

# SERVICE MANUAL

01

EKCO.L1 z  
EKCO.L1N z  
EKCO.L1 p  
EKCO.L1N p

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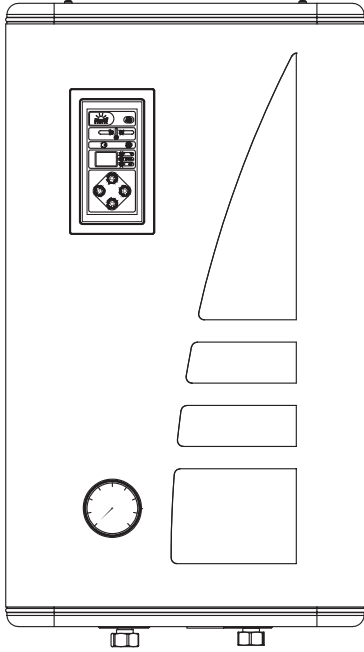
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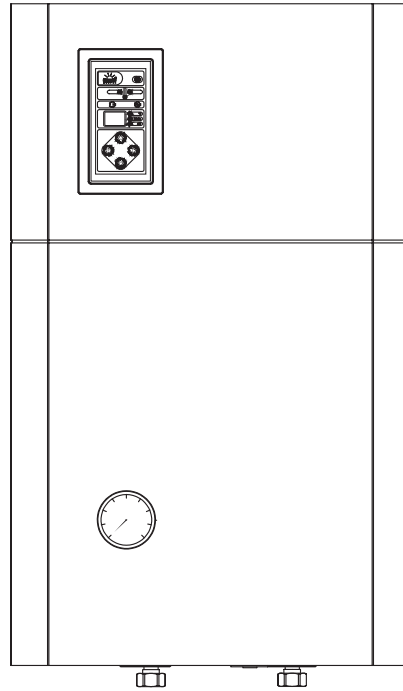
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# 1. Front view

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Pic.1a EKCO.L1 z, EKCO.L1 p



Pic.1b EKCO.L1N z, EKCO.L1N p

## 2. Front panel handling

### PSK.P4 front panel service mode configuration.

To set the service modes turn off the boiler by pressing and holding the power  button. Then press and hold the right arrow button and simultaneously press the power button. Use the upper and lower arrow buttons to change the parameter value or mode. Use the right arrow button to move to the next parameter.

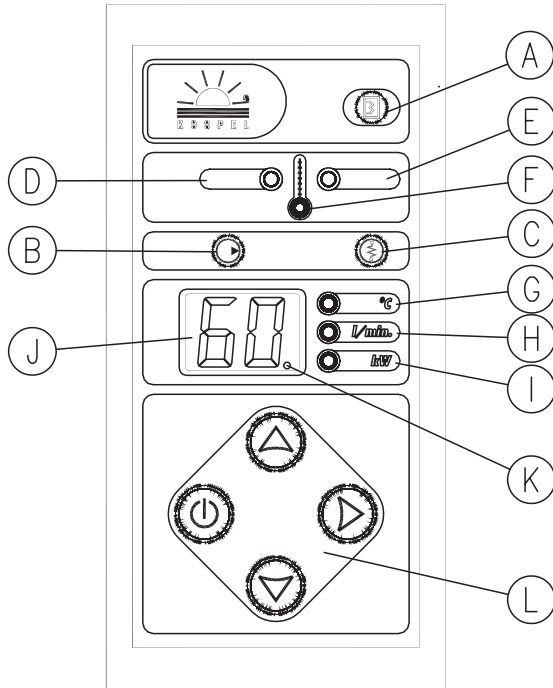
Parameter	Display	Description
Circulating pump mode	PA	Automatic mode
	Pr	Continuous working mode
Power board	G1 ÷ G6	Number of supplying heating elements
Temperature ranges	Po	Floor heating type 30-60°C (with no possibility to heat the DHWT)
	no	Standard type 40-85°C
Three phase mains supply symmetry	3F	No symmetry detection
	3F.	Symmetry detection is active. The K indicator is ON. The boiler stops heating the system if phase is missing
Cascade mode	r0	Separate standard mode
	r1	Cascade working mode
Boiler identification number	A1 ÷ A8	Set the A number exclusively to identify each boiler. Position A1 boiler no 1 ... A8 boiler no 8
DHWT loading temperature value	0	Heating of the DHWT is blocked. The DHWT indicator is off.
	50 ÷ 85	DHWT temperature range. The DHWT indicator is on.
Power of the heating box	1 - 36, indicator 'kW' lits	Set the proper number according to the power of the heating box and the number of active heating elements

All the settings are stored automatically. After settings are changed turn off device by pressing and holding the power button for 3 sec. Then turn the boiler on again. The boiler will work with the new settings.

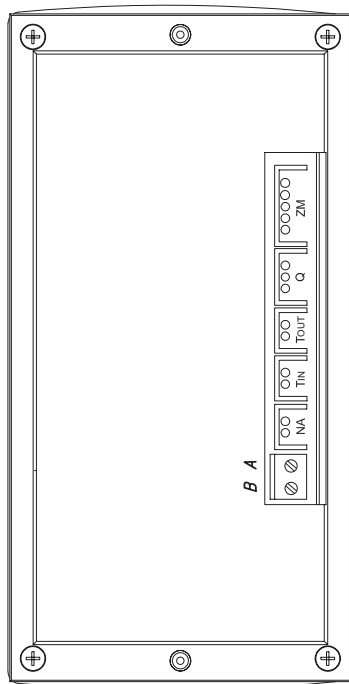
### Failure modes of PSK.P4 front panel.

Simultaneous blinking of all indicators means that one (or both) temperature sensors failed or are disconnected. By using the right arrow the one could review the return or flow temperature. If the main indicator shows E replace the adequate temperature sensor. In case of return temperature sensor failure the boiler will run in the failure mode and the heating temperature will be computed by using difference between main temperature settings and the supply temperature. Detection of the supply temperature sensor failure blocks the heating of the boiler.

