Varmeteknikk

Installation - operating - servicing

SB - boilers

180 - 200 - 225 - 250 - 300 kW

375 - 400 - 450 – 600 kW

750 - 800 - 900 - 1000 – 1200 kW

Technical data

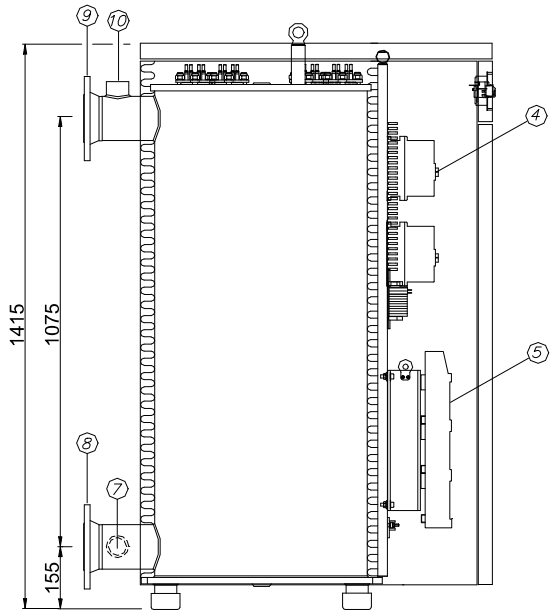
Model	SB 180	SB 200	SB 225	SB 250	SB 300	SB 375	SB 400
Power	180 kW	200 kW	225 kW	250 kW	300 kW	375 kW	400 kW
Nominal supply voltage Power circuit	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V	3 x 400 V
Control circuit	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz
Amps	260 A	289 A	32 A	361 A	433 A	541 A	577 A
Number of elements	15	15	15	15	15	30	30
Temp. controller (steps)	15	15	15	15	15	30	30
Temp. range	5 – 95 °C	5 – 95 °C	5 – 95 °C	5 – 95 °C	5 – 95 °C	5 – 95 °C	5 – 95 °C
Water contents (liters)	240	240	240	240	240	310	310
Tube connections							
Outlet/inlet	DN 100/16	DN 100/16	DN 100/16	DN 100/16	DN 100/16	DN 125/16	DN 125/16
Expansion/drain	1 ½"	1 ½"	1 ½"	1 ½"	1 ½"	2"	2"
Water circulation Δt = 20°C (m³/h)	7,7	8,6	9,7	10,8	12,9	16,1	17,2
Pressure drop (Wc)	9	12	15	18	27	14	16
Water speed (m/s)	0,27	0,30	0,34	0,38	0,46	0,33	0,35
Max. working pressure	6 bar	6 bar	6 bar	6 bar	6 bar	6-16 bar	6-16 bar
Min. working pressure	1 bar	1 bar	1 bar	1 bar	1 bar	1 bar	1 bar
Package size(cm)							
Height	160	160	160	160	160	160	160
Width	67	67	67	67	67	85	85
Depth	108	108	108	108	108	142	142
Weight empty, (kg)	290	300	310	315	315	450	450

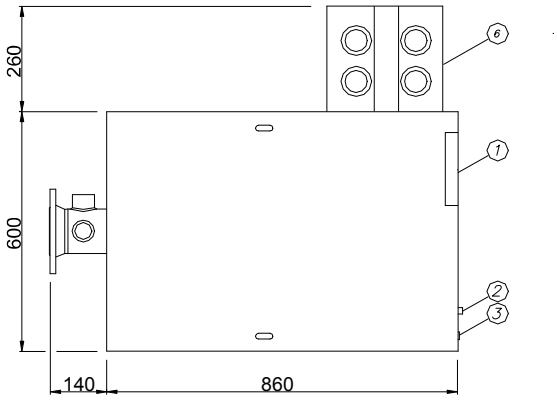
Technical data

Model	SB 450	SB 600	SB 750	SB 900	SB 1000	SB 1200
Power	450 kW	600 kW	750 kW	900 kW	1000 kW	1200 kW
Nominal supply voltage Power circuit	3 x 400 V	3 x 400 V	2 x 3 x 400 V	2 x 3 x 400 V	2 x 3 x 400 V	2 x 3 x 400 V
Control circuit	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz	1 x 230 V 50/60 Hz
Amps	650 A	866 A	2 x 541 A	2 x 650 A	2 x 722 A	2 x 866 A
Number of elements	30	30	60	60	60	60
Temp. controller (steps)	30	30	30	30	30	30
Temp. range	5 – 95 °C	5 – 95 °C	5 – 95 °C	5 – 95 °C	5 – 95 °C	5 – 95 °C
Water contents (liters)	310	310	620	620	620	620
Tube connections						
Outlet/inlet	DN 125/16	DN 125/16	DN 125/16	DN 125/16	DN 125/16	DN 125/16
Expansion/drain	2"	2"	2"	2"	2"	2"
Water circulation Δ t= 20°C (m³/h)	19,4	25,8	32,3	38,7	43,0	51,6
Pressure drop(Wc)	19	35	56	80	97	141
Water speed(m/s)	0,39	0,52	0,66	0,79	0,87	1,05
Max. working pressure	6/16 bar	6/16 bar	6/16 bar	6/16 bar	6/16 bar	6/16 bar
Min. working pressure	1 bar	1 bar	1 bar	1 bar	1 bar	1 bar
Package size(cm)						
Height	160	160	160	160	160	160
Width	85	85	132	132	132	132
Depth	142	142	184	184	184	184
Weight empty, (kg)	450	450	950	950	950	950

SB 180 – 300 kW

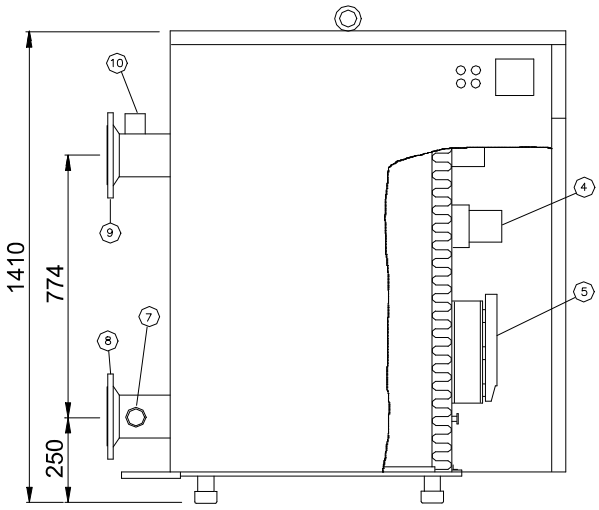
1. *Temp. controller*
2. *Safety temp .limiter*
3. *ON/OFF-switch*
4. *Contactors*
5. *Fuses*
6. *Connecting box for Supply cables*
7. *Drain*
8. *Return*
9. *Flow*
10. *Expansion*

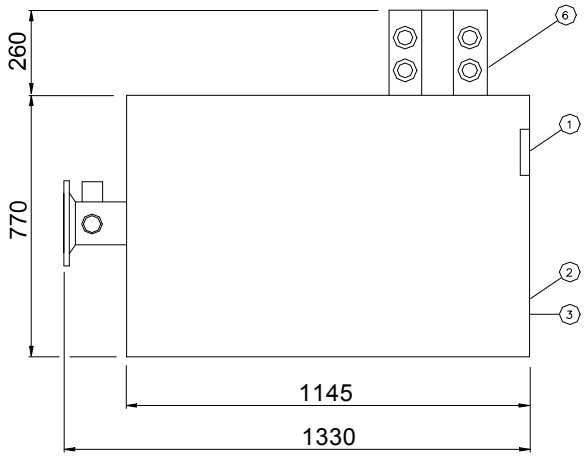




SB 375 – 600 kW

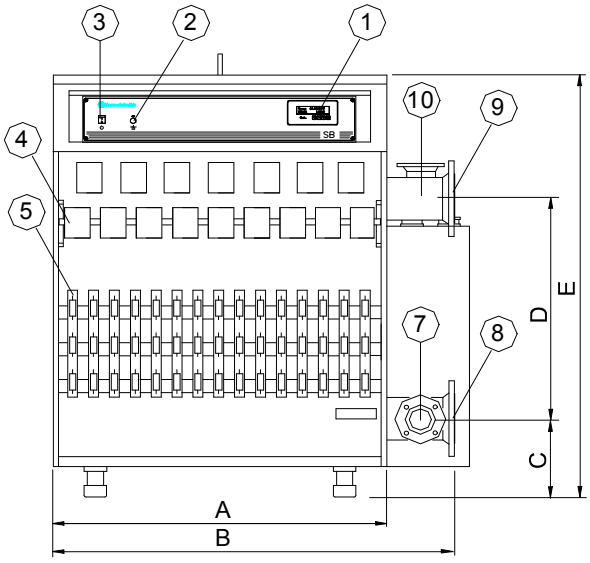
1. *Temp. controller*
2. *Safety temp. limiter*
3. *ON/OFF-switch*
4. *Contactors*
5. *Fuses*
6. *Connecting box for Supply cables*
7. *Drain*
8. *Return*
9. *Flow*
10. *Expansion*

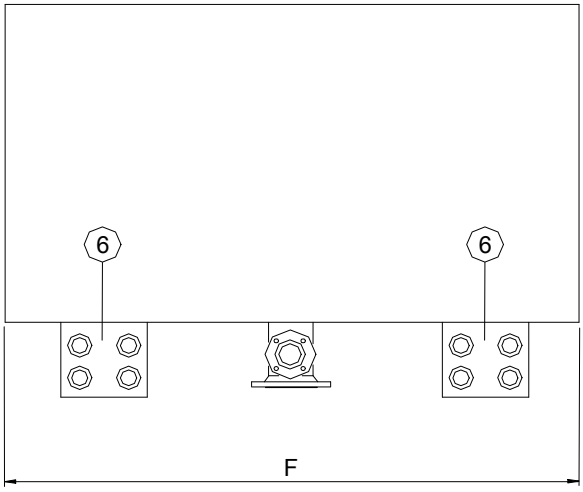




SB 750 – 1200 kW

1. Temp. controller
2. Safety temp. limiter
3. On-/Off-switch
4. Contactors
5. Fuses
6. Connecting boxes for supply cables
7. Drain
8. Return
9. Flow
10. Expansion



