid on the boiler's rear cover plate.

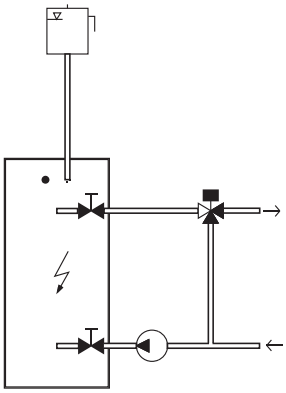
Pipe installation

Expansion system - Safety pipe

The electric boiler must be connected to an expansion system.

The figures shown on this page are system principles. The actual system must be installed according to existing standards.
Any additional equipment must be installed as indicated by the manufacturer for its product.

Open system



The boiler's safety pipe must be connected in an unisolatable, uninterruptible rise to the expansion vessel. To avoid oxygenation of the water, the distance between the highest point of the heating system and the expansion vessel must not be less than 2.5 m.
Pressure height must exceed the pump's.lowest static pressure on the low side.

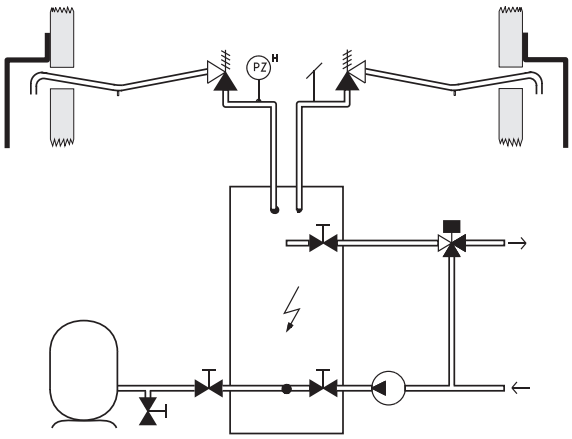
To avoid damage in the event of any blockage in the expansion system, the boiler should be fitted with a safety valve.

Closed system, > 300 kW (max. 1 MW) and < 105ºC

The opening pressure of the safety valve is determined by the component in the system that tolerates the lowest pressure.

The boiler:
- can cope with zero flow, from a safety viewpoint
- has a built-in temperature guards.
- has a built-in level sensor.
- can be supplied with a factory installed, option, safety valve, low and/or high pressure guard.

In accordance with the requirements of EN 12828, the installation must have:
- At least one safety valve min DN 15, with sufficient blow-off capacity at the system's operating pressure.
- If the boiler is located at a higher level than users, a float switch or low-pressure guard is required.



Safety valves are fitted with pressure guards and an automatic vent valve on the boiler's safety pipe.
Valve for expansion vessel, must be locked in open position.

The discharge pipe from a safety valve must meet the requirements of EN 12828.
Steam or liquid that flows out of the safety valve when it opens must be drained safely.
The discharge pipe from the safety valve is dimensioned so that the blow-off capacity is not impeded.
The discharge pipe must be laid so it cannot freeze, must be cleaned well and must be laid so that water pockets cannot form.
There must be drainage from the safety valve discharge pipe, if there is a risk that the water can remain standing.

Electrical installation

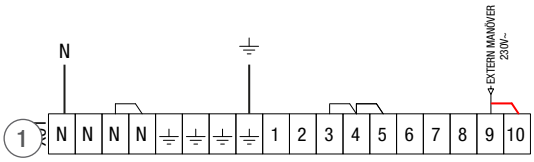
The installation must be carried out according to existing rules and standards under the supervision of a qualified electrician!

Cables must be dimensioned according to the Electrical Installation Rules.
Cables must be laid so that it is possible to open the front and remove the roof plate for service.
For minimum ceiling height, see Technical data.
Light-current cables must not be laid in direct connection with power cables as this may give rise to disruption.

External control voltage

The boiler control circuit can be fed by an external 230V~ control with a 6 A fuse. The boiler must be preceded by an all-pole switch with at least 3 mm breaking distance.

The connection between terminals 9 - 10 must be removed!



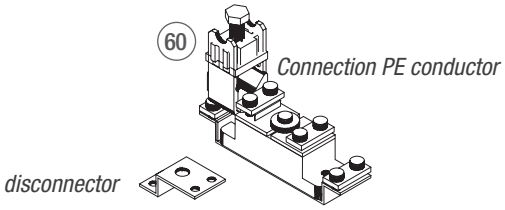
Power supply

Connection for PEN 4-core or 5-core cables; connection to switch and earth block.

Tightening torque phase conductor: 30 Nm
earth block: 40 Nm.

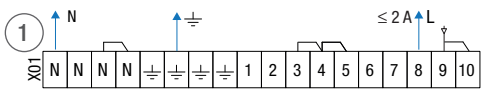
Aluminium cable must be greased with neutral contact grease.

If 5-core cables are connected, the disconnector must be removed from the earth block.



Power supply, 230V~, to external unit

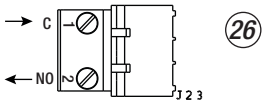
Load, max 2 A



Circulation pump

For setting, see 'CP function' in the installation menu!

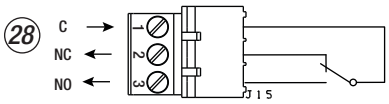
Potential-free closing contact, max load 230V~, 2A.



The circulation pump must be labelled to show that it is controlled by the boiler!

External alarm indication - buzzer alarm

Alarm indication of low water level, overheating protection triggered, PEC or safety equipment triggered.
Potential-free, max 230V~, 2A.

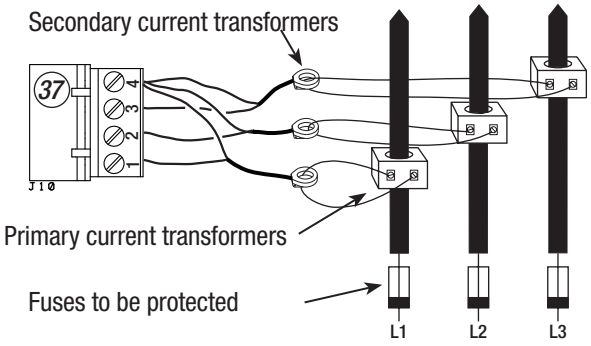


Terminals 1 - 2, C - NC, closed during operation.
Terminals 1 - 3, C - NO, closed during alarm.

Load guard

See 'CURRENT LIMIT' and 'MARGIN' in the Installation menu!

The guard is not phase-sensitive and the current transformers do not need to be connected if the function is not to be used.
Measurement is with primary and secondary current transformers. The latter are supplied with the boiler. The system-adapted primary current transformers, xxx/5 A, are supplied by the electrician.
The cable from the primary current transformer must pass through the secondary current transformer once.

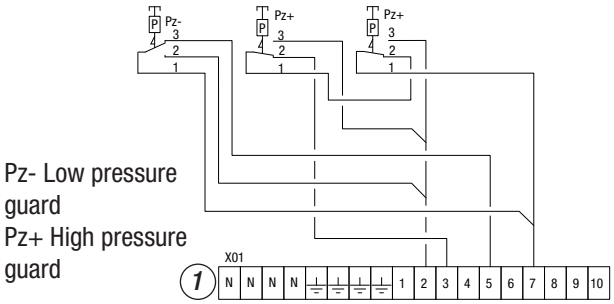


Electrical installation

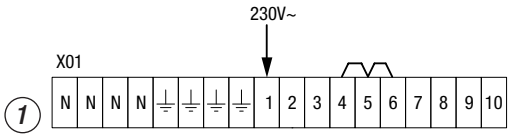
Pressure guards - Safety equipment

To ensure that the boiler's safety system works as intended, external safety equipment must be connected as shown below!