Pic.2 Front panel PSK.P4



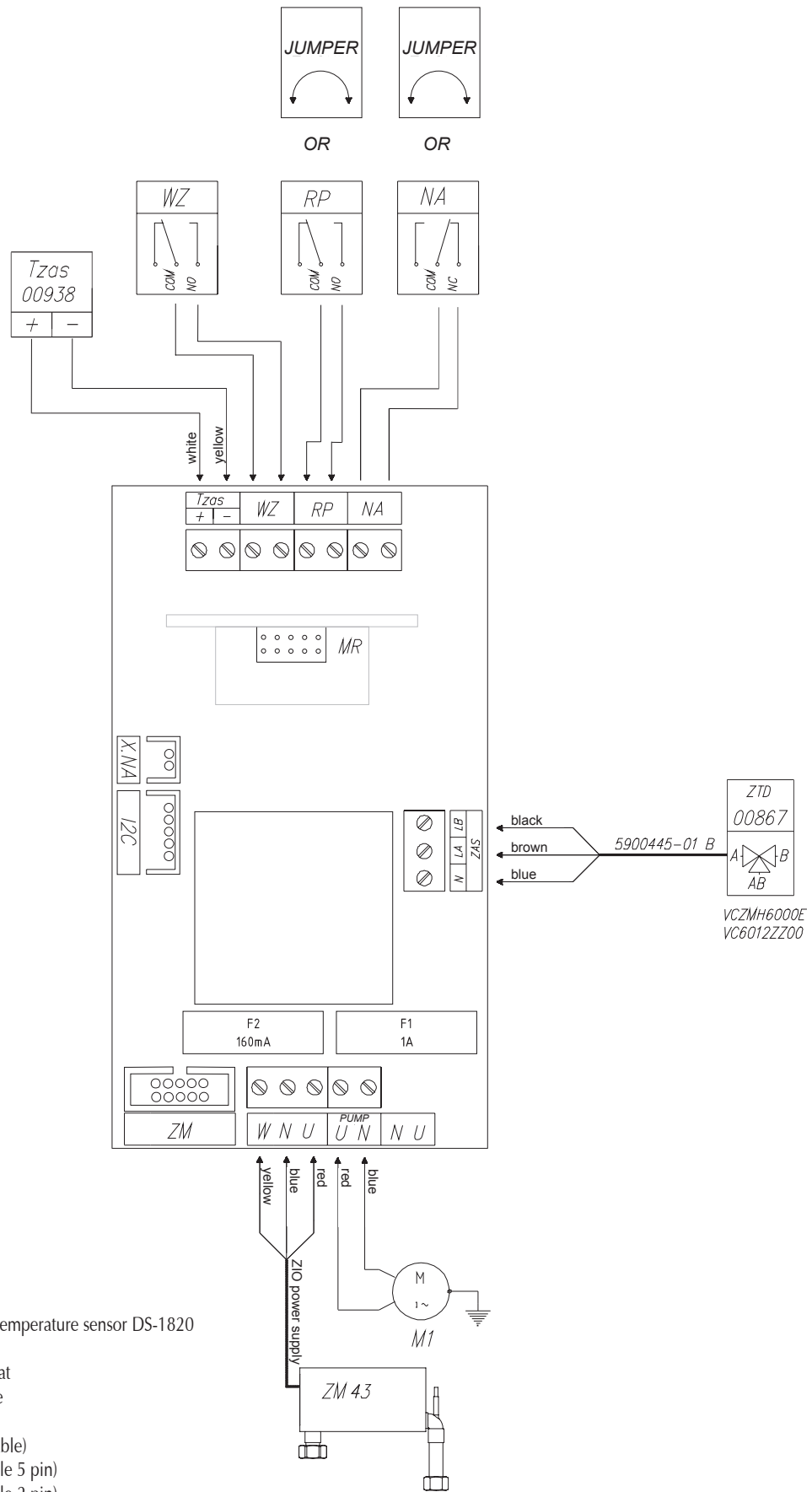
- A - heat exchanger indicator
- B - pump and flow indicator
- C - heating on and room thermostat indicator
- D - inlet temperature indicator
- E - outlet temperature indicator
- F - medium temperature setting indicator
- G, H, I - measurement value indicators
- J - LCD display
- K - temperature of water in the heat exchanger indicator symmetry error indication
- L - switches



- NA - superior device
- Tin - return temperature sensor socket
- Tout - supply temperature sensor socket
- Q - flow sensor socket
- ZM - I<sup>2</sup>C power module socket

### 3. ZIO-21 board

Pic.3 ZIO-21 board



- Tzas - DHWT water electronic temperature sensor DS-1820
- WZ - DHWT thermostat
- RP - jumper or room thermostat
- NA - jumper or superior device
- ZAS - three way valve
- ZM - power module (ribbon cable)
- I2C - PSK.P4 cable (ribbon cable 5 pin)
- X.NA - PSK.P4 cable (ribbon cable 2 pin)
- MR - radio controlled room thermostat receiver
- F1 - 1 A fuse (pump protection)
- F2 - 160 mA fuse or polymer fuse (ZIO protection)

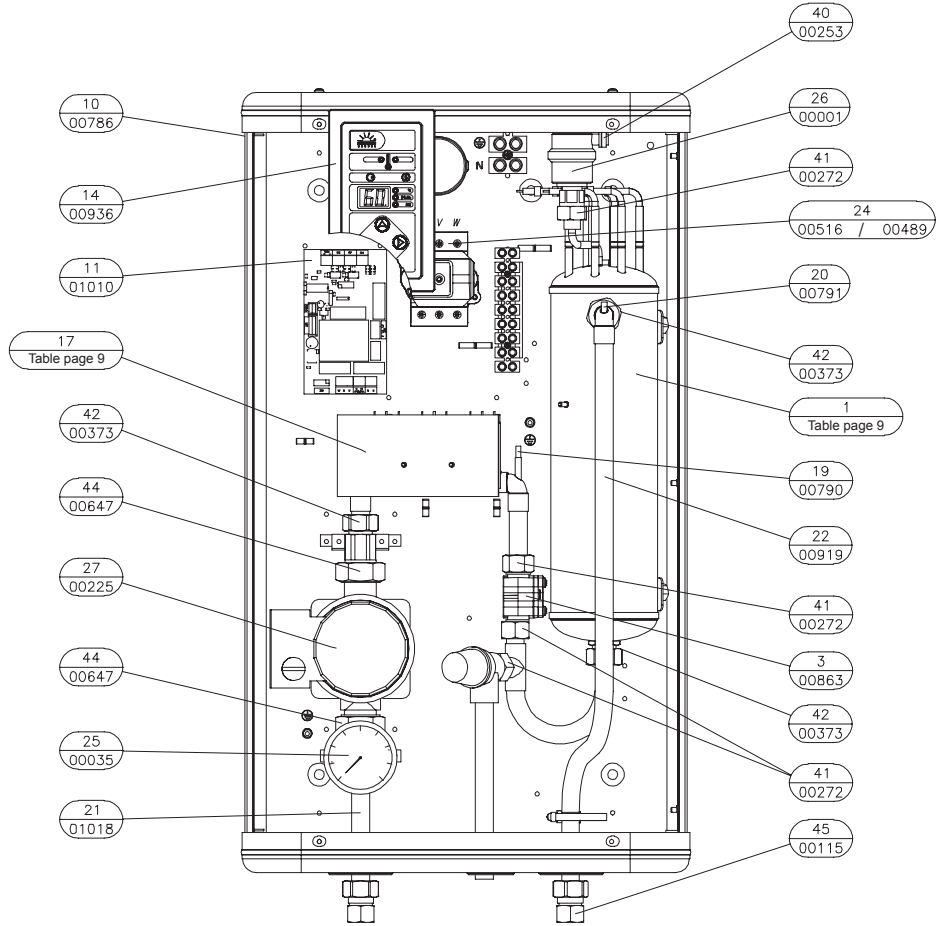
## 4. Failures

Table EKCO.L1 (PSK.P4)