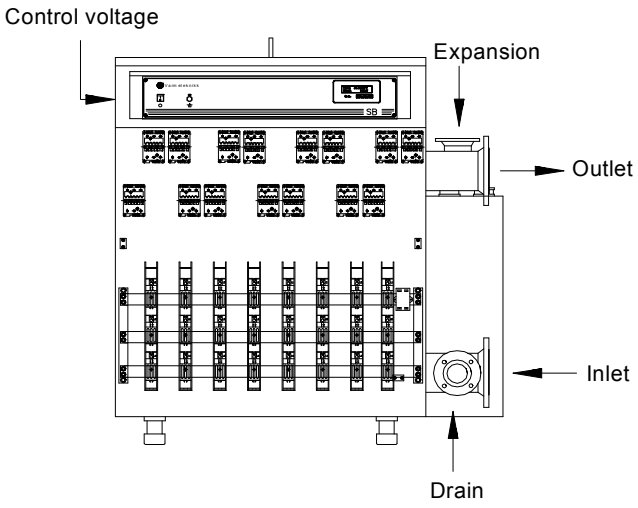


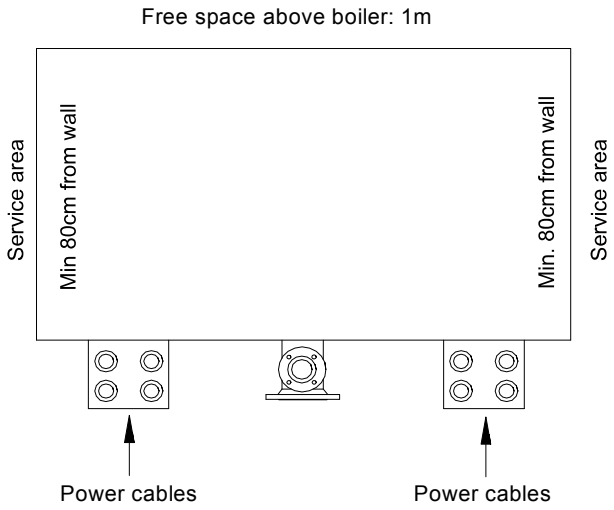
Content

Installation

THE BOILER MUST BE POSITIONED IN SUCH A WAY THAT IT DOES NOT PREVENT PERFORMANCE OF SERVICE AND MAINTENANCE.

Required free height above the boiler for disassembly of heating elements is 1 m. Front and at least one side should be free in order to perform service and maintenance. For SB 750–1200 kW both front and back and at least one side should be available for servicing.





Pressure safety valves

The boiler must be equipped with 2 pcs. pressure safety valves. The pressure safety valves should be placed as close as possible to boiler and it should not be any shutoff between the valves and the vessel. The opening pressure must not exceed maximum operating pressure of the boiler. To avoid damage a pipe pointing down towards the floor, should be fixed to the pressure safety valves.

Connection

NOTE! INSTALLATION MUST ONLY BY EXECUTED BY QUALIFIED PERSONNEL

All applicable regulations must be observed when electrical and plumbing connections. Sufficient provision must be made for expansion, in accordance with applicable regulations

SB-boilers are supplied with connecting box/es for supply cables. The connecting box can be mounted either on right or left hand side with cables from above or below. Factory delivery is prepared for mounting on right hand side. If mounting on left hand side is more convenient, transformer for power indication located on upper bus bar must be moved to the same side. Cable clamps are suitable for Cu/AL cable from 120 – 240 mm². Nominal current is 250 A.

Tightening torque for cable clamps: 35 Nm

Connecting box for supply cables

Cable glands must be put on the supply cables before these are fixed to the cable clamps.

Supply cables should be fixed to a cable bridge or similar.

Control voltage

A 220 – 230 V control voltage is required. Connection to be done on F1 & F2 on the terminal block Inside the boiler. see page 14.

Commissioning

Note! BEFORE SWITCHING ON THE BOILER CHECK THE FOLLOWING:

- Check that the water system is completely filled with water. To prevent heating element break down make sure there is no air pockets in plant.
- Switch on circulating pump and check water flow and direction.
- Hydraulic expansion system has to be controlled. Min. pressure, 1bar.
- Check for correct supply voltage

Note! Before start up, retighten all electrical connections.

Don't switch on the boiler if there is a possibility that the water in boiler is frozen.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

Start up

Switch on the boiler by using the ON/Off-switch on the front panel. Display will after a few seconds show actual water temp., preset temp. in brackets. The line below shows connected power. Boiler will now step by step increase power to obtain preset temperature.

The temperature is factory set at 80 °C, and step time is set to 40 sec. Unless corrections of preset temperature or step time are required, no further adjustments are needed.

Note! If boiler is controlled by external signals, missing signal can prevent boiler from running.

Temperature controller

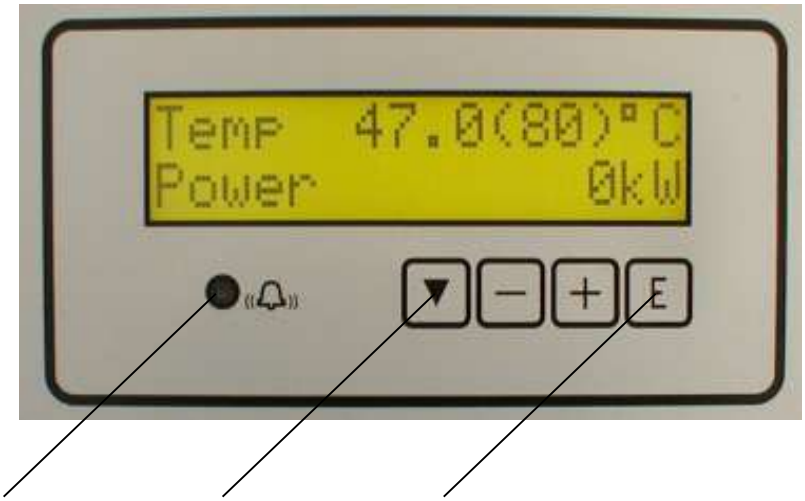
The boiler is equipped with a 15/30-steps electronic temperature controller located in front of the boiler. All settings can be done at the front. The controller has a proportional and integrating control and is designed to maintain constant boiler temperature. Temperature range is from 5 – 95 °C in steps by 1 °C. 4/8 relays control the power contactors which are connected in a binary order. This gives a high degree of reliability

If a failure occurs, an alarm diode starts flashing. Type of failure will be shown in display and could be:

Error temp: Temperature sensor is broken
Alarm net: Control voltage < 190 V
Alarm power: Power supply missing*

* *Alarm power* is activated if controller when reaching step 3, doesn't measure any power. The reason for this could be that main switch/circuit breaker on the switch board is OFF, security temp. limiter (STB) released because of high temperature, heating element/fuse is broken, or contactor is not connected.

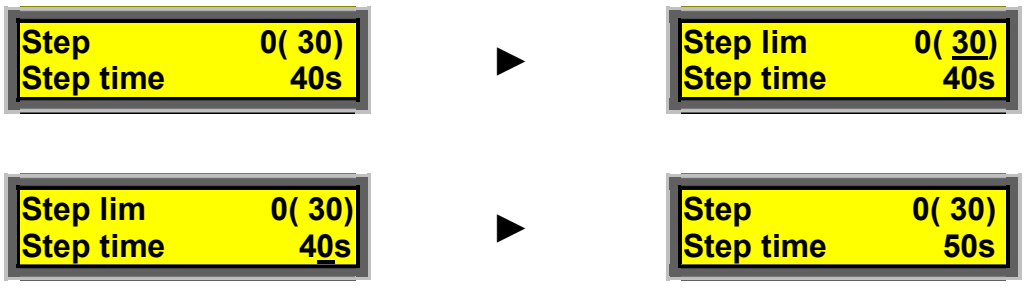
Settings



Failure Menu button Enter button

Preset temperature:
Temperature range is from 5 – 95 °C. Preset temperature is factory set to 80 °C. If correction is needed do the following:
Press **+** or **–** button to set desired temperature. Then press enter to save new value.

Step time:
Step time is adjustable between 1 – 250 sec.(V1725). Factory setting is 40 sec. and refer to connection of power steps. When disconnecting power, step time is 5 seconds(adjustable between 1 – 20 sec.).
If correction is required do the following:
Press menu button once to enter step limitation mode. Then press **+** or **–** button. To enter step time mode, press menu button. With +/- button choose desired step time. Press **E** button to save new value.



To return to temp/power mode, press menu button.

Additional functions

The temp. controller has been provided with a large number of other functions in addition to several possibilities for remote control.

Remote boiler in/out

The temp. controller is equipped with an potential free input for start/stop of the boiler. The disconnecting signal can be either an "**OFF**" or an "**ON**" switch. With a clamp on the PCB the temp. controller can be adjusted to either type of signal (see page 30). If start signal is missing display shows:

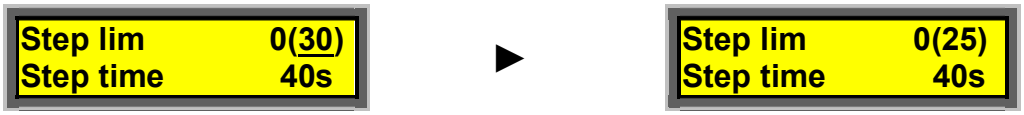
See page 14 for connecting start/stop signal.

Power limitation

The maximum output of the boiler can easily be limited. It is only possible to limit the boiler on a **hole** step base. Limitation can be done in the menu or on a potentiometer located on the PCB.

Limitation in menu:

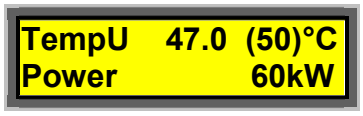
Enter Step mode and press **–** button. Choose number of power steps and then press **E** button to save new value.



For limitation on the PCB, see page 31

Outdoor temperature compensator

The temp. controller is prepared for outdoor temperature compensation. If outdoor sensor is connected, boiler will calculate and set flow temperature depending on outdoor temperature. Both curve and parallell are available for fine-tuning flow temperature. When outdoor sensor is connected, display shows:



Temperature in brackets is calculated flow temperature depending on outdoor temperature.
It is not possible to change calculated temperature when outdoor sensor is connected.

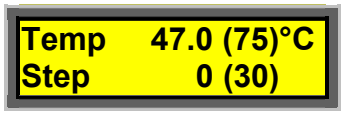
For further information, contact Varmeteknikk.

Remote control by external signals

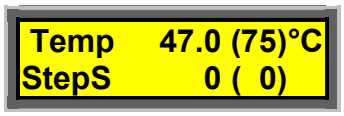
The boiler offers several possibilities for remote control. With a start/stop signal (potential free), boiler can be connected/disconnected from running. Maximum output or preset temperature can be controlled by a 0 – 10 V DC signal.