If the boiler was supplied without pressure guards, the installation must be supplemented with pressure guards. Connection as shown in the figure.



Alternatively, if the boiler can share the safety equipment with other boilers in the installation.

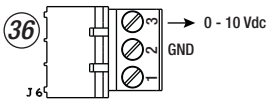


The alarm signal, 230 V~, from existing safety equipment, is connected to terminal 1. Please note that the alarm signal must be the same phase as that used for the boiler's control!

0 - 10 V output signal of connected power

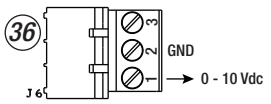
0 - 10 V, equivalent to 0 - 100% of installed power.

Installed power is the number of stages the boiler is permitted to use.



0 - 10 V output signal of boiler temperature

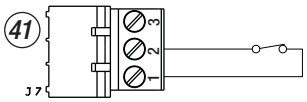
0 - 10 V is equivalent to 0 - 170°C.



External blocking

See 'Ext. STAGE LIMIT' in the Installation menu!

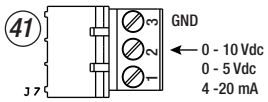
The boiler can be blocked by an external potential-free contact.



External stage control — 0 - 10 V, 0 - 5 V or 4 - 20 mA

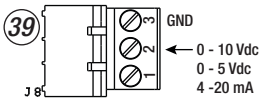
See 'Ext. STAGE LIMIT' in the Installation menu!

0 - 100% of installed power. Installed power is the number of stages the boiler is permitted to use.



External setpoint — 0 - 10 V, 0 - 5 V or 4 - 20 mA

See 'Ext. TEMP. SETPOINT' in the installation menu!
See "Max limit/MIN limit" in the adjustment menu!



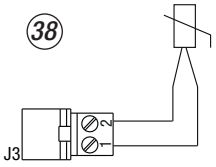
0 - 10V, 0 - 5V or 4 - 20 mA corresponds to 0 - 170°C.

Operational area is determined in the adjustment menu.

Outdoor temperature sensor - boiler with UTK

See adjustment menu!

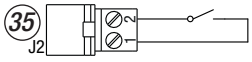
The temperature sensor is fitted to an outside wall, at half the height of the facade, close to a corner, facing north/north west. The sensor must not be placed where it will be reached by the morning sun or close to valves, windows or doors. Connection with at least 0.4 mm^2 cable up to 30 metres. The duct is sealed so as to avoid condensation in the sensor enclosure.



Alternative heating - boiler with UTK

See "Ext. TEMP. ADJUST" in the Installation menu and "TEMP.ADJUST" in the Adjustment menu!

The temperature can be changed with the aid of an external potential-free contact function, protective extra low voltage.



Check after electrical installation that no tools or similar have been left behind the busbar system. Check the insulation between phases and between phases and earth.

Wiring diagram - control circuit

1. Terminal block, control circuit.
   Terminals 1, 3, 4 and 5: connection safety equipment.
   Terminal 8: 230 V~ supply to external unit.
   Terminals 9-10: external 230V supply to control circuit.
2. 'START' button.
3. 'STOP' button. When pressed, it cuts the power supply to the boiler by tripping the load-break switches.
4. Panel circuit board with overlay.
5. Ribbon cable with ferrite terminals.
6. Temperature guard one.
7. Temperature guard two.
8. Zero voltage relay.
9. Load-break switch, B1, with auxiliary switch.
10. Load-break switch, B2, with auxiliary switch.
11. Contactor, K1, for power group one.
12. Contactor, K2, for power group two.
13. Contactor, K3, for power group three.
14. Contactor, K4, for half power group four.
15. Contactor, K5, for half power group four.
16. Contactor, K6, for part of power group five.
17. Contactor, K7, for part of power group five.
18. Contactor, K8, for part of power group five.
19. Contactor, K9, for part of power group five. Only included in EP 540 and 600.
20. Circuit board, power.
21. Sense inputs, sense the status of temperature guards and high pressure guards.
22. Indicator, on when:
    A: circuit board has voltage.
    B: temperature guards in operating mode.
    C: high pressure guards in operating mode (option).
23. Sense inputs, sense the status of load-break switches, low pressure guard and zero voltage relay.
24. Indicator, on when:
    A: load-break switches are in operating mode.
    B: low pressure guard in operating mode (option).
    C: zero voltage relay in operating mode.
25. Relay outputs for the boiler's power groups.
26. Potential-free relay output for circulation pump.
    Max. load 230 V~/2 A.
27. Potential-free relay output for cooling fan.
    Max. load 230 V~/2 A.
    A fan is included in EP 450 and 510, option in other models.
28. Potential-free relay output for buzzer alarm.
29. Outputs for control of ssr, option.
30. Boiler temperature sensor, J12.
31. Temperature sensor, J13, only in boiler with cooling fan, option (see point 27).
32. Temperature sensor, J14, only included in boiler for secondary control, option.
33. Alternative connection for temperature sensor 42, the sensor is connected to terminals 3 and 4.
34. PT100 boiler temperature sensor, J1, only in high temperature boilers, option.
35. Alternative temperature with the aid of external contact function, only with outside temperature compensator, option.
    alternatively
    PT100 temperature sensor, J2, only included in high temperature boilers, option.
36. Output signal, current power and boiler temperature.
37. Connection for the load guard's current transformers.
38. Outdoor temperature sensor, J3, only in boiler with outdoor temperature compensator, option.
39. Connection for external setpoint setting.
40. Level sensor connection.
41. Connection for external stage control.
42. Connection of current transformer for PEC function.
43. Ribbon cable connection for panel circuit board.
44. Ribbon cable connection for series control of boilers, option.
45. Ribbon cable connection for series control of boilers, option.

