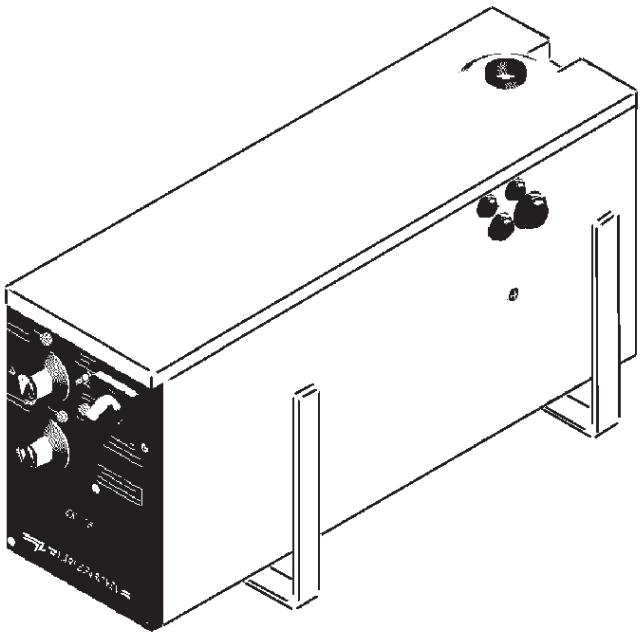
21/12/2011

Installation and maintenance

Electric cartridge EK 13



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Contents

Safety and handling

Read these instructions carefully before installation, adjustment or service is carried out. Follow the instructions.

- Keep these instructions close to the cartridge.
- If the cartridge is correctly installed and adjusted and serviced regularly, it will operate very reliably.
- Switch off the operating switch before any service/repair.
- Only authorised persons may intervene in the boiler.
- Never carry out maintenance work/service on pressure-bearing parts when they are pressurised.
- The boiler must not be modified, changed or converted in any way.
- The electric cartridge may not be used by children or people with physical or mental impairments. Nor by children/people who lack knowledge about the electric cartridge. Children may not play with the electric cartridge and connect accessories.
- Contact your installer for service.
- The type and production number of the cartridge must always be specified when contacting Värmebaronen. See the rating plate.
- Värmebaronen AB reserves the right to change the specification, in accordance with its policy of continuous improvement and development, without prior notice.

Operation

EK 13

Power 13 kW, which is divided into three stages, 6 + 4 + 3 kW.

Power can be limited to 10, 9, 7, 6, 4 or 3 kW.

EK 13 has a main switch, overheating protection, a thermostat, operating indication, time delay and a fuse-protected outlet for a circulation pump.

The electric cartridge has connection for external control/tariff control.

Stainless electric elements

The electric elements are of stainless, acidproof steel, SS 2353.

Low-energy

A low volume of water and a well-insulated tank mean extremely low heat loss.

Operation

The electric cartridge maintains a constant flow temperature in the range 30-85 °C.

Simple connection

In terms of pipes, the electric cartridge may be connected to the boiler via an expansion pipe or a docking outlet and drain cock.

Installation

Brackets for wall mounting are enclosed.

Accessories

Load guard VBB 12 TX. The load guard senses the load on the main fuses and, if necessary, temporarily disconnects power from the electric cartridge.