Remote start/stop of boiler

Boiler can be switched On/Off by an external signal. Before connecting signal, remove bridge on terminal 1 & 2, see next page. If start/stop-signal is connected and boiler gets start signal, display shows:



If start signal is missing, display shows:

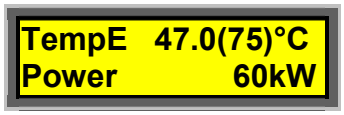


Temperature control by 0 – 10 V signal

Desired temperature can be controlled by a 0 – 10 V DC signal. 0 V = 0 °C, 10 V = 100 C°(V1725).

Connection on terminal 30(-) and 31 (+) on PCB (see page 30). Signal must be activated in service menu, see page 14. **"Temp IN"** must be set in **"ON"** position. Press **+** button twice and then **E** to enter new value.

Press menu button twice to return to **"Temp/Power"** mode. When signal is activaded display shows:



Note! When desired boiler temperature is controlled by a external 0 – 10 V signal, internal set point must be set as high as boiler should work. Internal thermostat is now working as a maximum thermostat and limit the temperature. This must be done before signal is activated.

Power control by 0 – 10 V signal

Boiler output can be controlled by a 0 – 10 V DC signal. 0 V = 0 step, 10 V = all steps (15/30). Connection on terminal 29(+) and 30(-) on PCB(see page 30). Signal must be activated in service menu, see page 15. "**Power IN**" must be set in "**ON**" position. Press **+** button twice and then **E** to enter new value.

Press menu button twice to return to **"Temp/Power"** mode. When signal is activated display shows:

Monitoring

Boiler is prepared for output digital signals to a central monitoring system. The signal contacts are wired to a terminal block inside the boiler. The outlet signals are:

Operation signal: indicates boiler is **ON**. Connection on terminal 3 & 4.

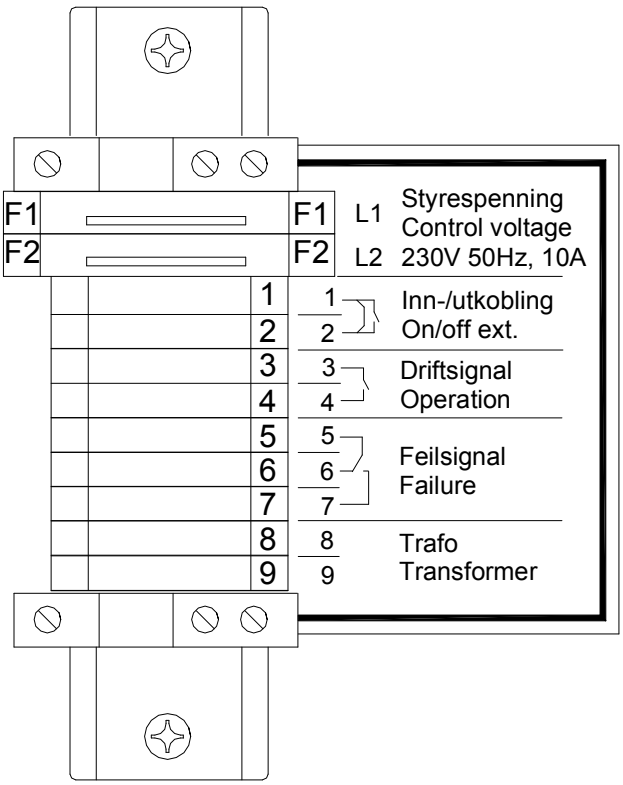
Failure: indicates STB released, sensor broken or control voltage < 190 V. Connection on terminal 5 & 6. Type of error is shown in display.

Output 0 – 10 V DC signals:

External power indication: 0 V = 0 kW, 10 V = Max kW (terminal 36 & 39)
External temp. indication: 0 V = 0 °C, 10 V = 100 °C (terminal 36 & 38)
External preset temperature: 0 V = 0 °C, 10 V = 100 °C (terminal 36 & 37)

Connection diagram, see page 17.

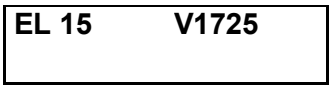
Terminal block inside boiler



Menus

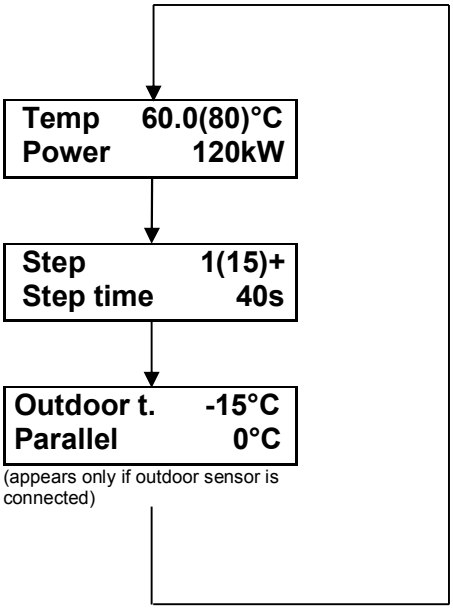
By pressing menu button, different modes appears

Start up:



El 15: 15-steps controller
V1725: version

Main menu

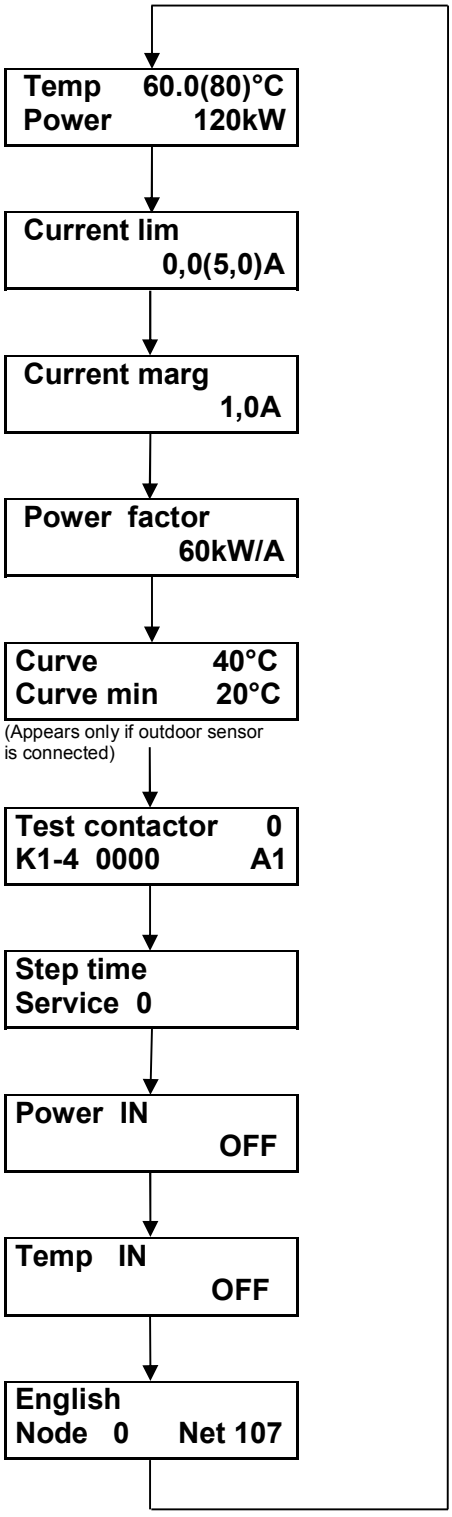


Settings in main menu:

- Desired temperature
- Number of power steps
- Step time

Service menu

To get access to service menu, press and hold menu button for more than 5 sec.



Maintenance

NOTE!
BEFORE SERVICE AND MAINTENANCE, BE SURE SUPPLY CABLES ARE DEAD.
Always use an appropriate voltage detector to verify that there is no voltage present.

After boiler has been in operation for some time, retighten electrical connections. To prevent breakdown, boiler should be checked annually. This check should contain the following points:

- **Leakage control**
  Make a visual inspection of the boiler checking for signs of water leakage. Remove top cover and check on top of the pressure vessel for leakage from heating elements.

- **Power checking**
  Check fuses. Check by resistance measurement if any heating elements are broken.

- **Contactors**
  Check all individual contactors if they are in normal position. Undertake a visual inspection of all wiring to the contactors and check for signs of overheating or burning. Any noise from contactor indicates wear and requires a thorough check. Be aware that burnt contactors may cause major damage.

- **Electrical connections**
  Retighten all electrical connections on fuse holders, contactors and heating elements.

- **Temp.controller**
  Check if temp.controller connect or disconnect power steps when adjusting preset temp. up and down. By entering service menu connection of power groups/contaktors can be checked.

- **Safety temp. limiter**
  Check safety temp. limiter. This can be done by switching off circulation pump or close valves. The boiler will then soon reach release temp. Safety temp. limiter must be manually reset.

Note!
SERVICE AND MAINTENANCE SHOULD ONLY BE CARRIED OUT BY QUALIFIED PERSONNEL

For service and spare parts, call your agent

Tightening torques for contactors:

Contactor, type	Connection screw	Tightening torque
AF26 – AF38	M4	2,5 Nm
AF40, AF52, AF 65	M6	4 Nm
AF80,	M8	6 Nm
AF116	M8	8 Nm

Tightening torques for fuse holders:

type	Connection screw	Tightening torque
ABB ZLBM	M8 - Cables	10 Nm
	M6 - for bus bar	8 Nm