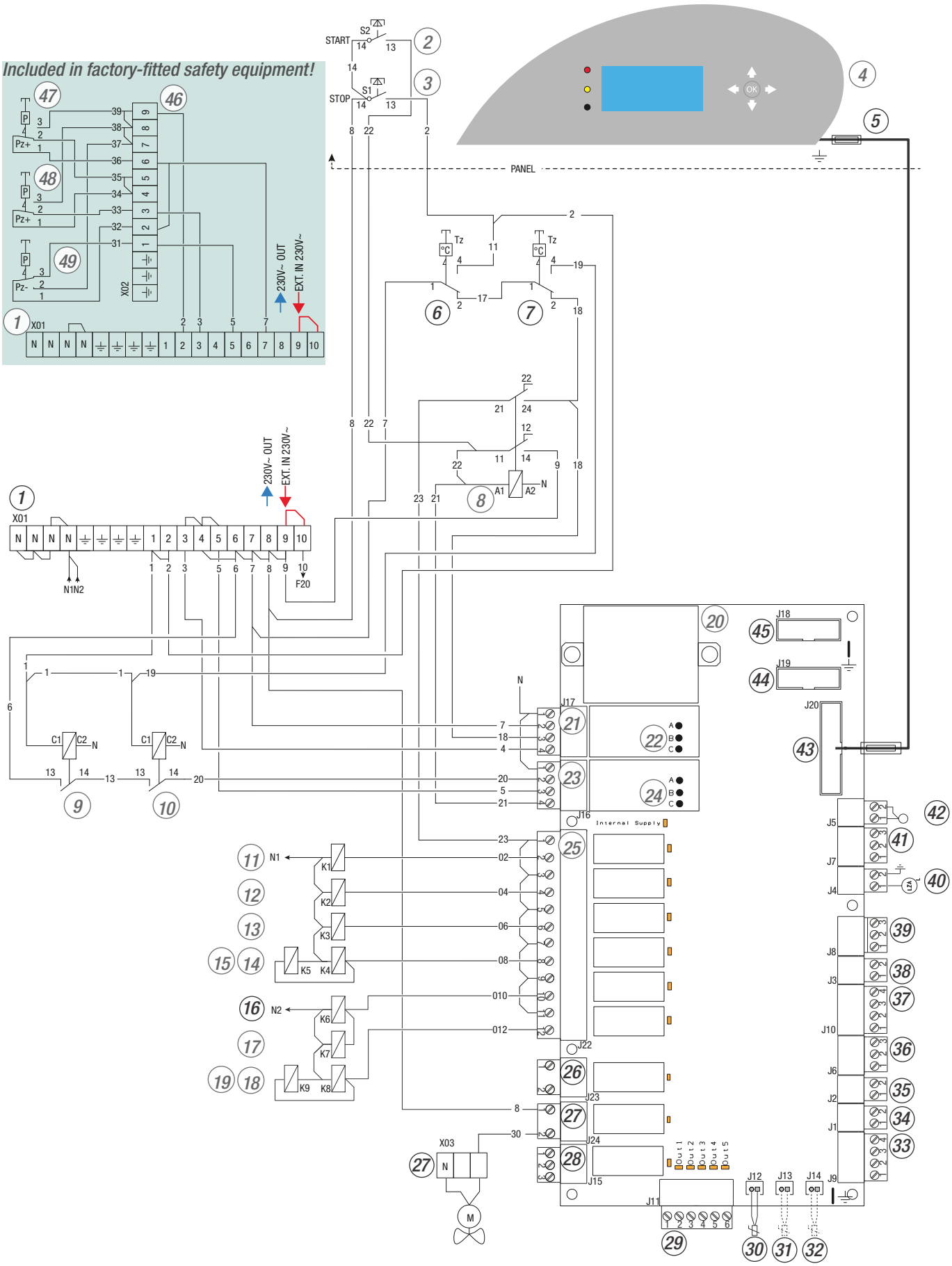
Included in boilers delivered with safety equipment!

46. Terminal block for pressure guards.
47 High pressure guard one.
48. High pressure guard two.
49. Low pressure guard.

*** Option*

The control voltage is not broken by the load-break switches! External voltage may occur.

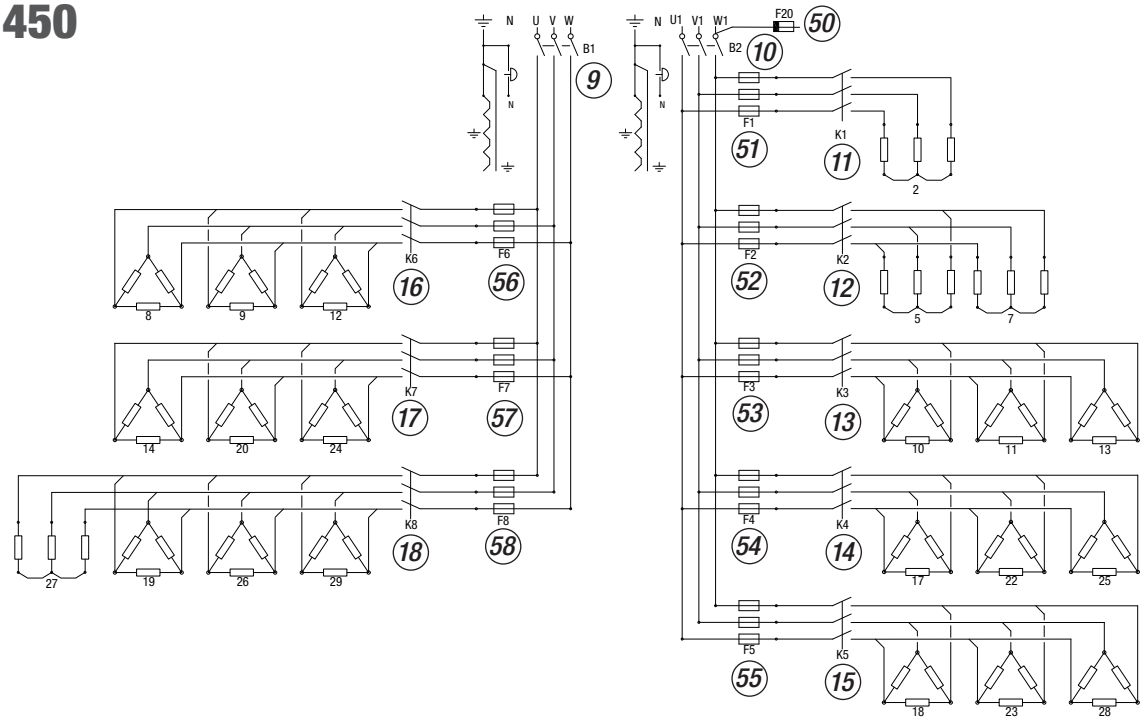
Wiring diagram - control circuit



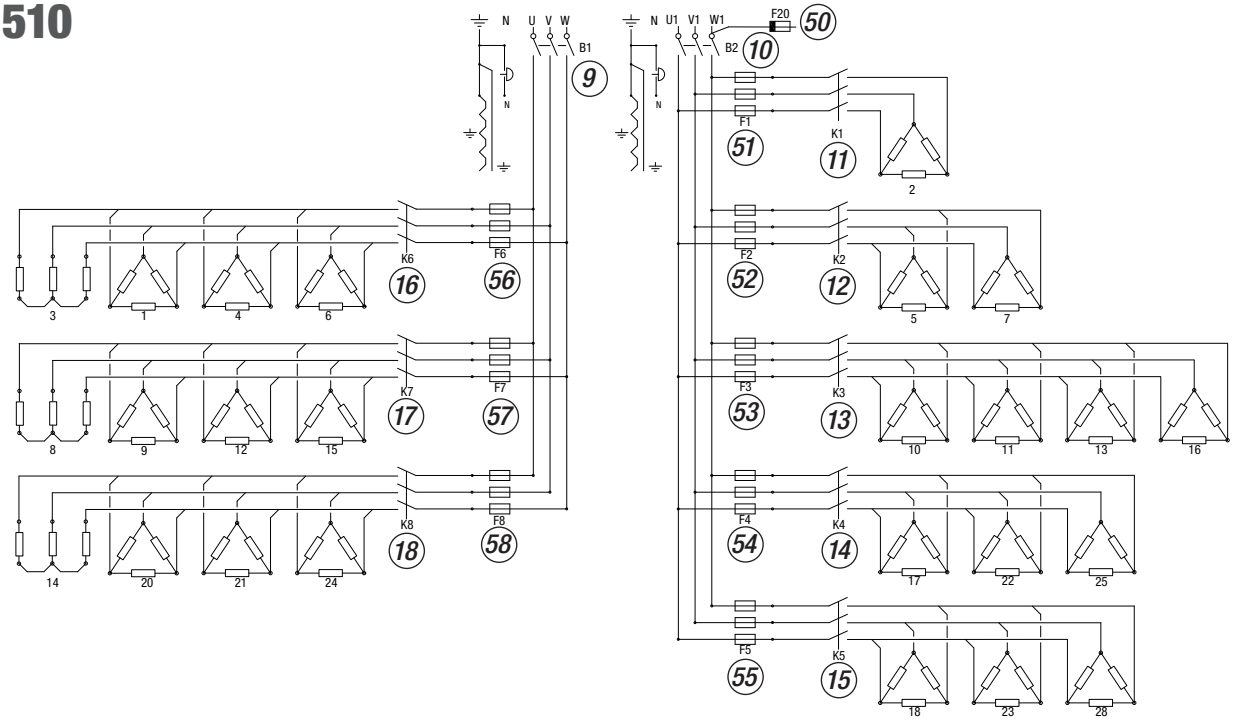
STOP ***Any intervention in the boiler's electrical equipment that requires tools must be carried out under the supervision of a qualified electrician!***