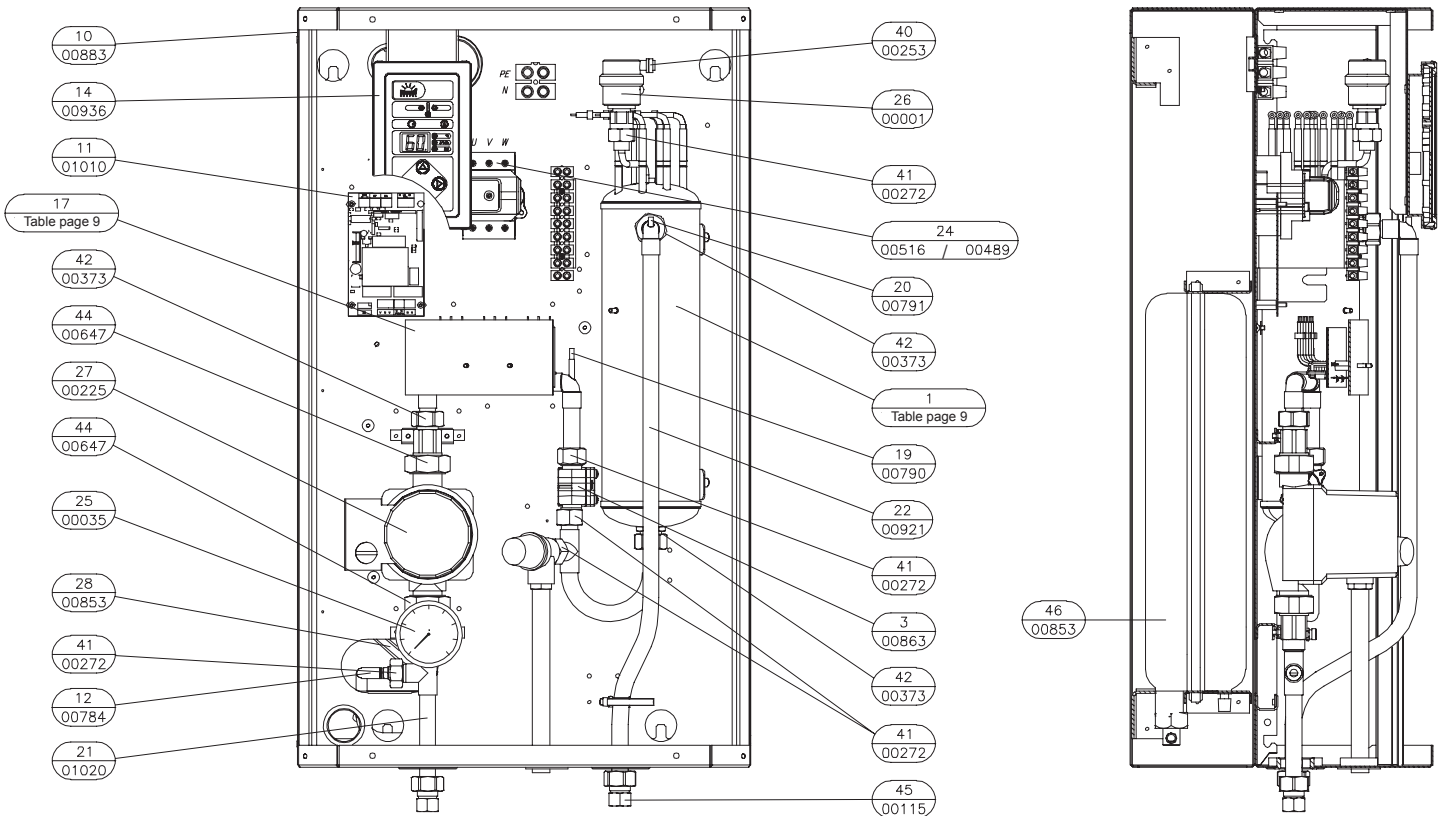
Symptoms	Reason	Operation
Front panel indicators are off.	Power supply failure.	Check the mains and the main fuses.
		Check the WT-3 temperature cut-off.
		Check the F2 fuse on ZIO-21 board.
		Replace the control panel.
K indicator is blinking.	Asymetric mains supply (only three phase boilers).	Check mains and the main fuses.
		Check the WT-3 temperature cut out.
	No transmission to ZIO board	Check the connection between power module and the ZIO 21 board.
		Replace power board.
B indicator is blinking.	The flow value is „0” or is too low. (below value of 5 l/min) Heating is blocked.	Check the F1 pump fuse on ZIO21 board.
		Air lock in the heating system, solve the problem.
		Deaerate the pump and the heating system.
	Circulating pump is blocked.	Circulating pump is blocked. Make a manual pump run. Use the screw to rotate the rotor.
Flow sensor failure.	Replace pump.	
Room thermostat heating start heating and the C indicator on the control panel is not off.	The room thermostat wiring connection failure.	Check the room thermostat wiring connection.
	Room thermostat failure.	Replace room thermostat.
	ZIO 21 failure.	Replace ZIO 21 board.
The supply temperature is too low.	The heating box failure.	Change the heating box.
The A indicator is on The boiler is heating only central heating	The three-way valve failure	Check the servo. Replace the servo of valve
	ZIO 21 failure	Replace ZIO 21 board
	Mains problem	Check the F1 fuse. Check the mains.
DHW temperature is too low. The boiler is heating only the heating system. The A indicator is off	The DHWT thermostat or DHWT electronic Sensor (DS 1820) failure	Replace DHWT thermostat or electronic sensor (DS 1820)
	ZIO 21 failure	Replace ZIO 21 board
	Too low DHWT temperature settings	Set the higher temperature on the DHWT thermostat or rise the DHWT temperature on the control panel (for the electronic sensor DS 1820)
The supply temperature is too low	Heating box failure	Check or replace heating box.
The NA connector is opened by the superior device. The C indicator does not blink	RP connector opened	Check the room thermostat
	Control panel failure PSK.P4	Replace front panel
Control panel indicators are blinking or temperature indicator is blinking or the return or supply temperature indicator is showing 99°C.	Return or supply temperature sensor.	Use the right arrow to view the return inlet and flow outlet temperature. If the „E” symbol or 99 is displayed replace the required sensor. (Nominal resistance of the temperature sensor 10kΩ at 25°C).
	Control panel failure	Replace the front panel PSK.P4