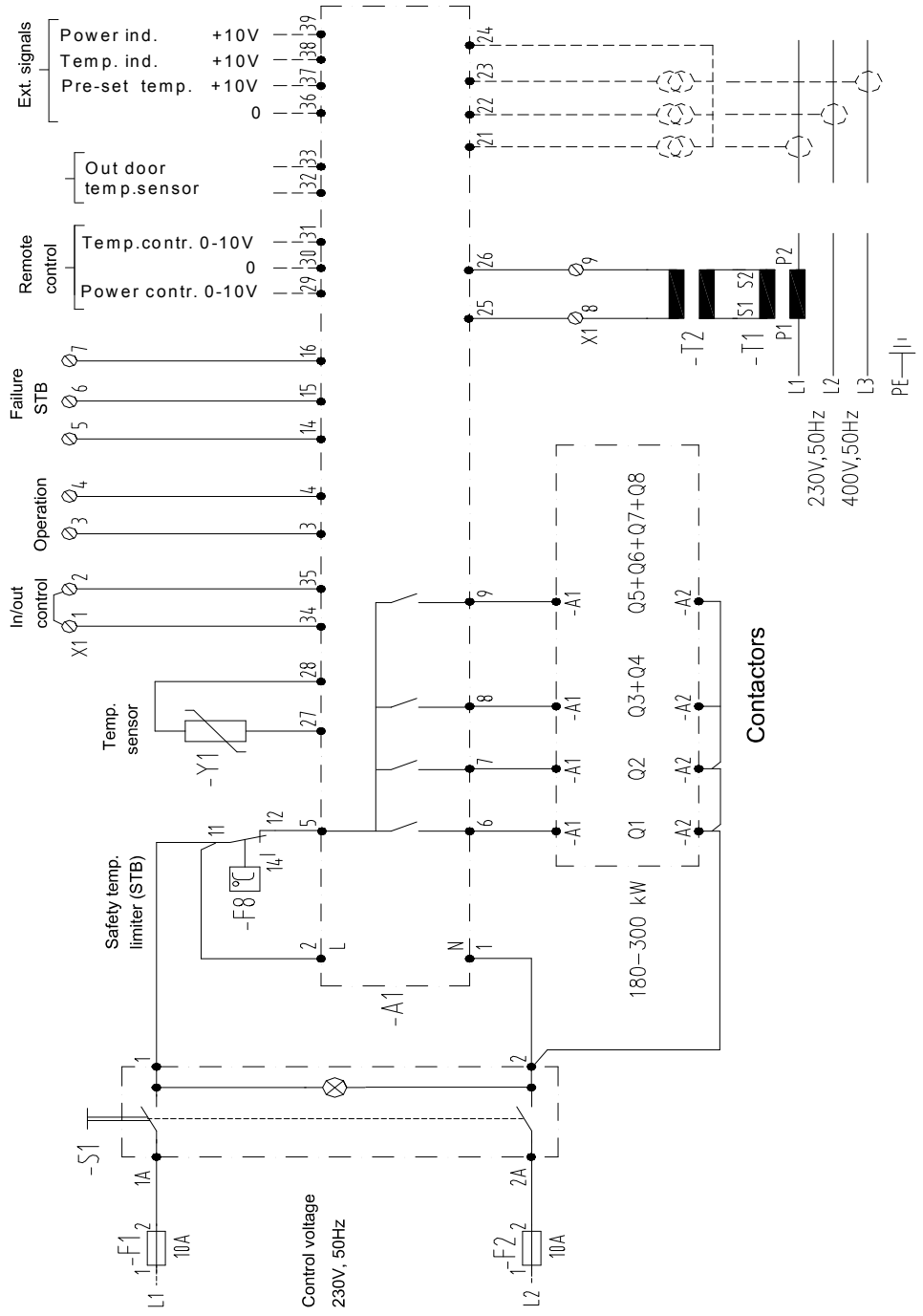
Tightening torque for heating element: M4 - 1,2 Nm
M12 – 15 Nm

Troubleshooting

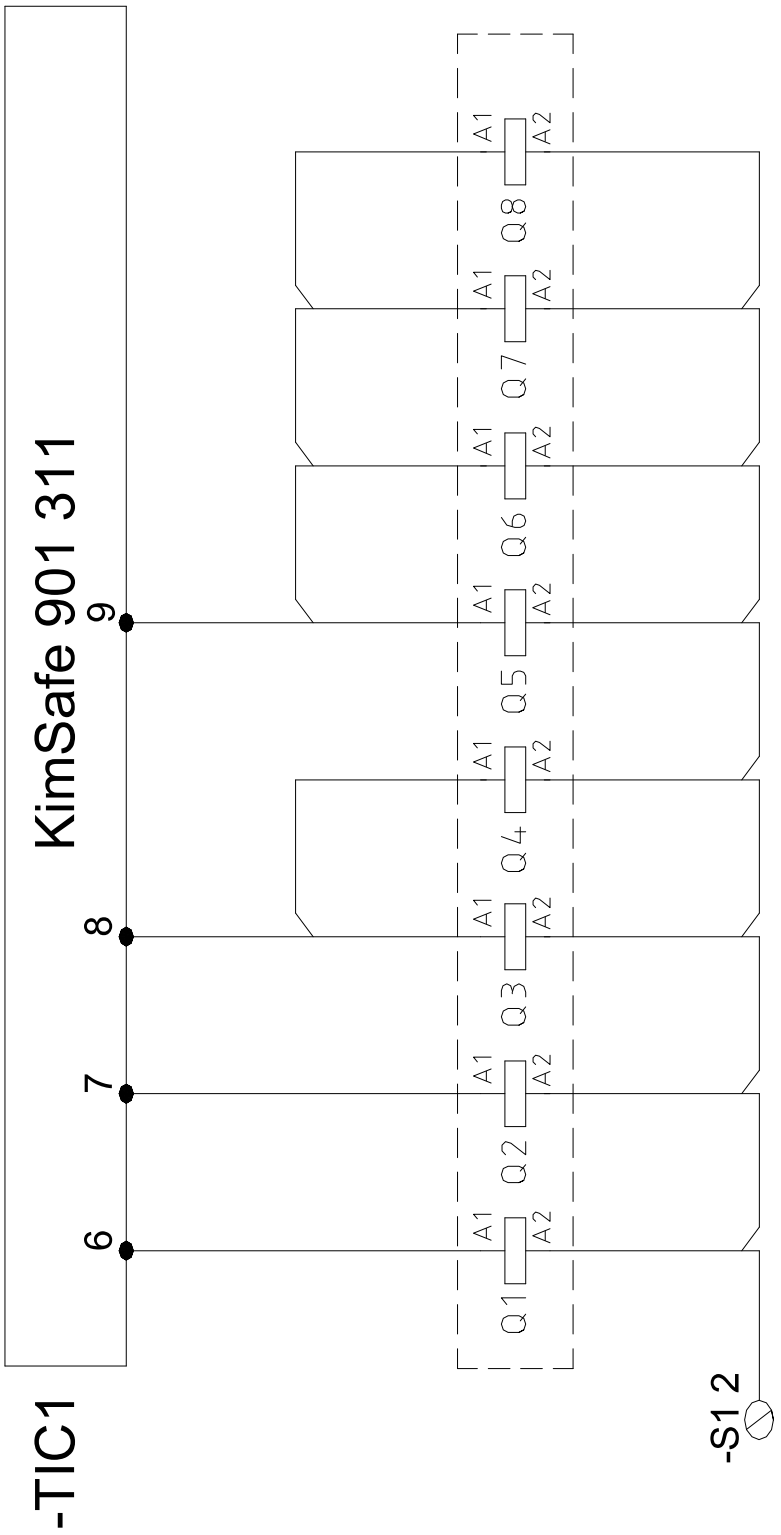
NOTE! TROUBLESHOOTING MUST ONLY BE EXECUTED BY QUALIFIED PERSONNEL

FAILURE	DISPLAY TEXT	POSSIBLE CAUSE OF TROUBLE	CONTROL /REPAIR
BOILER "dead"		Control voltage missing	Boiler needs separate control voltage
		Fuse/s for control voltage broken	Check fuses and replace if required
NO POWER	Temp 30.0 (80)°C StepS 0 (0)	External start signal missing	Check external signal. (See terminal 1& 2 on –X1)
	Temp 30.0 (80)°C StepE 0 (0)	External signal for power control missing	Check external signal
	TempE 20.0 (20)°C Power 0kW	External signal for temperature control missing	Check external signal
	Temp 0.0 (80)°C Error Temp	Defect temp.sensor	Change temp.sensor and Replace if required
BOILER STOPS AT STEP 3 (Alarm diode is flashing)	Temp 30.0 (80)°C Alarm Power	Connecting box mounted on left side without moving transformer	Transformer must be mounted on same side as connecting box
	Temp 30.0 (80)°C Alarm Power	Safety temp.limiter has tripped	Reset safety temp.limiter (STB) on front panel
	Temp 30.0 (80)°C Alarm Power	Main switch off or broken fuses	Check switch board/fuses Replace if required
LITTLE HEAT FROM BOILER	Temp 50.0 (80)°C Step 4 (4)	Maximum power limited from outside	Check external signals from a central monitoring system
	TempU 30.0 (30)°C Power 0kW	Check if boiler is limited from outdoor compensator	Check curves for outdoor compensation
		Defect heating elements, fuses, contactors	Check heating elements, fuses, contactors and replace if required
STB, safety temp.limiter released (Display shows "Alarm Power")	Temp 30.0 (80)°C Alarm Power	circulation in boiler	Check pump/valves
		Burned contactor	Check contactors and replace if required
LEAKAGE		Loose screws for heating element	Tighten screws
		Gasket for heating element	Replace if required
		Defect heating element	Replace if required