Wiring diagram - power circuit EP- 450 and 510

EP 450

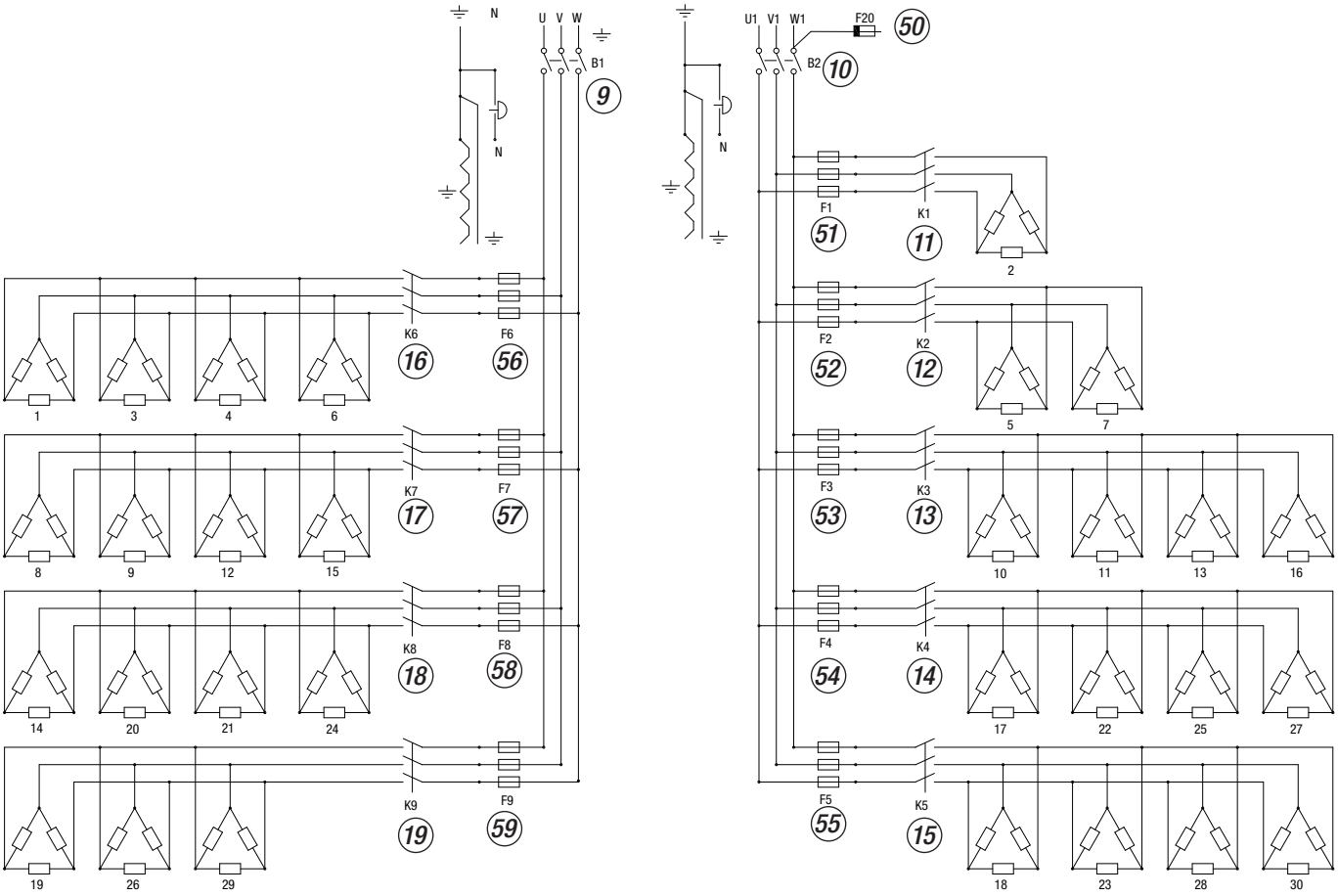


EP 510



		Power group 1	Power group 2	Power group 3	Power group 4	Power group 5	
	Contactor	K1 (11)	K2 (12)	K3 (13)	K4 (14), K5 (15)	K6 (16), K7 (17), K8 (18)	
EP 450	**Immer-sion**	2	5, 7	10, 11, 13	K4 17, 22, 25 K5: 18, 23, 28	K6: 8, 9, 12 K7: 14, 20, 24	3 × 23.3 kW 3 × 23.3 kW
	heater	15 kW	2 × 15 kW	3 × 20 kW	6 × 20 kW	K8: 27, 26, 29, 19	15 kW + 3 × 23.3 kW
	Power	15 kW	30 kW	60 kW	120 kW	224.7 kW	
EP 510	**Immer-sion**	2	5, 7	10, 11, 13, 16	K4: 17, 22, 25 K5: 18, 23, 28	K6: 3, 1, 4, 6 K7: 8, 9, 12, 15	15 kW + 3 × 23.3 kW 15 kW + 3 × 23.3 kW
	heater	17 kW	2 × 17 kW	4 × 17 kW	20kW+5×23.3 kW	K8: 14, 20, 21, 24	15 kW + 3 × 23.3 kW
	Power	17 kW	34 kW	68 kW	136.5 kW	254.7 kW	
	Fuse	F1 (51) 3 × 35 A	F2 (52) 3 × 80 A	F3 (53) 3 × 125 A	F4 (54), F5 (55) two groups 3 × 125 A	F6 (56), F7 (57), F8 (58) three groups 3 × 160 A	
	Switch	B1(9), B2 (10)					
	Fuse	F20, (50), 6 A					

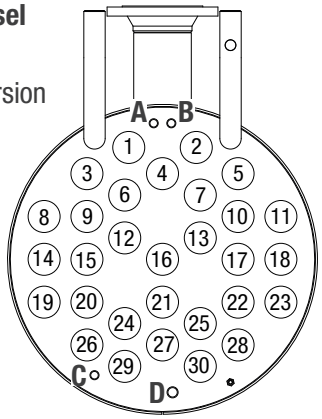
Wiring diagram - power circuit EP- 540 and 600



	Power group 1	Power group 2	Power group 3	Power group 4	Power group 5	
Contactor	K1 (11)	K2 (12)	K3 (13)	K4 (14), K5 (15)	K6 (16), K7 (17), K8 (18), K9 (19)	
Immer-sion heater	2	5, 7	10, 11, 13, 16	K4 17, 22, 25, 27 K5: 18, 23, 28, 30	K6: 1, 3, 4, 6 K7: 8, 9, 12, 15 K8: 14, 20, 21, 24 K9: 19, 26, 29	
EP 540	18 kW (18 kW)	36 kW (2×18 kW)	72 kW (4×18 kW)	144 kW (8×18 kW)	270 kW (15×18 kW)	
EP 600	20 kW (20 kW)	40 kW (2×20 kW)	80 kW (4×20 kW)	160 kW (8×20 kW)	300 kW (15×20 kW)	
Fuse	F1 (51)	F2 (52)	F3 (53)	F4 (54), F5 (55)	F6 (56), F7 (57), F8 (58)	F9 (59)
EP 540	3 × 35 A	3 × 80 A	3 × 160 A	Two groups 3 × 160 A	Three groups 3 × 160 A	3 × 125 A
EP 600	3 × 50 A					
Switch	B1 (9), B2 (10)					
Fuse	F20 (50) 6 A					

Location of top of boiler vessel

Figures state location of immersion heaters.
A. Temperature sensor
B. Temperature guards
C. Level sensor
D. Manometer connection



The control voltage is not broken by the load-break switches! External voltage may occur.