Notes

To be completed when the cartridge is installed

Production number: _____

Installation date: _____

Installer: _____

_____

Tel.: _____

Other: _____

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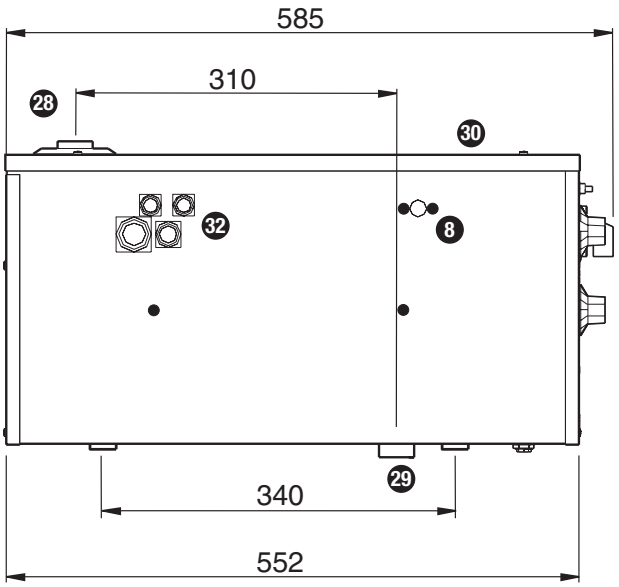
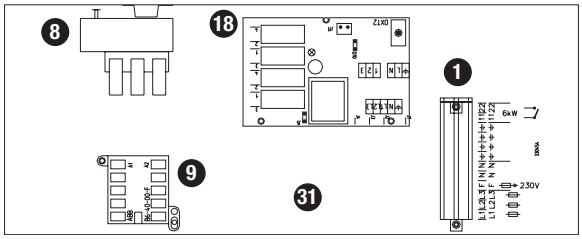
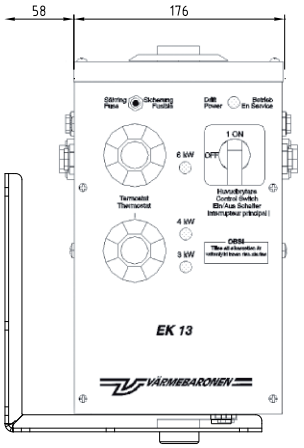
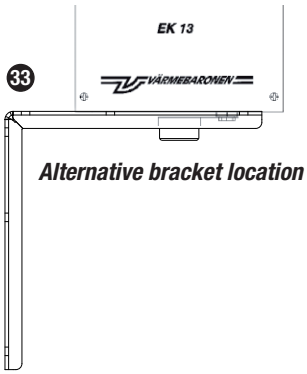
Technical data









Alternative bracket location

1. Terminal block.
8. Overheating protection.
9. Contactor.
18. Printed circuit board.
28. Flow line R25 ext.
29. Return line R 25 ext.
30. Cover over mounting plate.
31. Mounting plate.
32. Cable opening.
33. Wall bracket.

Weight:	13 kg	**Design temperature:**	110 °C	**Current:**	18.8 A
Volume:	3.6 litre	**Operating temperature:**	30-85 °C	**Fuse:**	3 x 20 A
Design pressure:	3 bar	**Power:**	13 kW	**Enclosure protection class:**	IP 21
Test pressure:	4.3 bar	**Voltage:**	400V 3N~, 50 Hz	**Manufactured to**	PED 97/23/EC article 3.3

General

The ambient temperature must not exceed 30 °C.

Cables and pipes must be laid so that it is possible to remove the front plate and open the roof plate for service. For installation and accessibility for service, there must be at least 60 cm space above and in front of the cartridge.

The electric cartridge is not designed for oxygenated water.

No work must take place on the electric cartridge's facing plates.

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 a technical water analysis should take place. Any nonconformities with standard values should be corrected.

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 tank or vent valves. The remainder will react with the metals in the system. This corrosion is often insignificant as the same volume of water circulates and it soon becomes oxygen-free.

The system must be leakproof so that the water does not need to be replaced with new oxygen-rich water and the water is not oxygenated during installation.

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.

Very soft water may cause corrosion damage.

Chloride contents over 100 mg/l make the water aggressive, in particular 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.

Pipe installation

Installation must take place according to existing regulations and standards.

The cartridge must be located indoors in a suitable location.

The cartridge must be installed horizontal with the pipe connections vertical so that air that is released can escape.

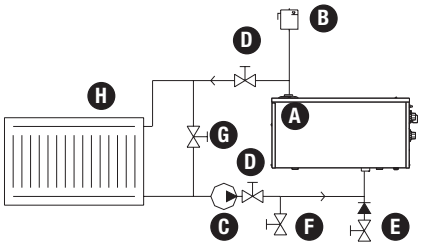
The cartridge must be connected to an open or closed expansion system.