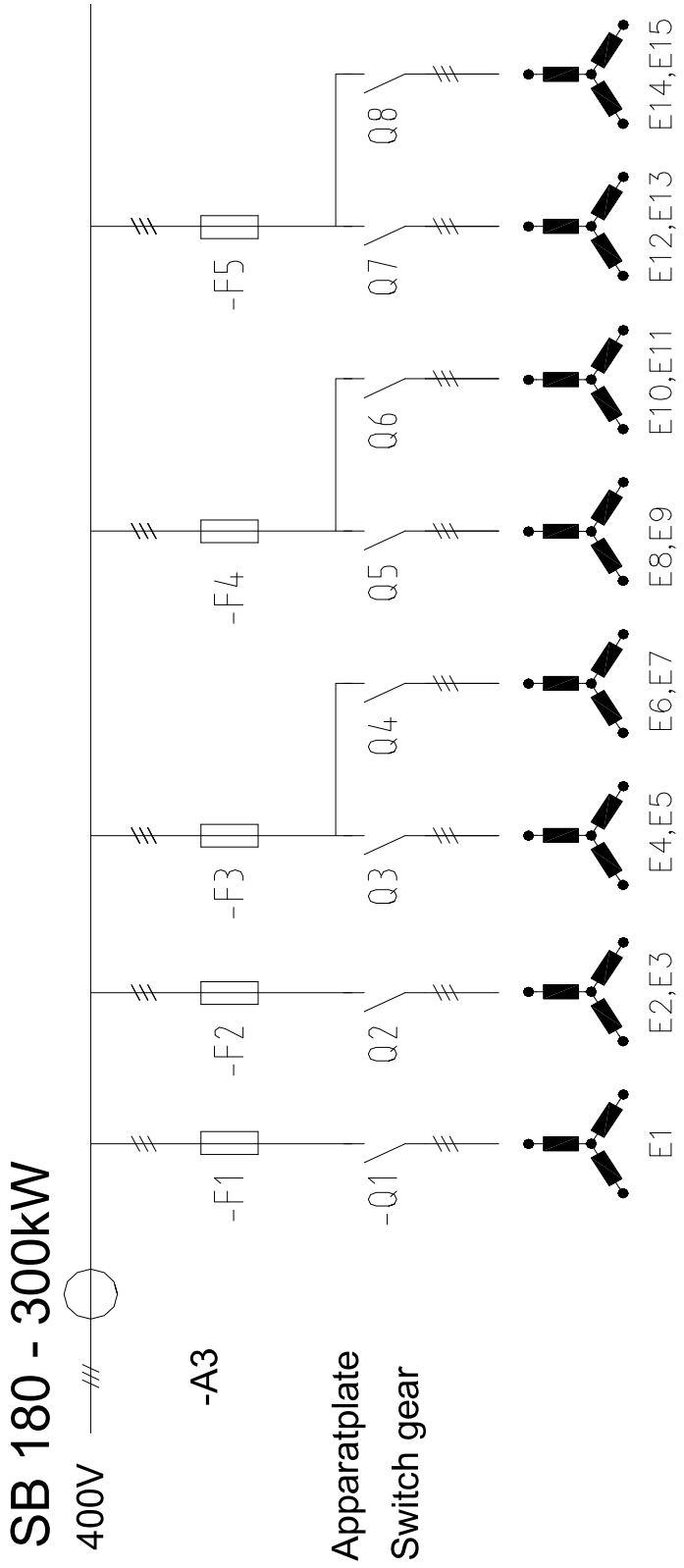
Circuit diagram SB 180-300 kW/400 V



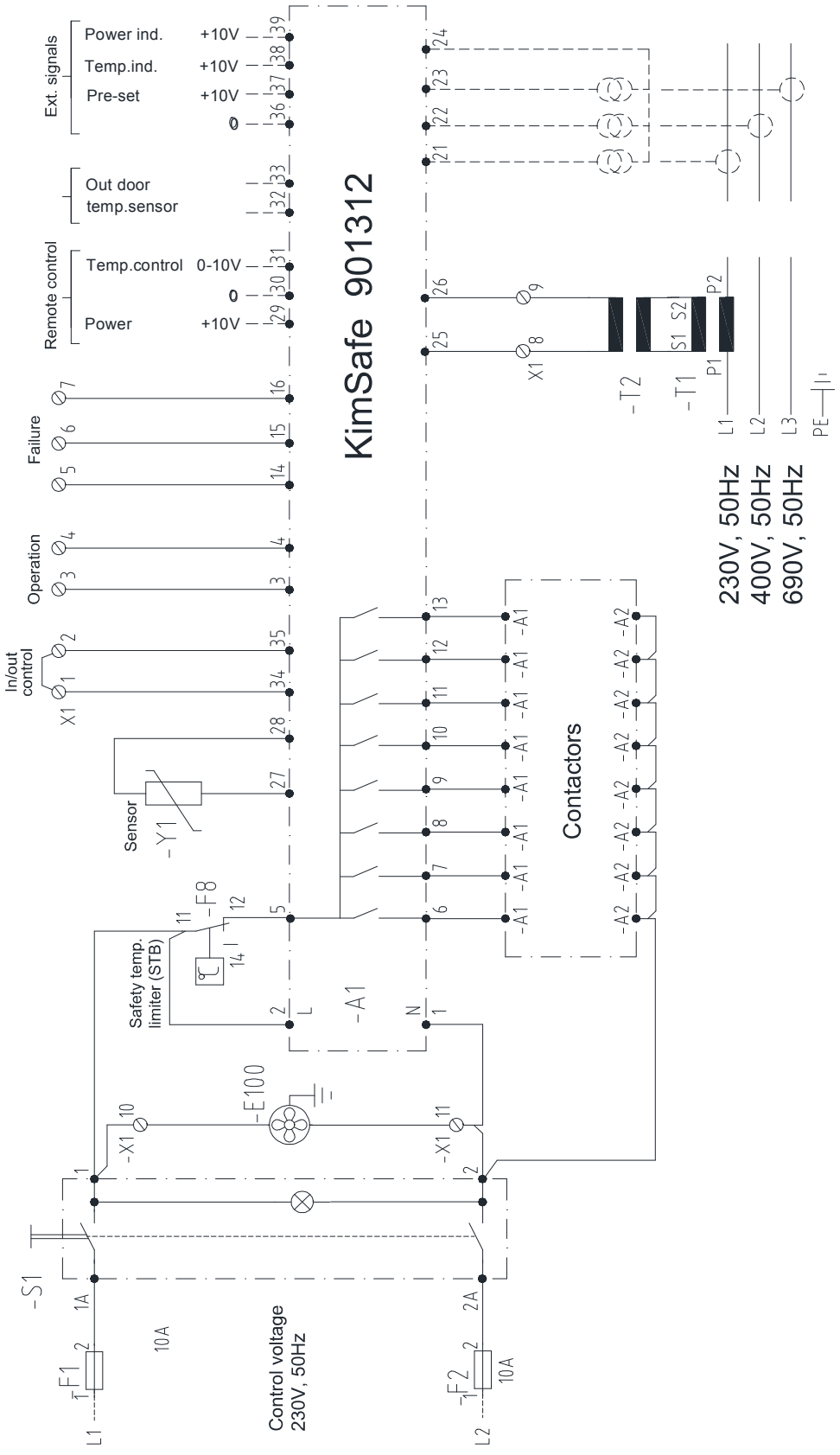
Circuit diagram contactors SB 180 -300 kW/400 V