To break the power supply to the boiler, both load-break switches, 9 and 10, must be placed in the 0 position. Lock the switches.

Technical Data

The boiler meets the work environment authority regulations AFS 2016:1. Pressure bearing devices.

If the boiler is supplied with factory-fitted safety equipment, it meets the Swedish Work Environment Authority's regulation AFS 2002:1, Section 17, on periodic monitoring of boiler systems. The boiler is then approved for installation without emergency protection.

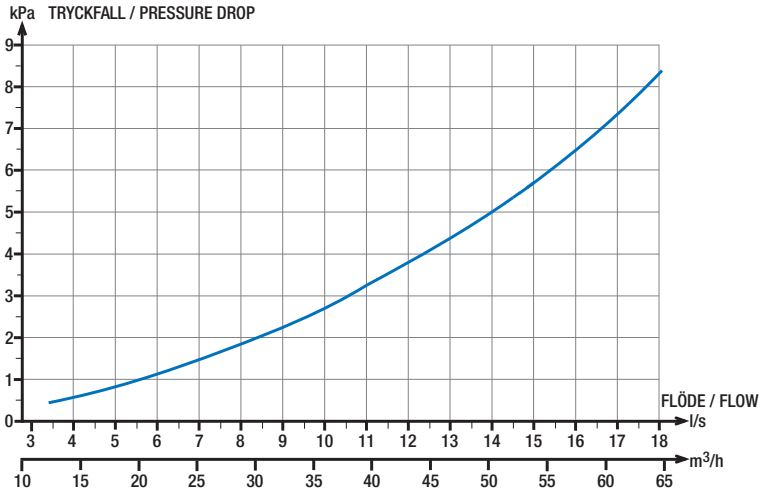
With factory-fitted safety equipment, the boiler can be installed without expansion trap according to EN 12828. The factory-fitted safety equipment comprises safety valves, high and low pressure guards and an automatic vent valve.

The boiler is designed so that it is not damaged if the forced circulation ceases, for example by a valve being closed or a pump stopping and only self-circulation being present.

A steam-collecting vessel is not required. The safety valves are fitted directly on the boiler's safety pipe.

The system does not need to be fitted with double circulation pumps or flow guards.