A system with a closed expansion tank 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 electric cartridge or expansion tank may not be replaced without another inspection.

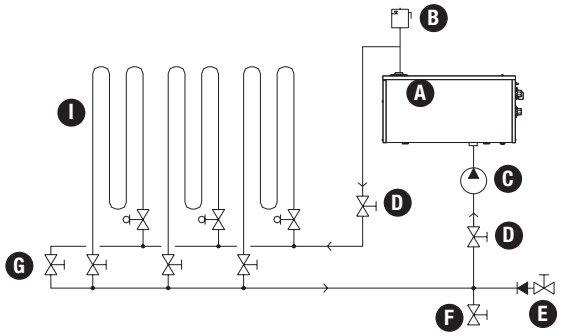
System principles

The system must be installed according to existing rules and standards.

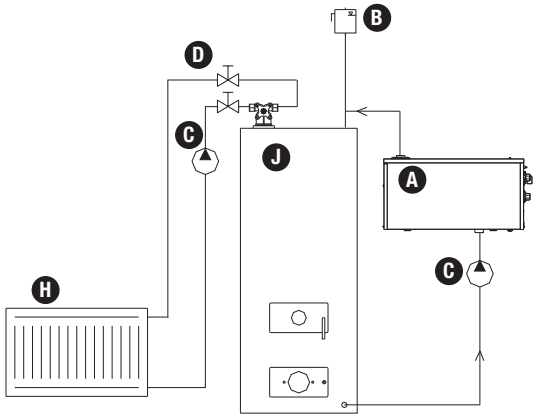
Radiator system



Underfloor heating system



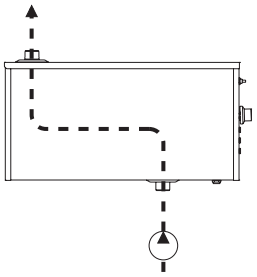
With boiler



A. EK 13
B. Expansion tank, open
C. Circulation pump
D. Stop valves
E. Filling valve
F. Drain valve
G. Bypass/overflow valve
H. Radiator system
I. Underfloor heating system
J. Boiler

Flow

The electric cartridge requires a constant adequate flow to work. If the heating system's valves are able to throttle circulation, an overflow valve must be installed.



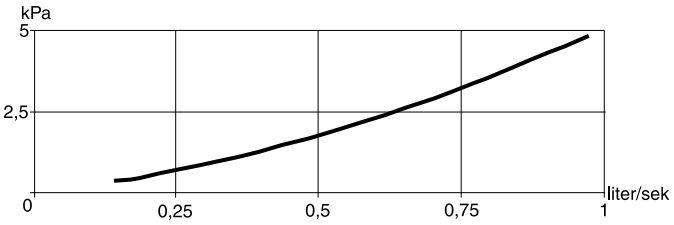
The circulation pump must press the water through the cartridge with the flow direction shown in the figure.

Recommended flow: 0.3 litre/second, $\triangle t$ = 10 °C.

Flow too low:
- High difference between desired temperature and achieved temperature.
- Irregular control with increased wear on the electromechanical components, with reduced service life as a result.
- Increased risk of the overheating protection being triggered.

Flow too high:
- Vibrations in the immersion heaters with noise and reduced service life as a result.
- Unnecessary wear on the system's components.

Pressure drop diagram



Freestanding heating unit

EK 13 must be connected to:

Open system: The expansion tank is connected in an unbroken, uninterruptible connection to the cartridge. The distance between the top of the highest radiator and the tank may not be less than 2.5 metres to avoid oxygenation of the heating system.

Closed system: The cartridge is connected to a closed expansion tank and in an unbroken, uninterruptible connection to a type-approved safety valve with maximum 3 bar opening pressure and an automatic vent valve.

Electrical installation

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

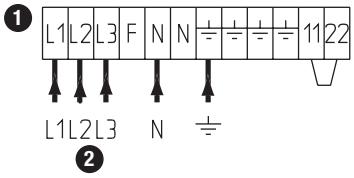
The electric cartridge and heating system must be filled with water and vented before the electric cartridge is connected to the power supply.