# 5. Boiler construction

Pic.4a Boiler EKCO.L1 z, EKCO.L1 p



Pic.4b Boiler EKCO.L1N z, EKCO.L1N p



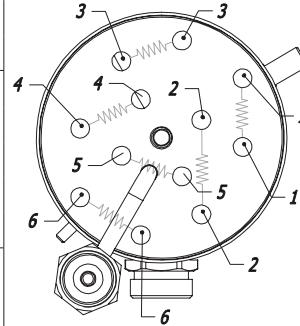


## 6. Heating box

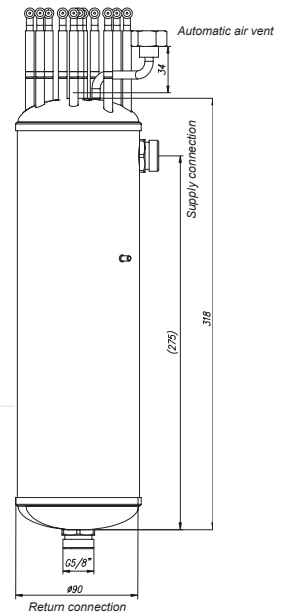
Boiler type	Service code	Heating box type	Amount of heating elements	$R_{el}$ Heating element resistance [Ω]	$I_f$ Heating supply current [A]	U heating element supply voltage [V]
EKCO.L1F-4	01022	ver.12	6	74,20 ÷ 82,00	2,80 ÷ 3,10	230V
EKCO.L1F-6	01024	ver.18	6	49,40 ÷ 54,70	4,20 ÷ 4,70	
EKCO.L1F-8	01026	ver.24	6	37,10 ÷ 41,00	5,60 ÷ 6,20	
EKCO.L1-4	01022	ver.12	6	74,20 ÷ 82,00	2,80 ÷ 3,10	
EKCO.L1-6	01024	ver.18	6	49,40 ÷ 54,70	4,20 ÷ 4,70	
EKCO.L1-8	01026	ver.24	6	37,10 ÷ 41,00	5,60 ÷ 6,20	
EKCO.L1-12	01022	ver.12	6	74,20 ÷ 82,00	4,80 ÷ 5,40	400V
EKCO.L1-15	01023	ver.15	6	59,30 ÷ 65,60	6,00 ÷ 6,80	
EKCO.L1-18	01024	ver.18	6	49,40 ÷ 54,70	7,30 ÷ 8,10	
EKCO.L1-21	01025	ver.21	6	42,40 ÷ 46,00	8,60 ÷ 9,50	
EKCO.L1-24	01026	ver.24	6	37,10 ÷ 41,00	9,70 ÷ 10,80	
EKCO.L1F-4	01027	ver.12	6	68,08 ÷ 75,24	2,90 ÷ 3,30	
EKCO.L1F-6	01029	ver.18	6	44,50 ÷ 49,18	4,40 ÷ 5,00	
EKCO.L1F-8	01031	ver.24	6	33,21 ÷ 36,71	5,90 ÷ 6,70	
EKCO.L1-4	01027	ver.12	6	68,08 ÷ 75,24	2,90 ÷ 3,30	
EKCO.L1-6	01029	ver.18	6	44,50 ÷ 49,18	4,40 ÷ 5,00	
EKCO.L1-8	01031	ver.24	6	33,21 ÷ 36,71	5,90 ÷ 6,70	
EKCO.L1-12	01027	ver.12	6	68,08 ÷ 75,24	5,00 ÷ 5,60	380V
EKCO.L1-15	01028	ver.15	6	54,46 ÷ 60,20	6,30 ÷ 7,00	
EKCO.L1-18	01029	ver.18	6	44,50 ÷ 49,18	7,70 ÷ 8,60	
EKCO.L1-21	01030	ver.21	6	37,95 ÷ 41,95	9,00 ÷ 10,10	
EKCO.L1-24	01031	ver.24	6	33,21 ÷ 36,71	10,30 ÷ 11,50	
EKCO.L1F-9	01032	ver.F9	6	35,80 ÷ 39,50	6,00 ÷ 6,80	
EKCO.L1F-12	01033	ver.F12	6	26,80 ÷ 29,60	8,10 ÷ 9,00	
EKCO.L1F-14.4	01034	ver.F14.4	6	22,40 ÷ 24,70	9,70 ÷ 10,80	

Pic.5 Heating box

Top view  
Heating elements layout

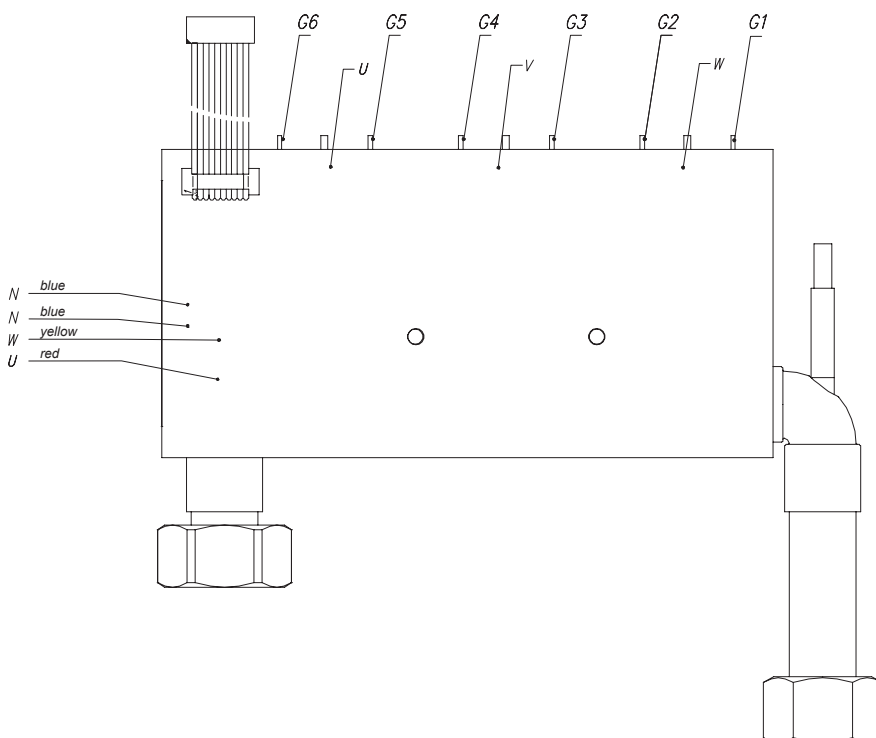


Side view



## 7. Power board

Pic.6 Power board

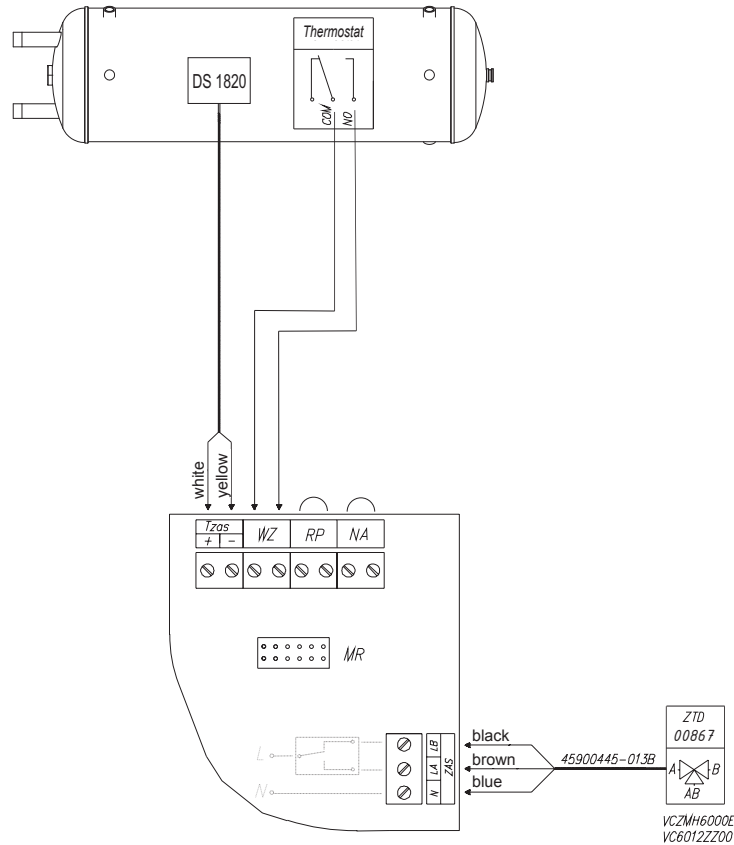


Boiler type	Service code
EKCO.L1F-4	01013
EKCO.L1F-6	
EKCO.L1F-8	
EKCO.L1F-9	01014
EKCO.L1F-12	
EKCO.L1F-14,4	
EKCO.L1-4	01012
EKCO.L1-6	
EKCO.L1-8	
EKCO.L1-12	01011
EKCO.L1-15	
EKCO.L1-18	
EKCO.L1-21	
EKCO.L1-24	

## 8. DHWT electric connection chart

The VCZMH600E is an example of the three-way valve for the DHWT and central heating systems separated. The valve should come together with the VC6012ZZ00 servo and the 45900445-013B wire. Switching of the valve requires 230V mains connection to be applied to brown or black wire. The blue wire should be connected to the mains neutral connector. By supplying voltage to the brown wire of the A/B the A way will be open. The voltage connector to black wire will open A/B to B way. The A/B, A and B indicates appropriate ends of the valve.