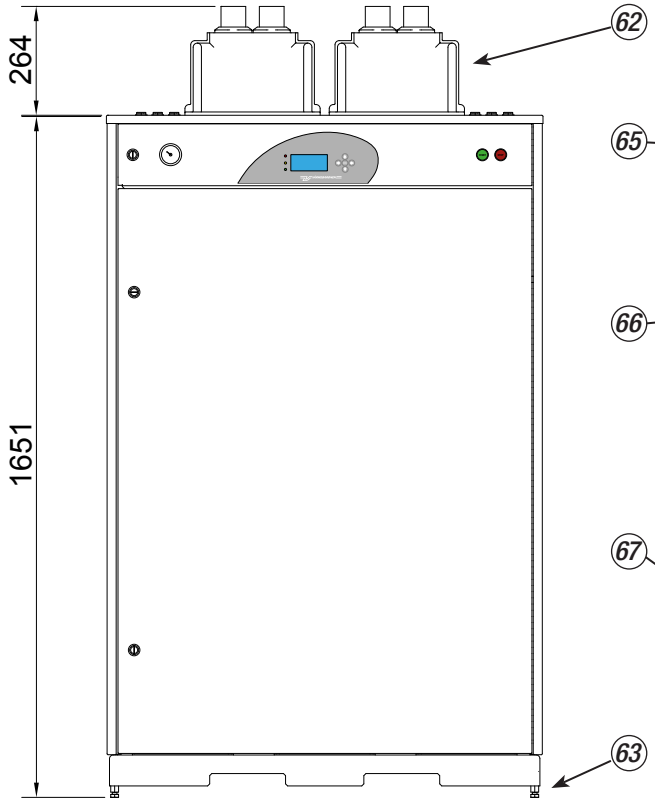
Pressure drop

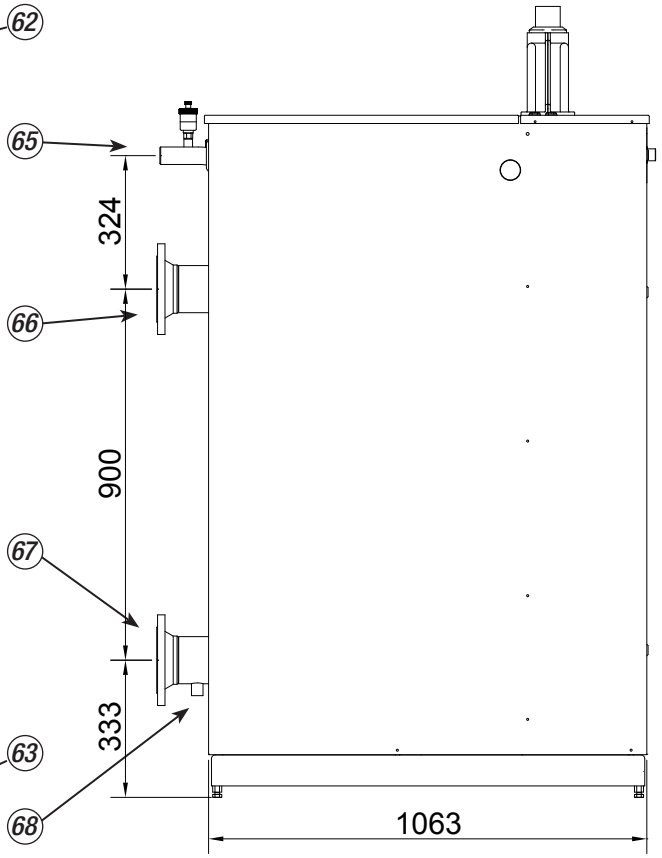


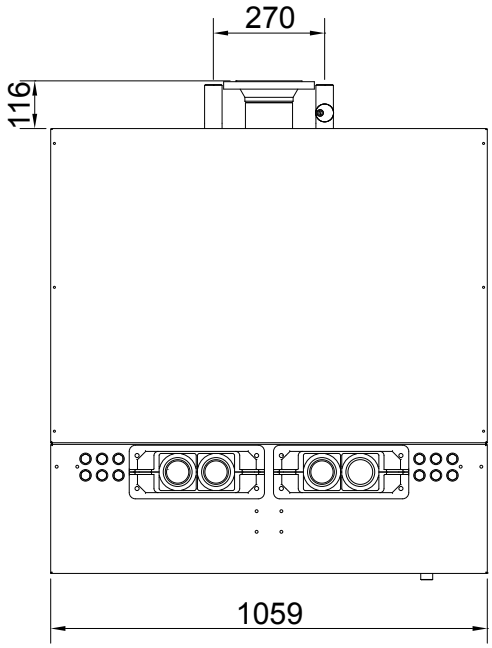
Technical Data

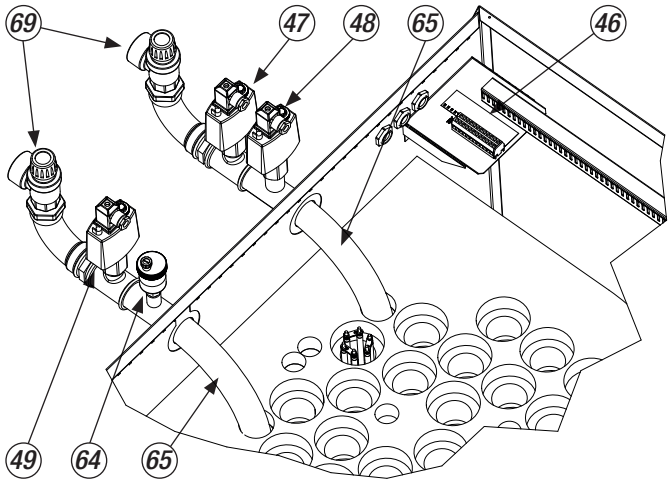
	EP 450	EP 510	EP 540	EP 600	
Item number	4713	4714	4715	4716	
RSK					
Voltage	400 V 3N~, alternatively 400 V 3~ with external 230 V~ control				
Voltage tolerance	≤ ±10				%
Frequency	50				Hz
Enclosure class	IP x1				
Power	450	510	540	600	kW
Current	648	735	778	865	A
Highest fuse	4 groups of 200	4 groups of 250			A
Number of stages	30, can be limited down to 1 stage				
Power/stage, stage size	15	17	18	20	kW
Current/stage	21.6	24.5	26	28.8	A
Cable flange	2 x FL 33 2 x Ø 60 mm				
Cable connection	4 x 95 - 240 Al/Cu, PEN or 5 cores *Up to 240 mm² round-pressed cable can be connected.*				
Volume	315				litre
Design pressure	0.6 6				MPa bar
Test pressure	0.86 8.6				MPa bar
Design temperature	110				°C
Operating temperature	20 - 100				°C
Ambient temperature	≤ 30				°C
Connection, flow/return	DN 100 PN 16				
Safety pipe	2 x R32 ext.				
Flow requirement, recommended	10.7	12.2	12.9	14.3	litre/sec.
min./max.	4.3/18	4.9/18	5.2/18	5.7/18	litre/sec.
Weight empty	467	470	470	485	kg
full of water	782	785	785	800	kg
Lowest ceiling height for immersion heater replacement	2430				mm
Manufactured to	AFS 1999:4§8, 97/23 article 3.3				

Technical Data







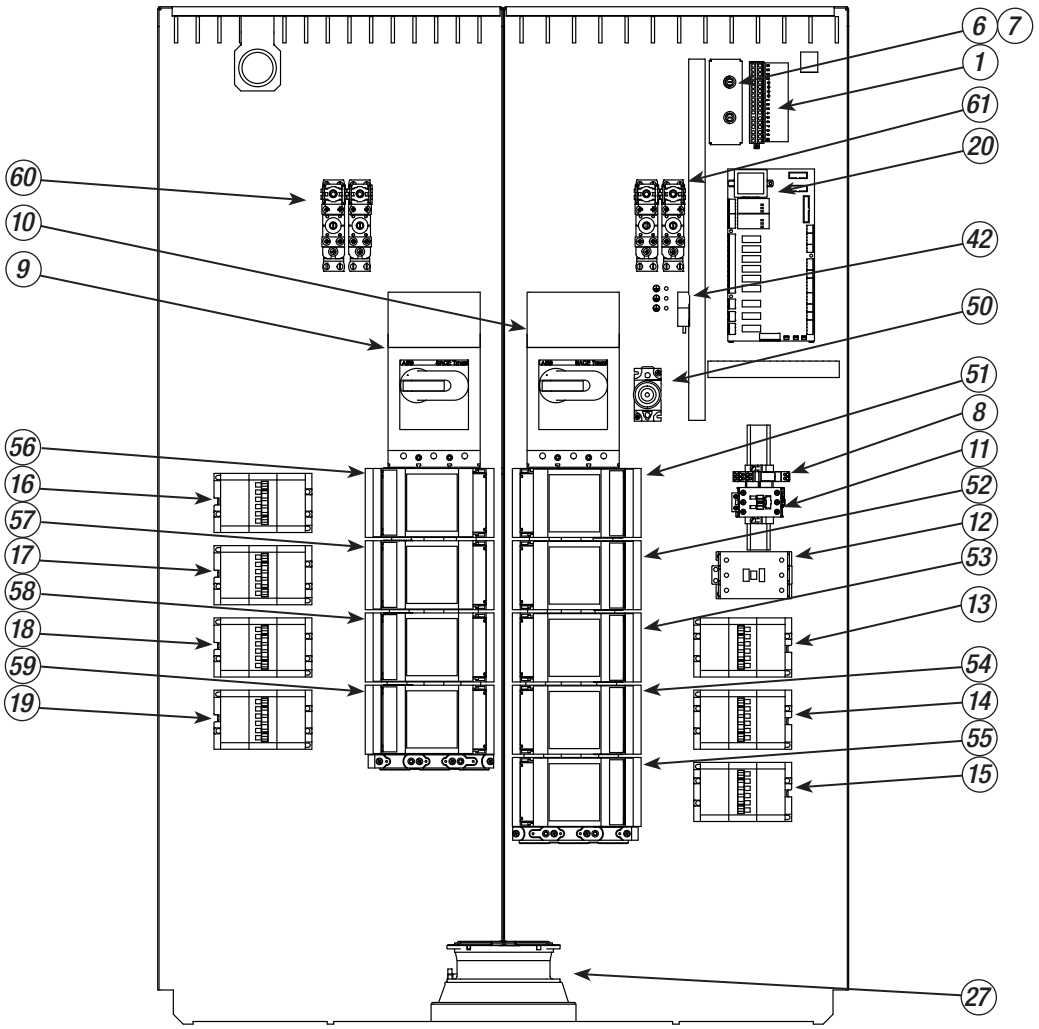


Top of boiler with cover plate removed

46. Terminal block for pressure guards.*
47. High pressure guard one.*
48. High pressure guard two.*
49. Low pressure guard.*
62. Cable flanges.
63. Adjustable foot bolts.
64. Automatic vent valve.*
65. Safety pipes.
66. Flow connection.
67. Return connection.
68. Drain/valve.
69. Safety valves, 2*

** Included in factory-fitted safety equipment, option.*

Technical Data



The figure is for illustration, there are differences between boiler models

1. Terminal block, control circuit.
6. Temperature guard one.
7. Temperature guard two.
8. Zero voltage relay.
9. Load-break switch, B1, power group 5.
10. Load-break switch, B2, power groups one to four.
11. Contactor, K1, power group one.
12. Contactor, K2, power group two.
13. Contactor, K3, power group three.
14. Contactor, K4, half power group four.
15. Contactor, K5, half power group four.
16. Contactor, K6, part of power group five.
17. Contactor, K7, part of power group five.
18. Contactor, K8, part of power group five.
19. Contactor, K9, part of power group five in EP 540 och 600.
20. Circuit board, power.
27. Cooling fan included in EP 450 och EP 510, otherwise option.
42. Current transformer, PEC function.
50. Control fuse, F20, 6 A
51. Blade fuse holder, F1, fuse power group one.
52. Blade fuse holder, F2, fuse power group two.
53. Blade fuse holder, F3, fuse power group three.
54. Blade fuse holder, F4, fuse part of power group four.
55. Blade fuse holder, F5, fuse part of power group four.
56. Blade fuse holder, F6, fuse part of power group five.
57. Blade fuse holder, F7, fuse part of power group five.
58. Blade fuse holder, F8, fuse part of power group five.
59. Blade fuse holder, F9, fuse part of power group five, only in EP 540 and EP 600.
60. Connection, PE conductor, power group five.
61. Connection, PE conductor, power groups one to four.