All connections must be with high voltage-insulated cable.

Terminal block, supply

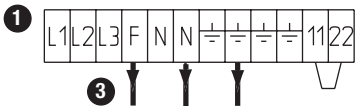
The electric cartridge is connected with 5 x 4 mm² cable with 3 x 20 A fuses.

The terminal block is in the automatic control cabinet.



Connection of circulation pump

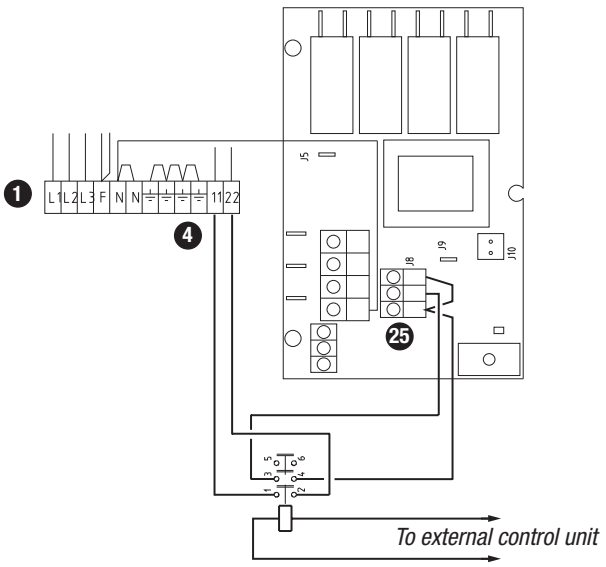
Fused power outlet, 10 A, to supply the circulation pump, max. load 1 A.



External blocking.

If the electric cartridge is to have tariff or external control, a 2-pole relay must be connected as shown in the diagram below, 230 V.

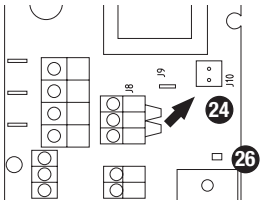
The relay must be closed in operating mode and open in idle mode.



Connection delay after power cut

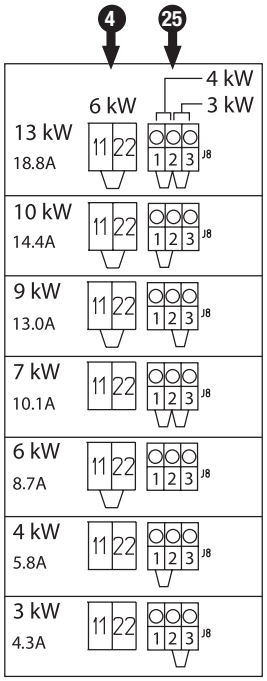
The electric cartridge has connection-delayed power stages after a power cut according to the standard. This means that, after a power cut that has lasted for more than three minutes, only power stage one is connected, 6 kW. The remaining power is connected approximately two hours after the power has returned.

For testing and inspection, the delay may be switched off temporarily by short-circuiting the pins marked with arrows until the LED goes out.



Limitation of power

The power of the electric cartridge may be limited by removing jumpers as shown in the diagram below.