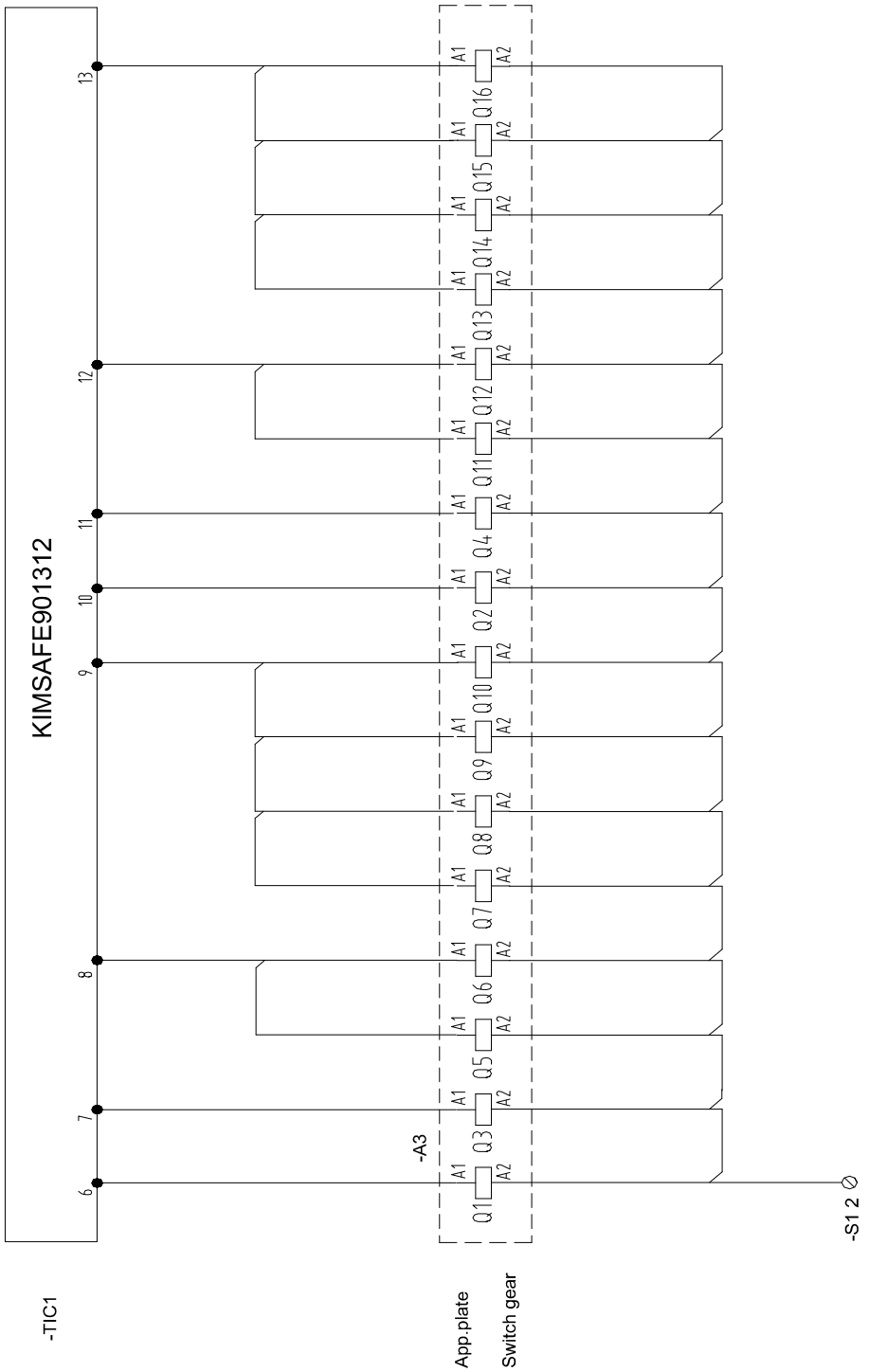
Power circuit SB 180 – 300 kW/400 V



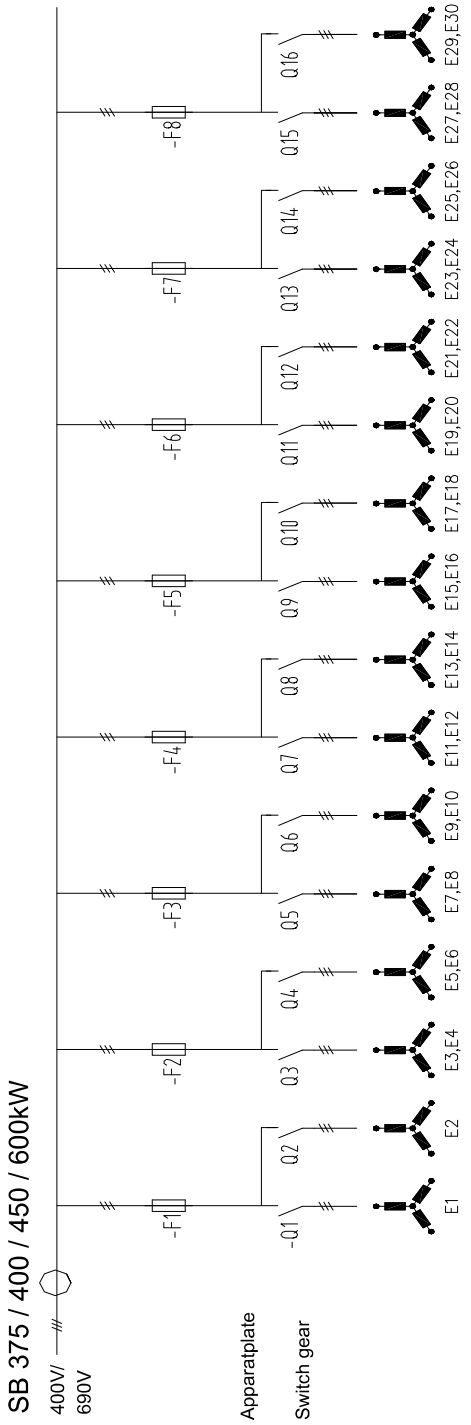
Circuit diagram SB 375 – 600 kW/400 V



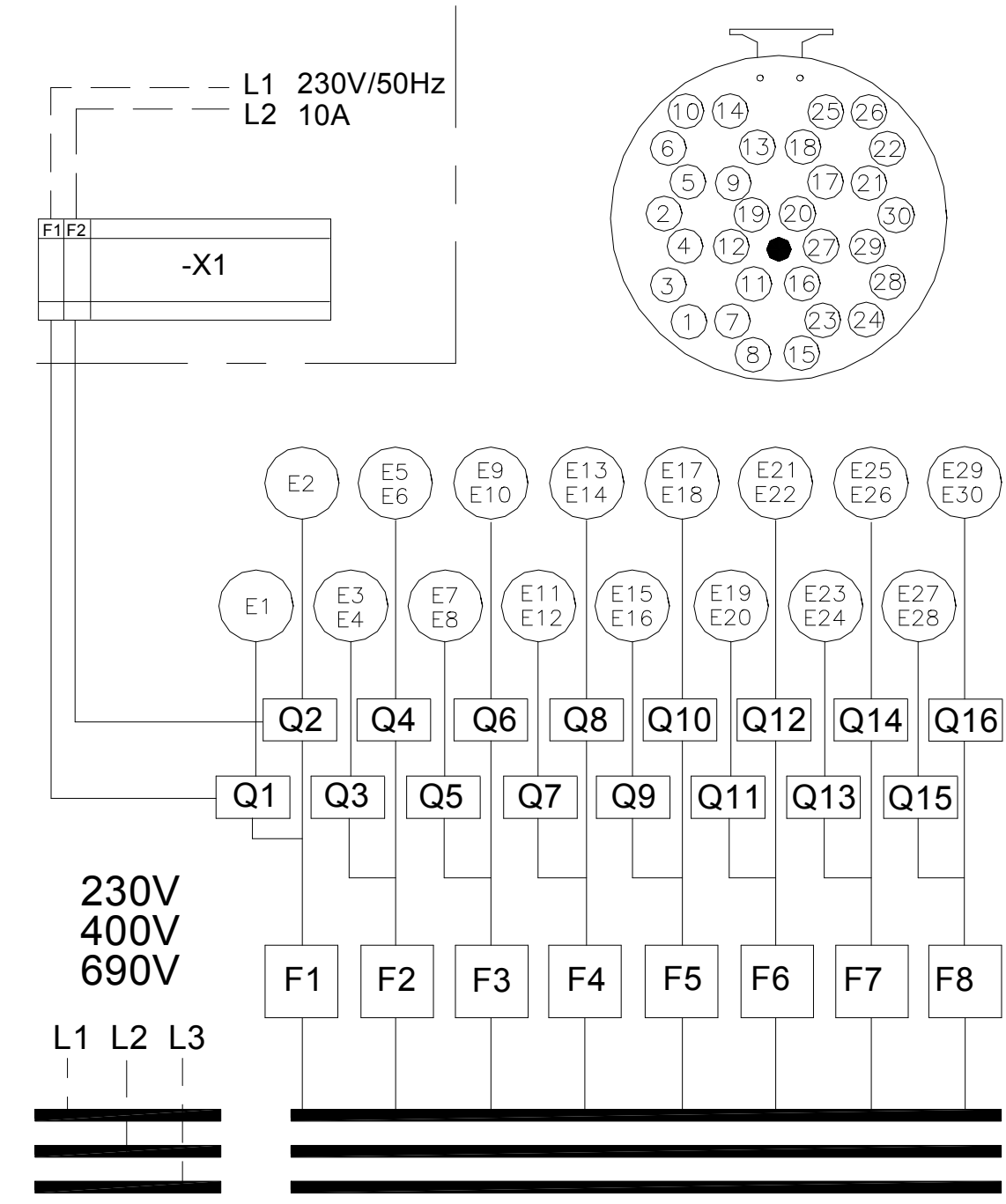
Circuit diagram contactors SB 375 – 600 kW/400 V