Pic.7 An example of three-way valve connection and DHWT temperature sensor or thermostat



Pic.7 An example of three-way valve and temperature sensor connections to ZIO 21 board.

If the A/B valve connector is connected to the boiler supply outlet then "A" will supply central heating system and the "B" DHWT system.

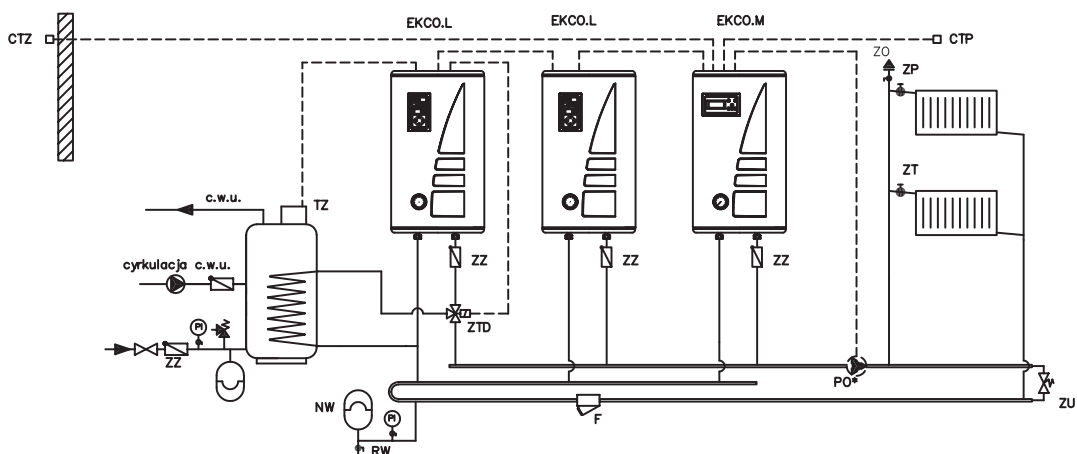
DS 1820 DHW temperature sensor should be to "Tzas" connector (white wire to "+" and yellow to "-"). If the DHW tank has the thermostat then connect it's wires to WZ connector (voltage free).

## 9. Cascade unit for a heating system with two or more heating boilers .

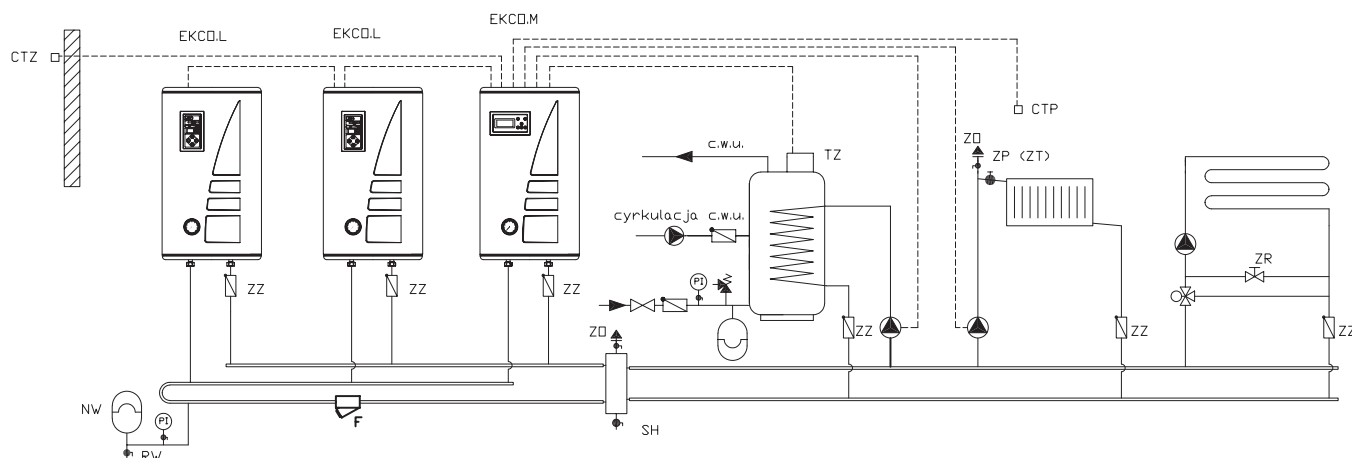
Cascade system enables possibility to increase maximum power output by parallel connection of several boilers. Cascade system uses the EKCO.M1 as master boiler and up to 8 Slim boilers as slaves. This system is controlled by one main control panel with the weather controlling system. All the Slim boiler settings are managed by the master boiler. The heating system temperature is calculated on the base of outside temperature. The operating power is calculated on the base of flow and return and supply temperatures.

Boilers should be connected according to Tichelmann schema. By using this schema the flow will be equal and power will be set to equal. Each of the supply connectors of the boiler should be equipped with the return valve to prevent back flow. On the return pipe mechanical filter with the magnetic cartridge should be installed. When the system heats more then one heating system with individual pump boilers should be separated by the hydraulic clutch.

Pictures below show some examples of cascade systems connections.



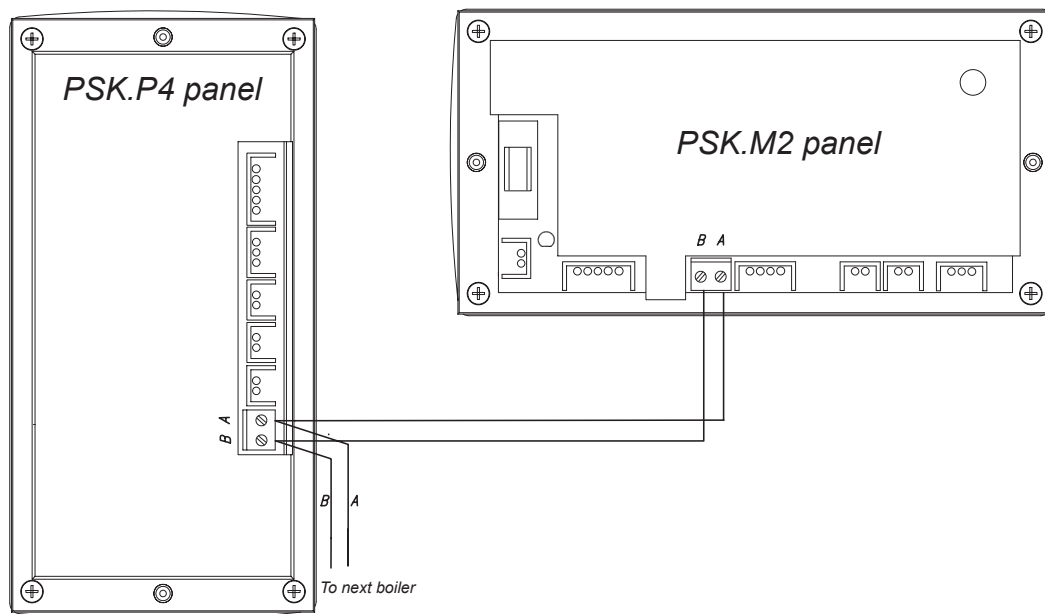
Pic. 8 Direct supply boilers heating system and the DHW tank. The wide heating system it may turn out that the internal pumps parameters are too low. In such conditions please install an external circulating pump PO\*. If the thermostat valves are installed on the radiators the bypass pipe system should included in the pipe system.