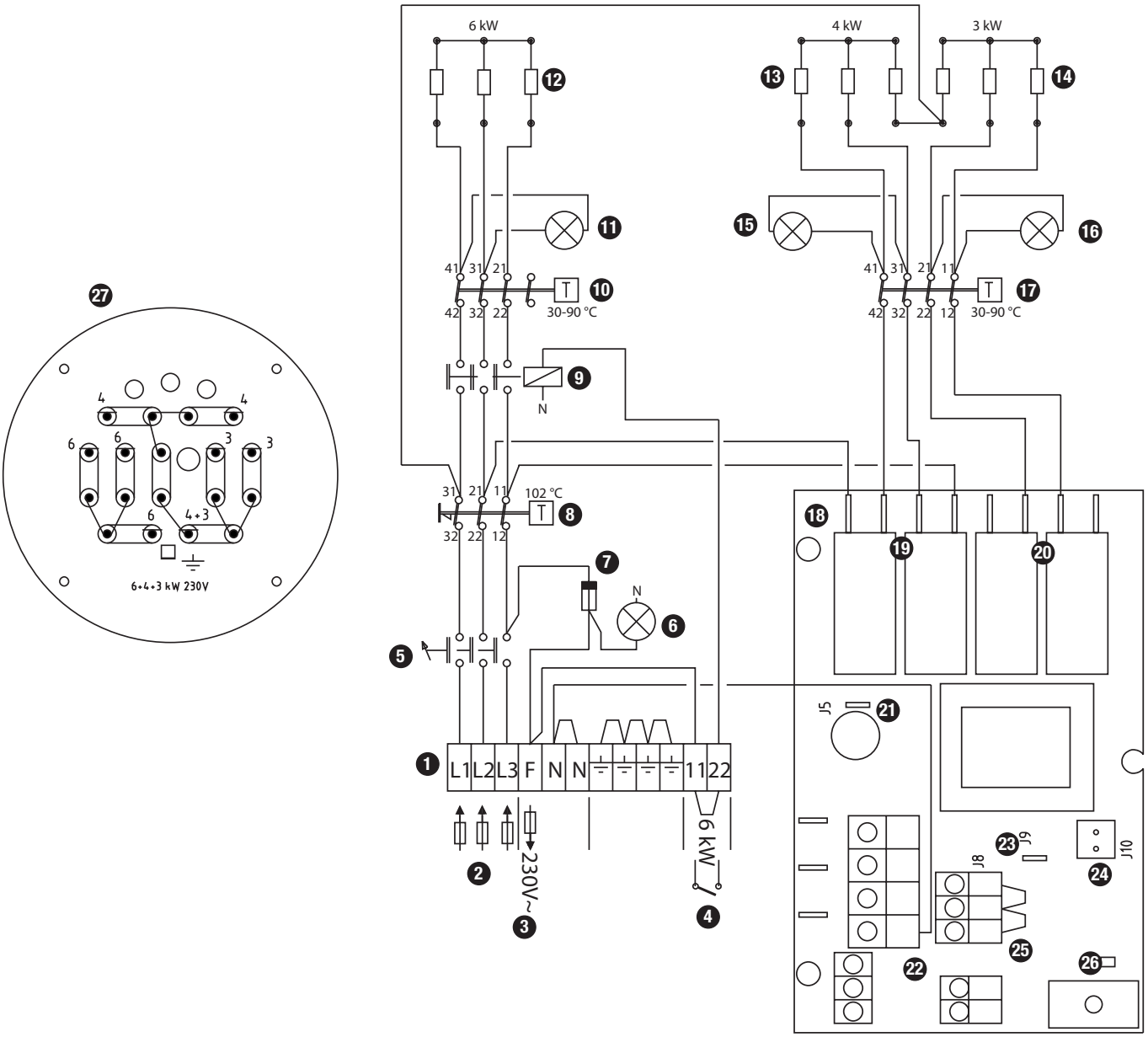


Load guard

A load guard VBB 12 TX is available as an accessory. It senses the total load on the main fuses and reduces the power in the electric cartridge in the event of overload. When the load on the main fuses falls, the load guard reconnects the power disconnected in stages.

Further information is available in the instructions for the VBB 12TX.

Electrical installation



1. Terminal block.
2. Power cable connection.
3. Power supply, circulation pump, 230 V~.
4. Blocking, power stage one.
5. All-pole switch.
6. Operation indicator.
7. Miniature circuit breaker for control and circulation pump.
8. Overheating protection.
9. Contactor, blocking, power stage one.
10. Thermostat, power stage one.
11. Indicator, power stage one.
12. Electric elements, power group one, 6 kW.
13. Electric elements, power group two, 4 kW.
14. Electric elements, power group three, 3 kW.
15. Indicator, power stage two.
16. Indicator, power stage three.
17. Thermostat, power stages two and three.
18. Printed circuit board.
19. Relay group, power stage two.
20. Relay group, power stage three.
21. Selection of connection delay:
    Jumpered: power stages two and three delayed for two hours (standard).
    Unjumpered: power stage three delayed for two hours.
22. Neutral for the electronics. The incoming control phase for the circuit board comes via relay group no. 19, connection no. 4.
23. Selection of connection delay, one or two hours.
24. The two-hour lock may be disabled by short-circuiting the pins until LED no. 26 goes out.
25. Connection of load guard or other external blocking:
    closure 1 - 2, relay group no. 19 picked up.
    closure 2 - 3, relay group no. 20 picked up.
26. LED, flashes when the two-hour lock is operating, normally off.
27. Connection pin for power groups on immersion heater.