Troubleshooting

Irregular operation

The electric boiler increases a few stages and is then reduced immediately, etc.

Water flow through the electric boiler too low.

Check that circulation pumps and valves are working.

This is an easy way to get an idea of the level of flow through the boiler:

a. Limit the power stages of the boiler so that the power is constant, for example to one power stage.

b. Let the boiler's temperature become stable.

c. Measure the temperature increase between the flow and return lines of the boiler.

d. Calculate the flow through the boiler using the formula below.

e. Check against the details in "Data" whether the flow is adequate.

$$q = \frac{P}{\Delta t \times 1{,}16}$$

q = water flow in m^3/h. (m^3/h x 1000/3600 = litres/second)
P = electric boiler's power output in kW
Δt = temperature difference between the boiler's flow and return line in °C.
1.16 = the water's thermal absorption coefficient.

Tables for temperature sensors

When the resistance of a temperature sensor is measured, it must be disconnected from the circuit board.

For voltage measurement of sensors J12 = Boiler temperature sensor, 27.
J13 = Temperature sensor, 28, boiler with cooling fan, option.
J14 = Temperature sensor, 29, for secondary control, option. Also terminals 3 - 4 in terminal block 30.

if there are measuring points on the circuit board with connections. The voltage of other temperature sensors is measured in their connection to the terminal block.

Temperature sensors, J12, J13 and J14

°C	kΩ	V	°C	kΩ	V	°C	kΩ	V
5	141.9	4.670	45	24.55	3.552	85	5.871	1.849
10	111.6	4.588	50	20.21	3.344	90	5	1.666
15	88.31	4.491	55	16.72	3.128	95	4.273	1.496
20	70.31	4.377	60	13.89	2.907	100	3.665	1.341
25	56.33	4.246	65	11.6	2.685	105	3.155	1.199
30	45.39	4.097	70	9.723	2.464	110	2.724	1.070
35	36.79	3.931	75	8.187	2.250			
40	29.98	3.749	80	6.92	2.044			

Outside temperature sensor, option

°C	kΩ	V	°C	kΩ	V
-30	46.95	4.3	5	6.83	2.4
-25	34.70	4.1	10	5.36	2.1
-20	25.89	3.9	15	4.24	1.8
-15	19.50	3.6	20	3.37	1.6
-10	14.82	3.3	25	2.70	1.3
-5	11.36	3.0	30	2.18	1.1
0	8.78	2.7			

Pt100 temperature sensor, option

°C	Ω	V	°C	Ω	V
5	101.9526	0.4626	85	132.799	0.5862
10	103.9022	0.4706	90	134.7022	0.5936
15	105.849	0.4786	95	136.6026	0.6009
20	107.7928	0.4865	100	138.5	0.6083
25	109.7338	0.4944	105	140.3945	0.6156
30	111.6718	0.5023	110	142.2862	0.6228
35	113.607	0.5101	115	144.1749	0.6300
40	115.5392	0.5179	120	146.0608	0.6372
45	117.4686	0.5256	125	147.9437	0.6444
50	119.3951	0.5333	130	149.8237	0.6515
55	121.3186	0.5410	135	151.7009	0.6586
60	123.2392	0.5486	140	153.5751	0.6656
65	125.157	0.5562	145	155.4464	0.6727
70	127.0718	0.5637	150	157.3149	0.6797
75	128.9838	0.5712	155	159.1804	0.6866
80	130.8928	0.5787	160	161.043	0.6935

Components

Immersion heater		EP 450	EP 510	EP 540	EP 600
110035	15 kW	4	3	-	-
110036	17 kW	-	7	-	-
110037	18 kW	-	-	30	-
110038	20 kW	9	1	-	30
110039	23.3 kW	9	14	-	-

Load-break switch				
130067	2	-	-	-
130068	-	2	2	2

Contactor				
170080	K6 - K8	K3 - K8	K3 - K8	K3 - K8
170081	K3 - K5	-	K9	K9
170085	K1	K1	K1	K1
170087	K2	K2	-	-
170088	-	-	K2	K2

Blade fuse					
180060	35 A	F1	F1	F1	-
180061	50 A	-	-	-	F1
180063	80 A	F2	F2	F2	F2
180064	100 A	-	-	F9	-
180065	125 A	F3 – F5	F3 – F5	-	F9
180066	160 A	F6 – F8	F6 – F8	F3 - F8	F3 - F8

Fan				
500030	1	1	-	-

Temperature sensor to fan				
210206	1	1	-	-

Common components

210314	Circuit board, panel	1
700415	Overlay, panel circuit board	1
210313	Circuit board, power	1
218010	Ferrite terminal	2
700564	Temperature sensor	1
360020	Current transformer, PEC	1
440040	Level sensor	1
360020	Current transformer for load guard	3
120022	Temperature guard	2
130034	“STOP” button	1
130036	Green “START” button	1
170008	Zero voltage relay	1
240350	Drain valve	1
380023	Manometer	1
380002	Non return valves	1
300016	O-ring 9.25 x 1.78	1
300017	O-ring, seal immersion heater/blind plug	

Option

1909	UTK 7/15/30 outside temperature compensator, complete	
210211	Outside temperature sensor for UTK	
4801	Flan kit EP 135-750, one fan, complete	
4802	Flan kit EP 135-750, extra fan, complete	
500030	Fan for 4801 and 4802	1
500031	Filter for 4801 and 4802	1
210206	Temperature sensor for 4801 and 4802	1
4804	Secondary control EP31-750, complete	
210203	Temperature sensor for 4804	1
4803	Series control two boilers EP31-750, complete	

4795	Safety equipment open system, EP 350 - 750, contains:	
245077	Deaerator with non-return valve	1
440196	High pressure guard	1
440197	Low pressure guard	1

Safety equipment closed system Includes besides some of the safety valves specified below:		
245077	Deaerator with non-return valve	1
440196	High pressure guard	2
440197	Low pressure guard	1

4759	Safety equipment EP 350-450 3 bar 245511 Safety valve, 3 bar	2
4785	Safety equipment EP 350-450 1.5 bar 245517 Safety valve, 1.5 bar	2
4788	Safety equipment EP 350-540 1.5 bar 245512 Safety valve, 4 bar	2
4791	Safety equipment EP 450-540 2.5 bar 245516 Safety valve, 2.5 bar	2
4792	Safety equipment EP 510-750 3 bar 245515 Safety valve, 3 bar	2
4794	Safety equipment EP 600-750 4 bar 245518 Safety valve, 4 bar	2
4793	Safety equipment EP 450-750 6 bar 245513 Safety valve, 6 bar	2

Inspecta

Granskning av el-pannor

Tillverkare: Värmebaronen
Typ: EP 360-600kW
Föreskrifter: AFS 1999:4 §8, AFS 2002:1 §17
Standard: EN 12828
REG-NR: 2012_059

Datum 2012-08-20

Pannan är CE märkt av tillverkaren som aggregat och klassas som tryckbärande anordning i AFS 1999:4 enligt §8. Denna typ av elpannor med säkerhetsutrustning har levererats av Värmebaronen sedan år 2000, och detta utlåtande är baserat på tidigare godkännanden.