Pic. 9 Heating system with separated supply boilers equipped with the hydraulic clutch (SH). Each of the heating system is supplied with the pump (PO). The master boiler regulates the temperature in up to two heating systems. If more heating systems are supplied that are loaded with the equal or lower temperature system should be supplied with the independent temperature regulated systems.

CTP - room temperature sensor	ZP – by-pass valve
CTZ – outside temperature sensor	ZT – radiator valve with thermostatic head
TZ – DHW thermostat	ZZ – no-return valve
NW – expansion vessel	ZR – regulating valve
RW – expansion pipe	ZU – drain valve
PO – circulating pump	ZM – mixing valve
F – filter	ZTD – three-way valve
SH – hydraulic clutch	ZO – deaerate valve

Install all boilers and connect mains as pictured in manual. The slave boilers should be connected to the master by two wires connected to the control panel as in pic. 10. Use the twin wire LIYY 2x0.14. Use this wire to make a series of connections of A and B connectors in all boilers. Order or direction of connections is not important. Do not make the ring connections!



Pic.10 PSK.M2 (master) and PSK.P4 (slaves)

### Control panel settings

#### PSM.M2

Set the "Nr" to the definite number of boilers

#### PSK.P4

In service menu switch from "r0" to " r1 " and the position "A1" to the adequate identification number which will be simply recognised as unique. For every boiler an unique "A" number must be assigned.

### Cascade mode

#### PSM.M2

In the main menu the power output is shown as a sum of power outputs of all boilers.

On the page "Heating data" each of the boilers has its own parameters information. Master boiler has number 0. To switch the preview of other boilers press the upper or lower arrow. The additional information is the data transmission time. If the boiler will not answer in more then 255 seconds the "kocioł nie odpowiada" message will appear.

Switching off the master boiler will also switch off all the slave boilers

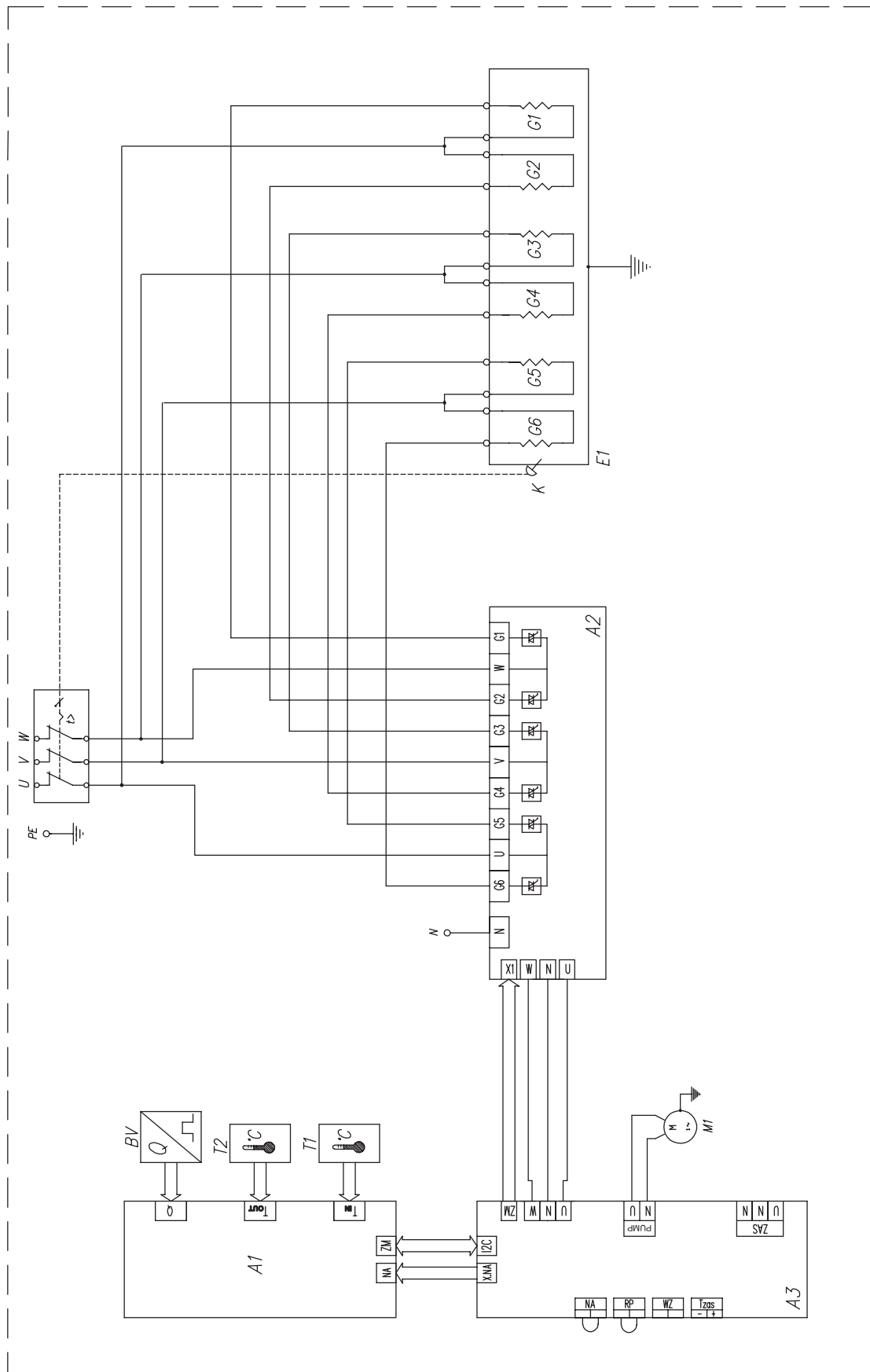
#### PSK.P4

The master control panel controls all the slave boilers panels therefore temperature settings cannot be changed individually on PSK.P4 panel. Each of the slave boilers can be switched off separately. If the PSK.P4 control panel has not confirmed transmission to PSK.M in more then 60 seconds all the indicators start to blink and heating of this particular boiler will be stopped.

If the master boiler sends an order to stop heating minus symbol will appear on display of adequate boiler.