Operation and maintenance

After installation, check with the installer that the system is in perfect condition.

Ask the installer to demonstrate the control and functions so that you know how the system should work and be maintained.

Check that:

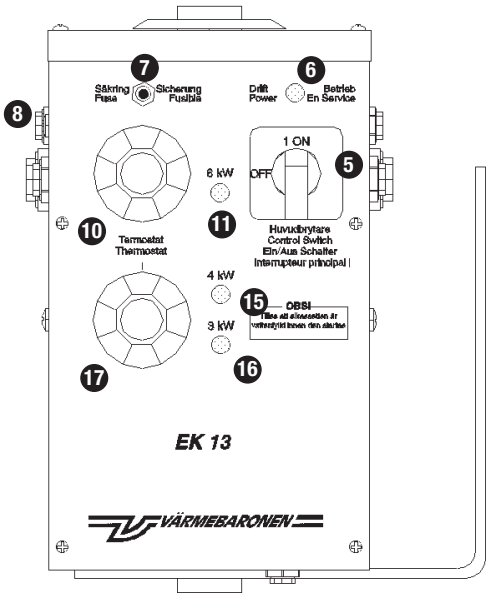
- No tools have been left in the cartridge's connection space.
- The electric cartridge and the heating system have been filled with water and vented.
  Air may remain for a while, for which reason a few more checks should be made.
- Pipe connections are leakproof.
- Safety valves work. Water must enter the blow-off pipe when the valve is operated.
- Start the electric cartridge by switching the main switch to position 1.

Set the thermostats to the required temperature.

As the cartridge has been without power, the connection delay will limit the power connection for the first two hours.

- The circulation pump works and has the right speed.
- Heat is distributed to the radiator system.
- The temperature matches the temperature selected. It may take a while before the temperature in the system has been stabilised.

Control panel



5. Main switch.
6. Operation indicator.
7. Miniature circuit breaker.
8. Reset overheating protection.
10. Thermostat for power stage one.
11. Indicator for power stage one.
15. Indicator for power stage two.
16. Indicator for power stage three.
17. Thermostat, power stages two and three.

Operation

The electric power is controlled by two thermostats. The thermostats have a difference of approximately 5 °C between breaking and closing. This means that if the thermostat is set to 65 °C, it breaks when the temperature reaches this level. The thermostat closes again when the temperature has fallen to approximately 60 °C.

The thermostat for power stages two and three works in two stages. Stage two is connected at 5 °C lower than stage three. Otherwise it works in the same way as the thermostat for power stage one.

Overheating protection

The electric cartridge has overheating protection that is triggered when the temperature exceeds approximately 95 °C.

The overheating protection is reset on the side of the electric cartridge. It may only be reset when the temperature has fallen below 80 °C. You need to press quite hard to reset the protection.

Venting

Check regularly that there is water in the system. After venting, the pressure must be checked and water may need to be added.

Action in the event of electrical operation

When EK 13 is installed as a supplement to a boiler and the electric cartridge takes over the heating, any unnecessary air throughput and thus cooling of the boiler should be avoided.

Safety valve

To maintain safety protection, any safety valve should be operated regularly, approximately four times a year.

Draining

If the heating system needs to be drained of water, the electric cartridge must first be switched off so that the immersion heater is not damaged.

Action in the event of a risk of freezing

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 system is frozen, contact an installation engineer.

If the system is to be switched off for an extended period of time, the system should be drained or filled with water mixed with glycol.