Säkerhetsutrustning

Högtemperaturvakt	2 st Jumo typ 602031/81	(bryter kontaktorer och shunt utlösare)
Högtrycksvakt	Danfoss RT alt Sauter DSH	(bryter kontaktorer och shunt utlösare)
Lågvattennivå	Elektrod	(bryter kontaktor) *)
Lågtrycksvakt	Danfoss RT alt Sauter DSL	(bryter kontaktorer och shunt utlösare)

*) Låg nivåskyddet är värmebaronens egna konstruktion, utformning av skyddet har inte granskats.

Stödande dokument
Riskanalys 2012-04-04

Säkerhetskrets:
EP 360-600 kW EP 600 rev H

Strömavbrott
EP 360-600 kW, efter strömavbrott så kommer pannan att gå i blockering som kräver manuell återställning.

Utlåtande
Kopplingen av säkerhetsutrustning har bedömts uppfylla kraven i EN 12828, samt i AFS 2002:1 § 17 för drift med periodisk övervakning. Slutgiltig bedömning på att pannan har erforderlig säkerhetsutrustning etc. skall ske av ackrediterat organ vid bedömning av övervakningsintervall för respektive panna.

Säkerhetsventiler
Ritning: 700472
Ventilerna är av fabrikat Watts Industries modell SV.
De har erforderlig kapacitet och ett tryckfall i inloppet som är mindre 3% av öppningstrycket.
Ventilerna uppfyller ställda krav med avseende på tryckfall i inlopp och kapacitet. Se bilaga

Kontroll av tryckfall samt förläggning utloppsledningar uppfyller säkerhetsventils tillverkas instruktioner ska kontrolleras vid besiktning.

Begränsningar
Detta utlånade gäller så länge inte regelverket förändras dock max 5 år.

Granskning har utförts av

Mats Dahlrot
Inspecta Sweden AB
mats.dahlrot@inspecta.com

PÅL / 29/08/2014
Design of safety valves SV, in VB “safety set”

	item no.	Boiler	Valve (SV[1]) capacity	Valve dim.[2]	P_{set}	Valve capacity	Number of valves	Total[3] capacity	Pressure drop inlet
		kW			bar	kg/h		kg/h	
>100 - 300 kW	4741	112	185	3/4”	1.5	130.6	2	235	<3%
1 high-pressure guard	4745	112	188	3/4”	2.5	181.1	2	326	<3%
	4749	112	190	3/4”	3.0	205.5	2	370	<3%
	4753	112	192	3/4”	4.0	257.6	2	464	<3%
	4757	112	196	3/4”	6.0	358.6	2	645	<3%
	4741	119	197	3/4”	1.5	130.6	2	235	<3%
	4745	119	200	3/4”	2.5	181.1	2	326	<3%
	4749	119	202	3/4”	3.0	205.5	2	370	<3%
	4753	119	204	3/4”	4.0	257.6	2	464	<3%
	4757	119	208	3/4”	6.0	358.6	2	645	<3%
	4743	135	223	1”	1.5	339.3	2	611	<3%
	4746	135	227	3/4”	2.5	181.1	2	326	<3%
	4750	135	229	3/4”	3.0	205.5	2	370	<3%
	4754	135	231	3/4”	4.0	257.6	2	464	<3%
	4758	135	237	3/4”	6.0	358.6	2	645	<3%
	4743	150	248	1”	1.5	339.3	2	611	<3%
	4746	150	252	3/4”	2.5	181.1	2	326	<3%
	4750	150	254	3/4”	3.0	205.5	2	370	<3%
	4754	150	257	3/4”	4.0	257.6	2	464	<3%
	4758	150	263	3/4”	6.0	358.6	2	645	<3%
	4743	180	298	1”	1.5	339.3	2	611	<3%
	4747	180	303	1”	2.5	470	2	846	<3%
	4750	180	305	3/4”	3.0	205.5	2	370	<3%
	4754	180	309	3/4”	4.0	257.6	2	464	<3%
	4758	180	315	3/4”	6.0	358.6	2	645	<3%
	4743	225	372	1”	1.5	339.3	2	611	<3%
	4747	225	378	1”	2.5	470	2	846	<3%
	4751	225	381	1”	3.0	533.7	2	961	<3%
	4754	225	386	3/4”	4.0	257.6	2	464	<3%
	4758	225	394	3/4”	6.0	358.6	2	645	<3%
	4743	255	422	1”	1.5	339.3	2	611	<3%
	4747	255	429	1”	2.5	470	2	846	<3%
	4751	255	432	1”	3.0	533.7	2	961	<3%
	4755	255	437	1”	4.0	669	2	1204	<3%
	4758	255	447	3/4”	6.0	358.6	2	645	<3%
	4743	270	446	1”	1.5	339.3	2	611	<3%
	4747	270	454	1”	2.5	470	2	846	<3%
	4751	270	457	1”	3.0	533.7	2	961	<3%
	4755	270	463	1”	4.0	669	2	1204	<3%
	4758	270	473	3/4”	6.0	358.6	2	645	<3%
	4790	300	496	1 1/4”	1.5	445.3	2	802	<3%
	4747	300	504	1”	2.5	470.3	2	847	<3%
	4751	300	508	1”	3.0	533.7	2	961	<3%
	4755	300	514	1”	4.0	669	2	1204	<3%
	4758	300	526	3/4”	6.0	358.6	2	645	<3%
>300 kW	4785	350	579	1 1/4”	1.5	445.3	2	802	<3%
2 high-pressure guards	4786	350	589	1”	2.5	470.3	2	847	<3%
1 low-pressure guard	4759	350	593	1”	3.0	533.7	2	961	<3%
	4788	350	601	1”	4.0	669	2	1204	<3%
	4789	350	613	3/4”	6.0	358.6	2	645	<3%
	4785	450	744	1 1/4”	1.5	445.3	2	802	<3%
	4791	450	756	1 1/4”	2.5	617.3	2	1111	<3%
	4759	450	762	1”	3.0	533.7	2	961	<3%
	4788	450	772	1”	4.0	669	2	1204	<3%
	4793	450	788	1”	6.0	931	2	1676	<3%
	4791	510	857	1 1/4”	2.5	617.3	2	1111	<3%
	4792	510	864	1 1/4”	3.0	700.5	2	1261	<3%
	4788	510	874	1”	4.0	669	2	1204	<3%
	4793	510	894	1”	6.0	931	2	1676	<3%
	4791	540	907	1 1/4”	2.5	617.3	2	1111	<3%
	4792	540	914	1 1/4”	3.0	700.5	2	1261	<3%
	4788	540	925	1”	4.0	669	2	1204	<3%
	4793	540	945	1”	6.0	931.4	2	1677	<3%
	4792	600	1016	1 1/4”	3.0	700.5	2	1261	<3%
	4794	600	1028	1 1/4”	4.0	878.1	2	1581	<3%
	4793	600	1052	1”	6.0	931.4	2	1677	<3%
	4792	750	1271	1 1/4”	3.0	700.5	2	1261	<3%
	4794	750	1288	1 1/4”	4.0	878.1	2	1581	<3%
	4793	750	1313	1”	6.0	931.4	2	1677	<3%
>300kW - open system 1 low-pressure guard 1 high-pressure guard	4795	-	-	-	0-6	-	-	-	

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