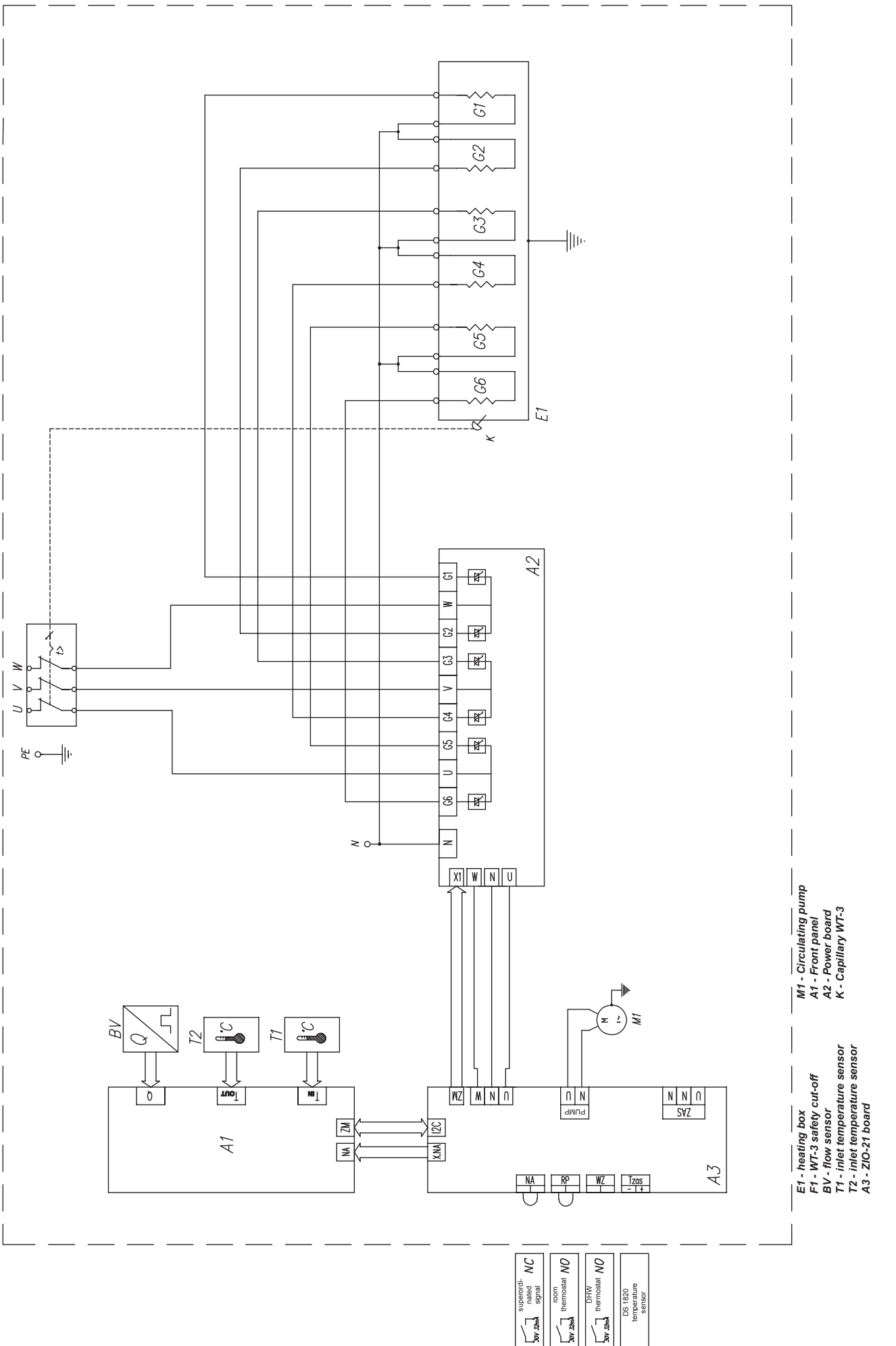
# 10. Wiring diagram

Pic.11 Ver. I EKCO.L1, EKCO.L1N 12kW, 15kW, 18kW, 21kW, 24kW.

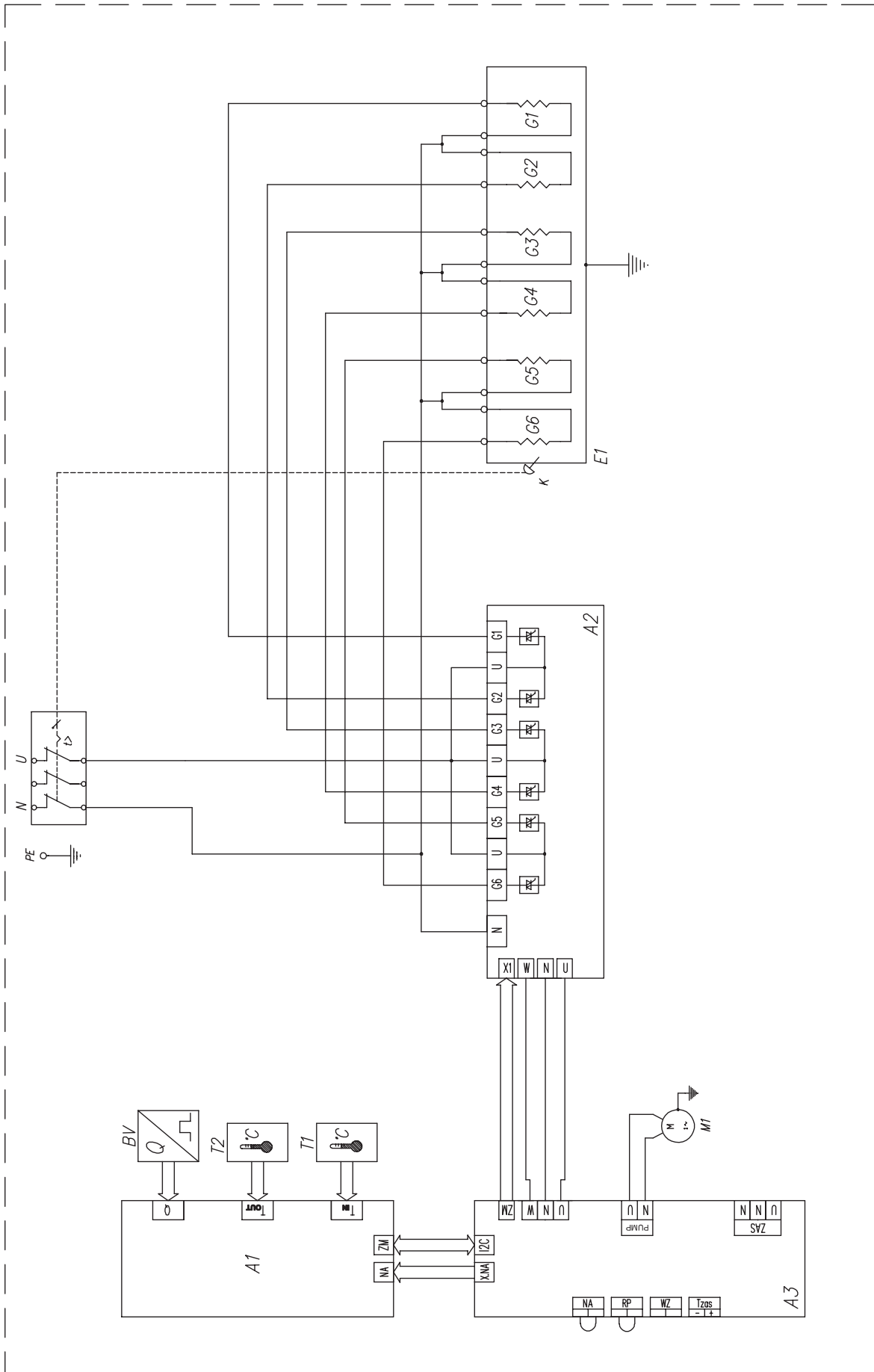


- E1 - heating box
- F1 - WT-3 safety cut-off
- BV - flow sensor
- T1 - inlet temperature sensor
- T2 - inlet temperature sensor
- A3 - ZIO-21 board
- M1 - Circulating pump
- A1 - Front panel
- A2 - Power board
- K - Capillary WT-3