Power circuit SB 375 – 600 kW/400 V

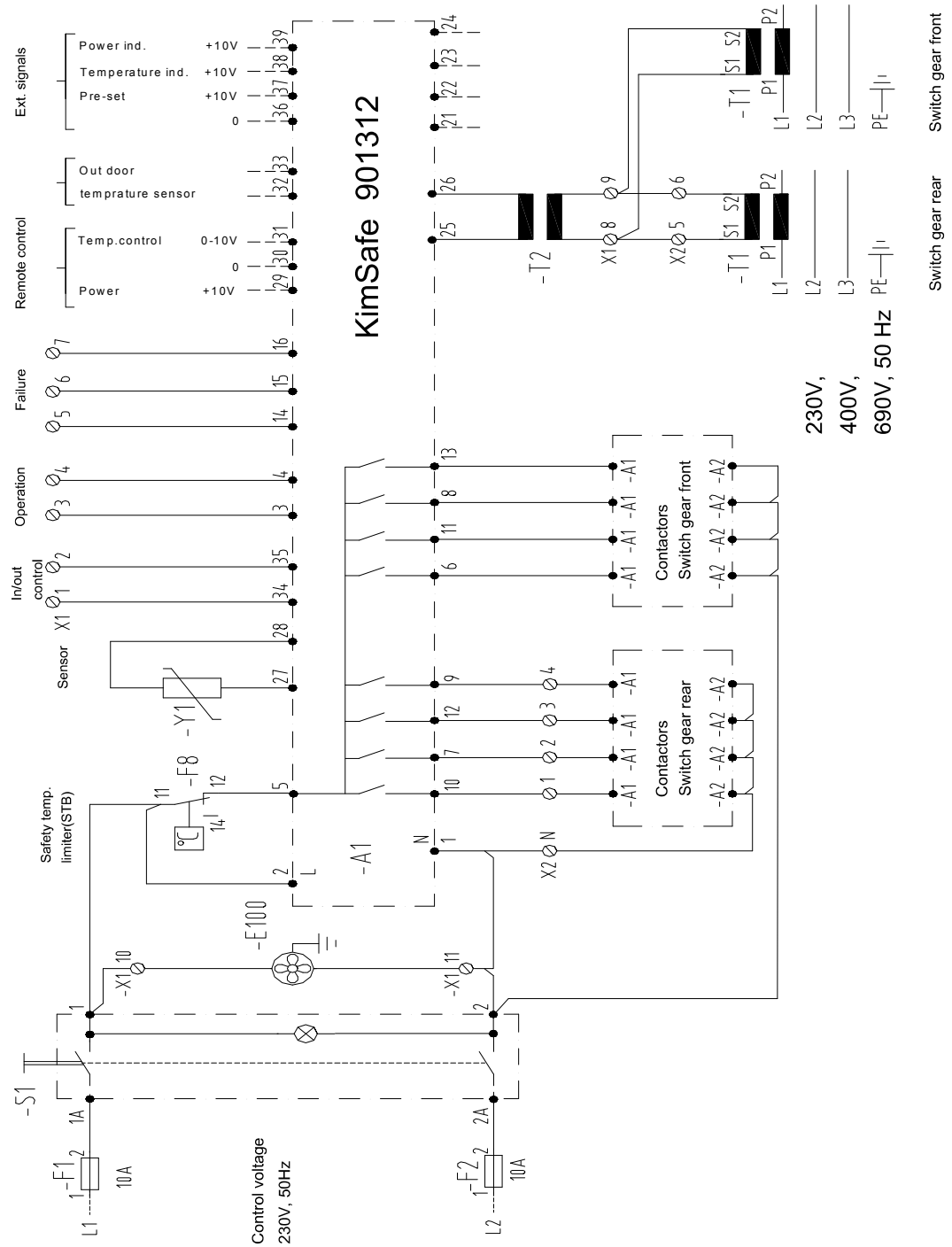


Power groups SB 375 – 600 kW/400 V

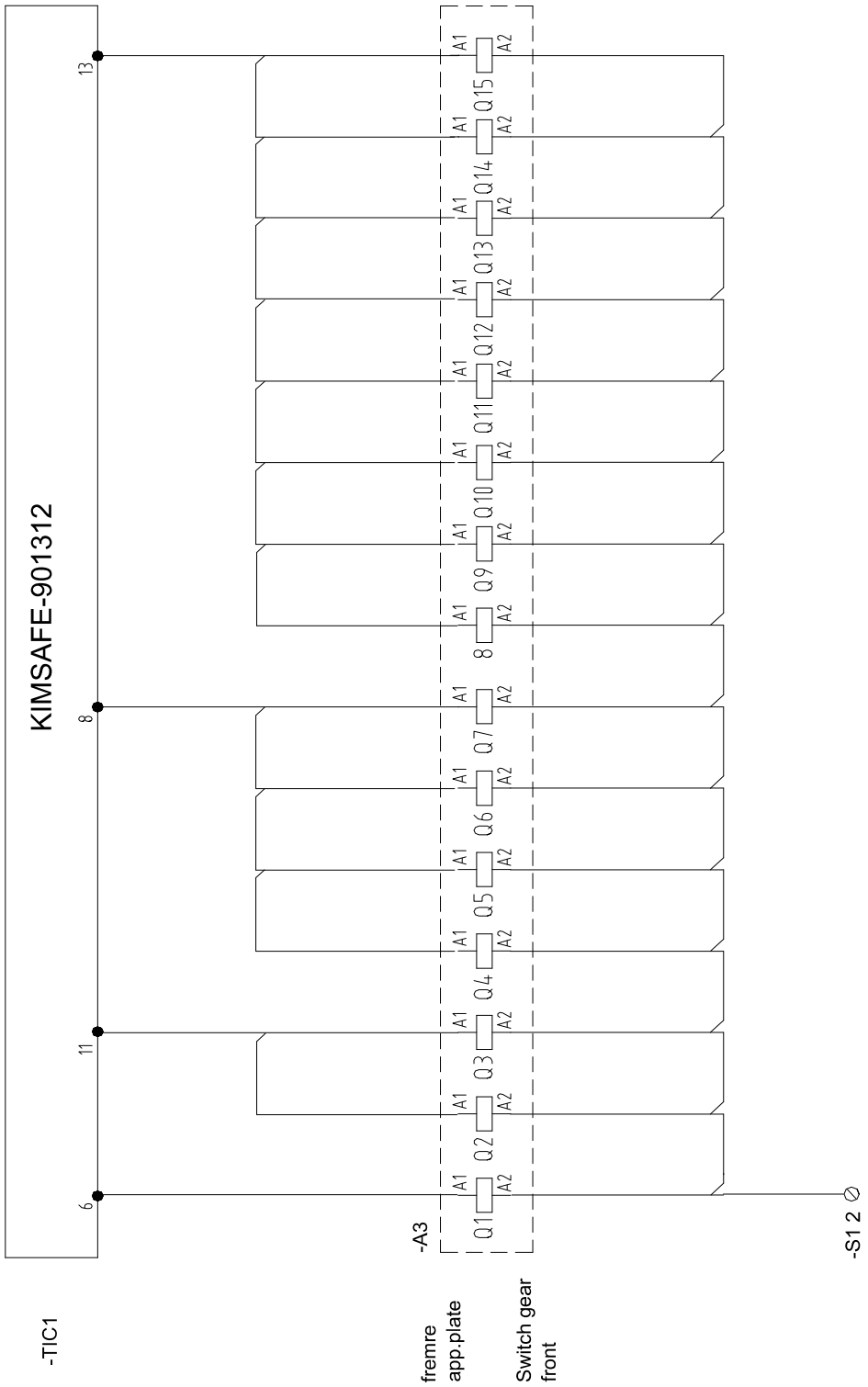


Connecting box Switch gear

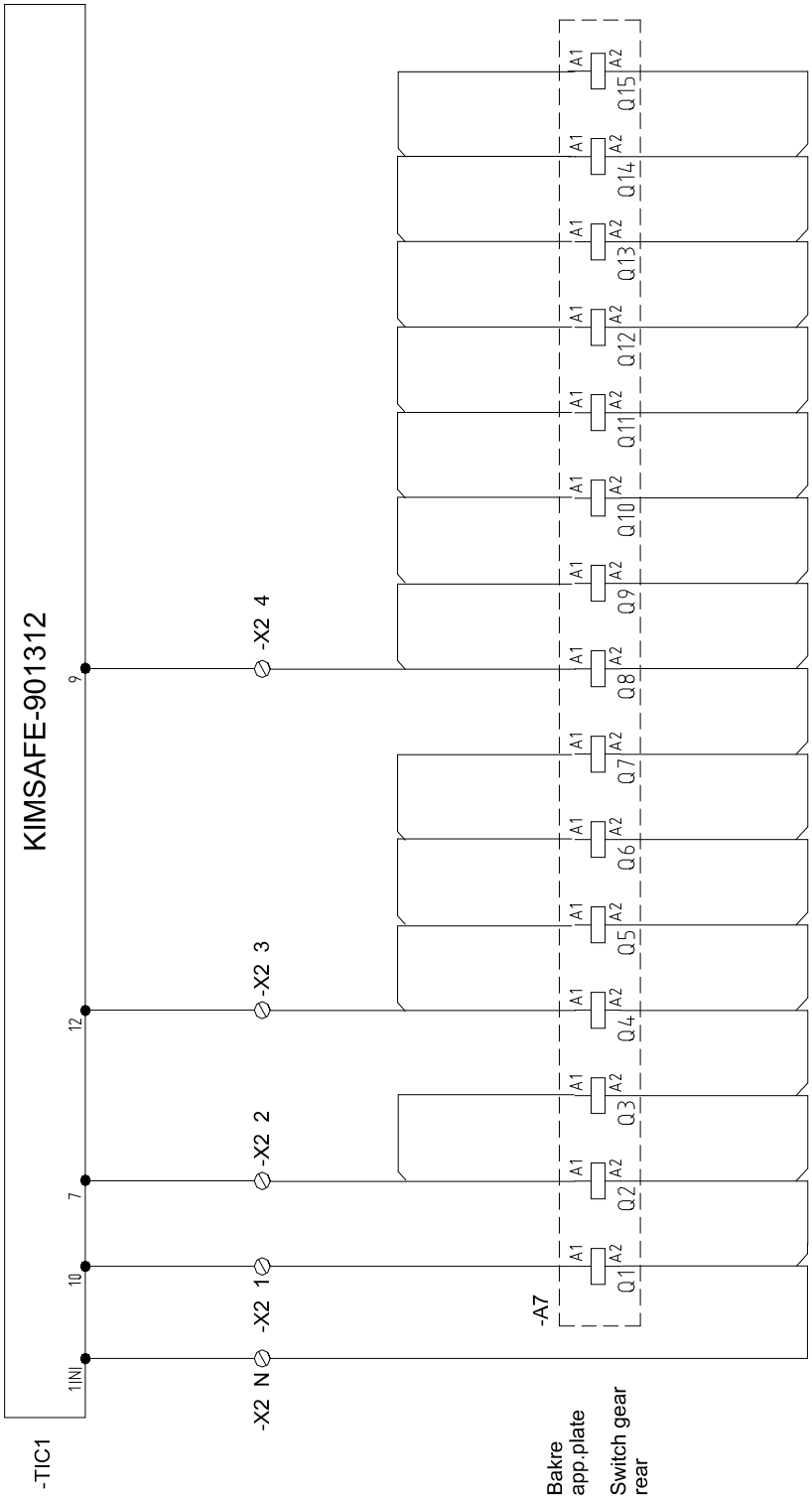
Circuit diagram SB 750 – 1200 kW/400 V



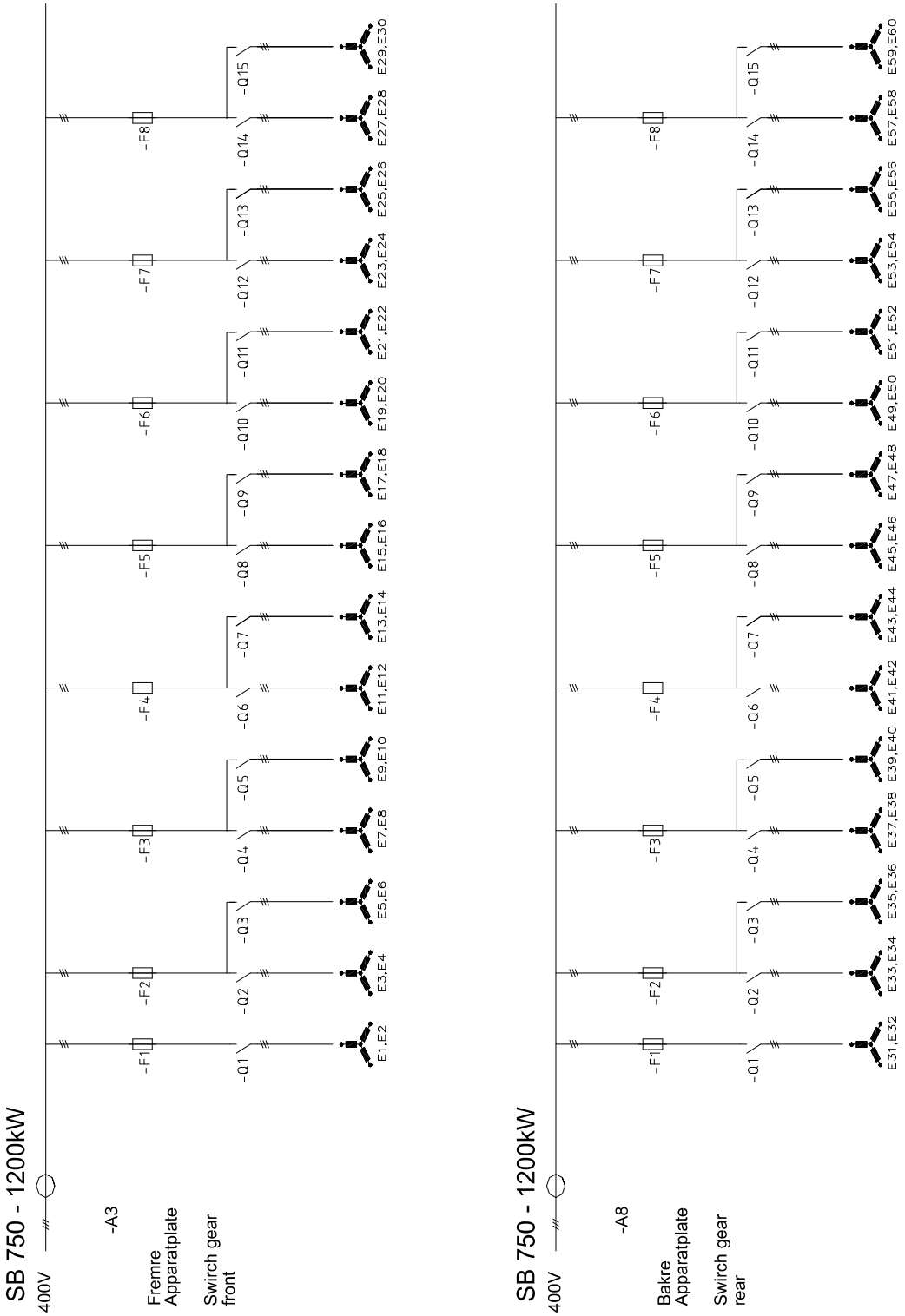
Circuit diagram contactors front, SB 750 – 1200 kW/400 V