Frost protection

If the system water is mixed with glycol, it is important for the glycol to contain a suitable quantity of corrosion-protection agent. When glycol breaks down, carbonic acid is produced, which increases the risk of corrosion.

Connection delay

According to the standard, a maximum of 6 kW may be connected directly. The remainder must be delayed for two hours. This means that, after a power cut that has lasted for longer than three minutes, only two of the electric cartridge's power stages are connected directly. The remainder are connected (if required) two hours after the power has returned.

Troubleshooting

Intervention that requires tools must be performed by a qualified electrician.

Fault	Possible cause of fault	Action
Operating indicators off.	Electric cartridge without power.	Check the main fuses.
	Main switch off.	Turn the switch to position I. The time delay function will lock the power stages if it has been without power for more than three minutes.
	The electric cartridge is blocked by external equipment.	Check whether the electric cartridge is blocked by external control or similar.
	Overheating protection triggered.	If the overheating protection has been triggered, the operation of the system's circulation pumps and valves must be checked. Reset by pressing the overheating protection button. This may take place when the temperature has fallen below 80 °C.
	Connection is limited by a power cut.	It is possible to bypass the time delay function on the printed circuit board.
	Load guard limits power stages.	Check whether the load guard is connected and whether it is limiting the power stages.
Operating indicator for stage one off. Stage two and/or stage three on.	Miniature circuit breaker in automatic control cabinet triggered.	Check where the short-circuit is. Take action. Then reset the miniature circuit breaker.
Operating indicators for stages two and three off. Stage one on.	Miniature circuit breaker on circuit board triggered.	Check where the short-circuit is. Take action. Then reset the miniature circuit breaker.
Group fuses for electric cartridge triggered.	Immersion heater faulty.	Switch off the main switch. Check the insulation of the immersion heater's power groups. If any of the electric elements is faulty, replace the immersion heater and the tank for the immersion heater.
The operation of the electric cartridge is irregular. The thermostats are switching on and off at regular intervals.	Water flow too low.	Check that the circulation pumps are working and that all necessary valves are open. The flow through the electric cartridge is checked as follows: a. Limit the power stages of the electric cartridge so that the power output is constant, for example to 1 power stage. b. Let the temperature of the electric cartridge become stabilised and measure the temperature increase between the flow and return lines of the electric cartridge. c. Calculate the water flow using the formula below. ***Recommended flow: 0.3 litre/second, Δt = 10 °C.*** $q = \frac{P}{\Delta t \times 1.16}$ q = water flow in m3/h P = cartridge's power output in kW. Δt = temperature difference in °C. 1.16 = water's thermal absorption coefficient. To obtain the flow in litre/second, multiply q by 1/3.6

Components

Item	Art. no.	Designation	Qty.
8	120002	Overheating protection, 102°	1
10, 17	120004	Thermostat, 30-90°	2
	120005	Thermostat dial	2
5	130024	Switch	1
32	140010	Sealing nipple 18.6	5
	140011	Sealing nipple 22.5	2
	140012	Sealing nipple 28.3	2
	140031	Locking nut 18.6	5
	140032	Locking nut 22.5	2
	140033	Locking nut 28.3	2
	150057	Cables, complete, EK 13	1
1	160003	12-pole terminal block	1
	160006	End plate	1
	160009	2-pole bridge	2
	160011	4-pole bridge	1
9	170046	Contactor, 230 V	1
7	180021	Miniature circuit breaker, 10 A	1
11, 15, 16	190002	Indicator lamp, 400 V	3
6	190008	Indicator lamp, 230 V	1
18	211003	Circuit board	1
	280012	Insulation	1
	280038	Insulating disc	1
	280100	Pipe insulation (m)	0.13
	295430	Outer cover	1
	295431	Rear	1
	295433	Roof	1
31	295437	Mounting plate.	1
	370022	Cover washer	1
	400211	Flat-pin contact	1
	81216	Jumper	2
	90030	Tank, including immersion heaters	1
33	90032	Bracket	2
	92011	Panel	1

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