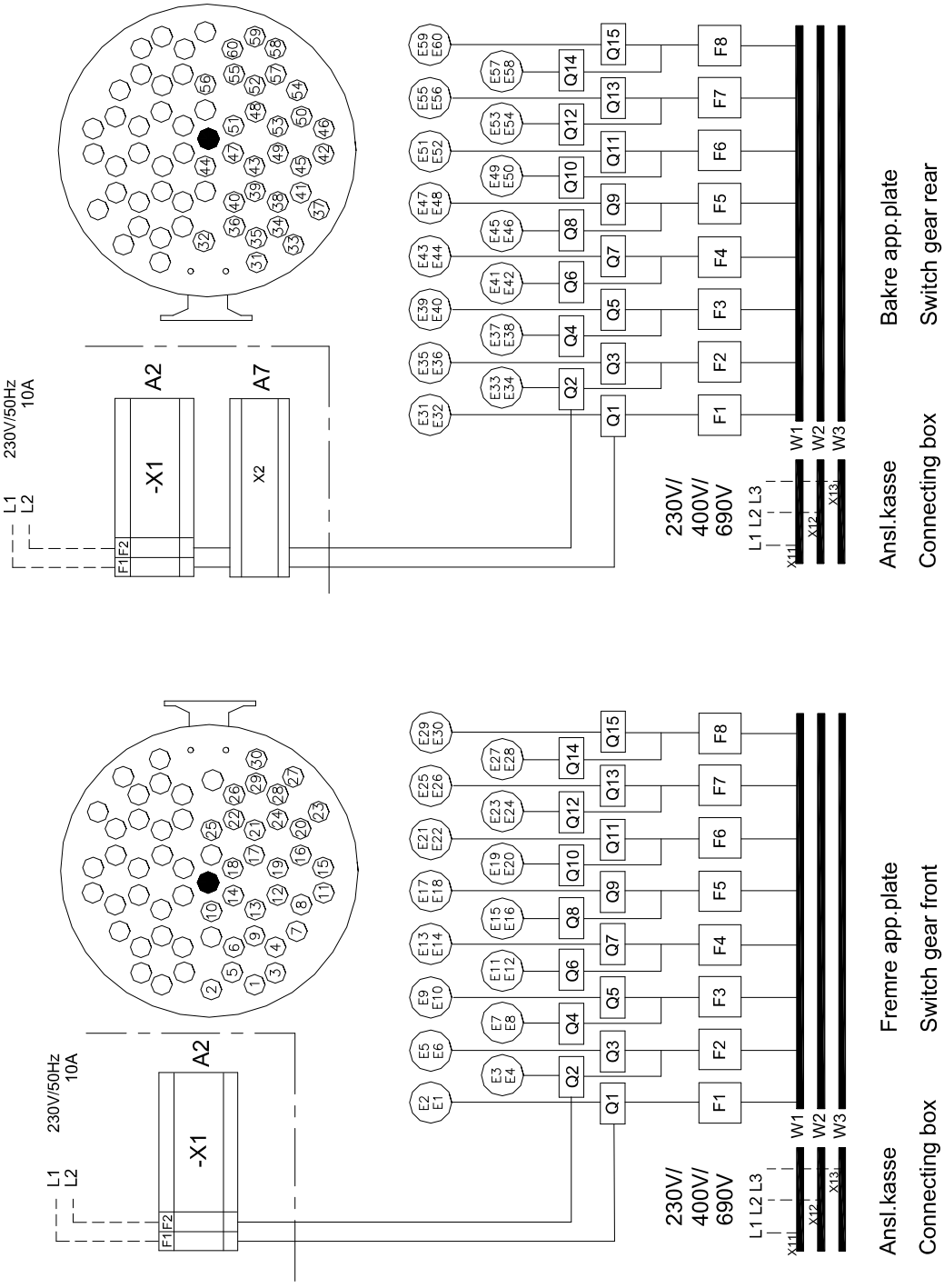
Circuit diagram contactors rear side, SB 750 – 1200 kW/400 V



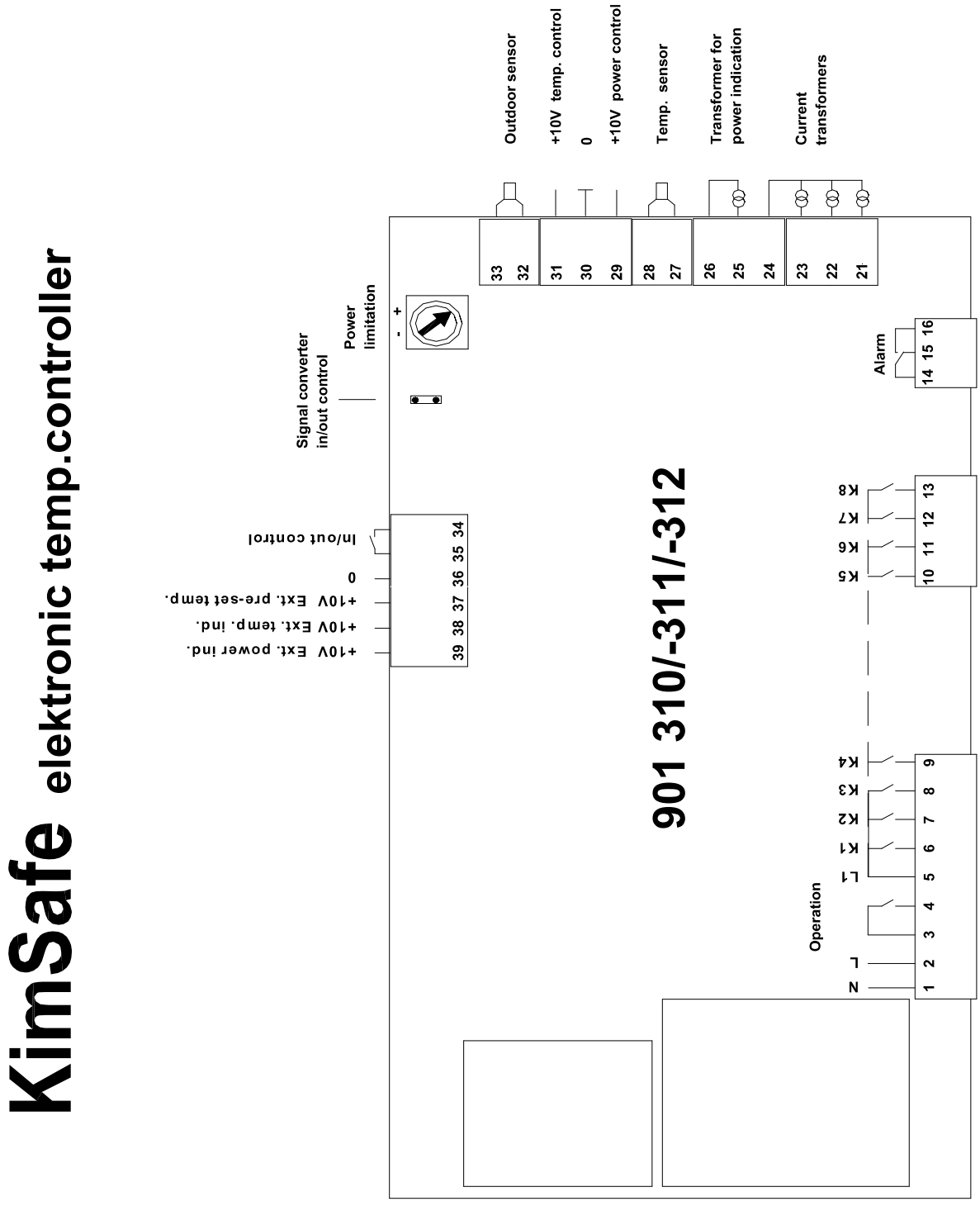
Power circuit SB 750 – 1200 kW/400 V



Power groups SB 750 – 1200 kW/400 V



Temp. controller, terminals



Spare parts for SB-boilers 400 V

		Number												
Item	**Article no.**	**180 kW**	**200 kW**	**225 kW**	**250 kW**	**300 kW**	**375 kW**	**400 kW**	**450 kW**	**600 kW**	**750 kW**	**900 kW**	**1000 kW**	**1200 kW**
Heating element 10 kW	6672 0242-A						15	10			30			
Heating element 12 kW	6613 0001-G	15	8											
Heating element 15 kW	6672 0242-D		7	15	10		15	20	30		30	60	40	
Heating element 20 kW	6672 0242-G				5	15				30			20	60
Gasket	2152 0022-4	15	15	15	15	15	30	30	30	30	60	60	60	60
Isolating brick	6672 0260-AL	15	15	15	15	15	30	30	30	30	60	60	60	60
Temp.controller 15-steps	901 311	1	1	1	1	1								
Temp.controller 30-steps	901 312						1	1	1	1	1	1	1	1
Sensor for temp.controller	200 232	1	1	1	1	1	1	1	1	1	1	1	1	1
Transformer	200 018	1	1	1	1	1	1	1	1	1	1	1	1	1
On-/Off-switch	6672 0235-3	1	1	1	1	1	1	1	1	1	1	1	1	1
Safety temp. limiter	6672 0235-1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fan	6480 0001-1						1	1	1	1	1	1	1	1
Contactor AF26	41 175 48	2	1	1	1	1	2		2					
Contactor AF30	41 175 56		1	1	1						1 + 1			
Contactor AF38	41 175 64													
Contactor AF40	41 175 75	6	6	6	6		14		14	2	14 + 14	15 + 15		
Contactor AF52	41 175 80					7				14			15 + 15	15 + 15
Contactor AF65	41 175 86													
Contactor AF80	41 175 92													
Contactor A95	41 149 36													
Contactor A110	41 150 26													
Fuse 10 A	6672 0235-27	2	2	2	2	2	2	2	2	2	2	2	2	2
Fuse 20 A	16 192 25													
Fuse 25 A	16 192 26	3	3	3										
Fuse 35 A	16 192 27					3								
Fuse 50 A	16 192 28	3	3	3			3		3		3 + 3	3 + 3	3 + 3	
Fuse 63 A	16 192 29					3								
Fuse 80 A	16 192 30	9					21			3	21 + 21			3 + 3
Fuse 100 A	16 192 31		9	9					21			21 + 21	6 + 6	
Fuse 125 A	16 192 32					9				21			15 + 15	21 + 21
Fuse 160 A	16 192 47													
Fuse holder 3-phase	6672 0251-6	5	5	5	5	5	8	8	8	8	8 + 8	8 + 8	8 + 8	8 + 8
Bushing 240 mm²		4	4	4	4	4	4	4	4	4	4 + 4	4 + 4	4 + 4	4 + 4
Connecting clamp	6672 0251-6	9	9	9	9	9	12	12	12	12	12 + 12	12 + 12	12 + 12	12 + 12
Earth clamp	6672 0251-9	5	5	5	5	5	5	5	5	5	5 + 5	5 + 5	5 + 5	5 + 5

Notes