superordi- nated Signal	room thermostat	DHW thermostat	DS 1820 temperature sensor
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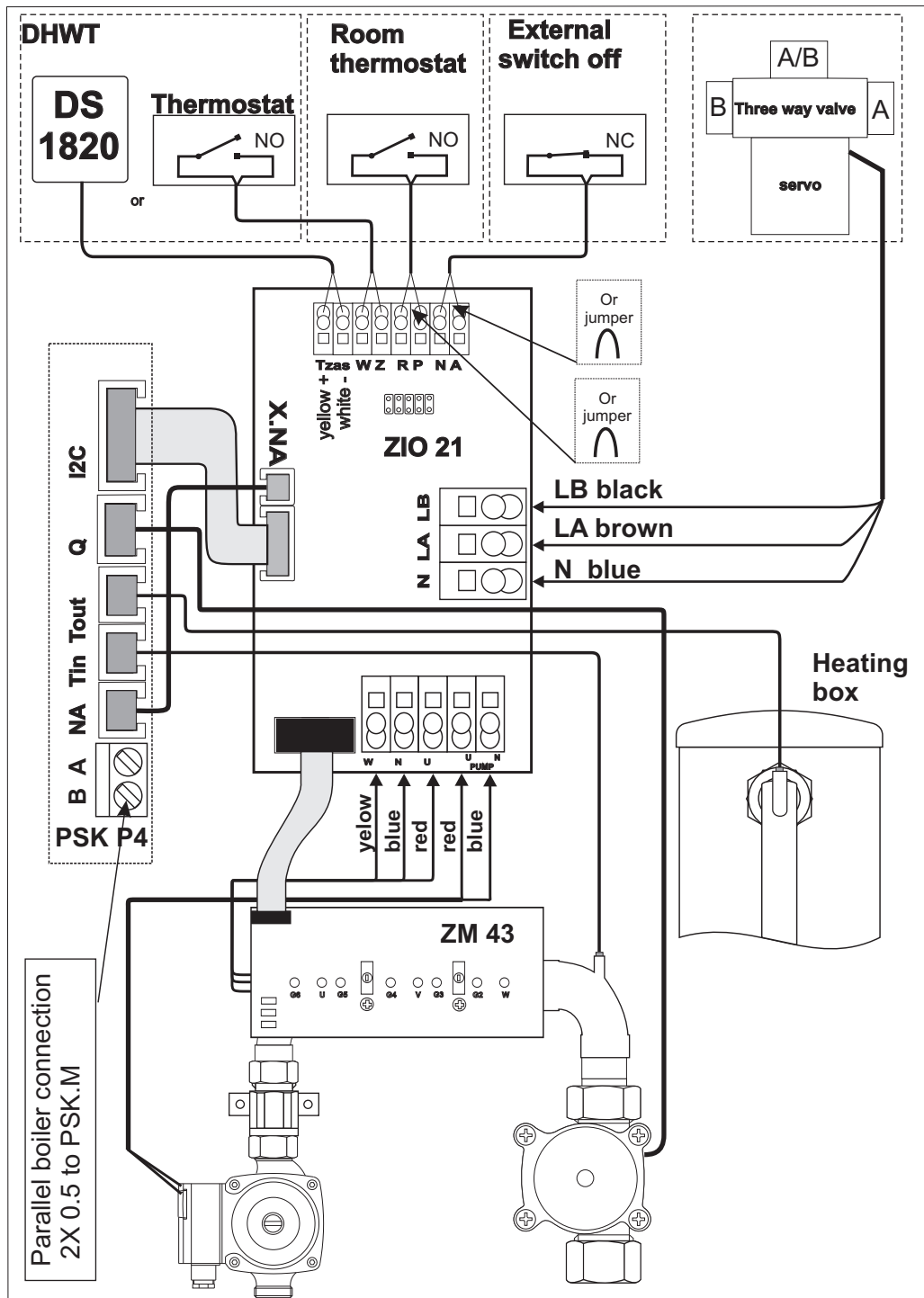


Pic.13 Ver.III EKCO.L1F, EKCO.L1NF 4kW, 6kW, 8kW.



# 11. Simplified schema of internal connections.

Pic.14 Simplified schema of internal connections





## 12. Parts list.

pos.	service code	picture no	description	Amount (pcs.)		notice
				EKCO.LI	EKCO.LIN	
1	01022	EKCO.L-01.00.00a/5	Heating box 12 / 400V	1	1	
	01023	EKCO.L-01.00.00a/4	Heating box 15 / 400V			
	01024	EKCO.L-01.00.00a/3	Heating box 18 / 400V			
	01025	EKCO.L-01.00.00a/2	Heating box 21 / 400V			
	01026	EKCO.L-01.00.00a/1	Heating box 24 / 400V			
	01032	EKCO.L-01.00.00a/14	Heating box 9 / 240V			
	01033	EKCO.L-01.00.00a/13	Heating box 12 / 240V			
	01034	EKCO.L-01.00.00a/12	Heating box 14,4 / 240V			
2						
3	00863	CZP-00.00.00	Flow sensor	1	1	
4						
5						
9	01016		Front cover EKCO.LI	1		
	01017		Front cover EKCO.LIN		1	
10	00786		Back base EKCO.L	1		
	00883		Back base EKCO.LN		1	
11	01010	EKCO.L-14.00.00a	ZIO-21 board	1	1	
12	00784	EKCO.LN-17.00.00	Expansion vessel pipe		1	
13	00661	EPCO.M-16.00.00	Manometer pipe	1	1	
14	00936	PSK.P4-00.00.00	Front panel PSK.P4	1	1	
15						
16						
17	01011	EKCO.L-10.00.00a/I	Power board EKCO.LI wyk."I"(12-24)	1	1	
	01012	EKCO.L-10.00.00a/II	Power board EKCO.LI wyk."II"(4-8)			
	01013	EKCO.L-10.00.00a/III	Power board EKCO.LIF wyk."III"(4-8)			
	01014	EKCO.L-10.00.00a/IV	Power board EKCO.LIF wyk."IV"(4-8)			
18						
19	00790	WE-005/02	Temperature sensor Tin	1	1	sensor resistance 10kΩ at temperature 25°C
20	00791	WE-005/01	Temperature sensor Tout	1	1	sensor marked with red colour sensor resistance 10kΩ at temperature 25°C
21	01018	EKCO.L-04.00.00a	Inlet connection pipe	1		
	01020	EKCO.LN-04.00.00a	Inlet connection pipe		1	
	01019	EKCO.L-18.00.00a	Inlet connection pipe UK ver.	1		
	01021	EKCO.LN-18.00.00a	Inlet connection pipe UK ver.		1	
22	00919	EKCO.L-06.00.00	Outlet connection pipe	1		
	00921	EKCO.LN-08.00.00	Outlet connection pipe		1	
23	00144		Safety valve 3 bar	1	1	
24	00516	WT3-00.00/2	WT3 safety cut-out	1	1	t=100°C
	00489	WT3-00.00/3				underfloor heating t=75°C
	00879	WT3-00.00/5				t=100°C I=55A
25	00035		Manometer M53-0..0,4 Mpa	1	1	
26	00001		Automatic air-vent G1/2"	1	1	
27	00225		Pump (UPS 15-50 130 lub RS 15/5-3)	1	1	
28	00853		Expansion vessel (CP387 G1/2" 6L)		1	
29						
30						
35						
36						
33						
37						

38					
39					
40	00253		Gasket 1,5x14,8x8	1	1
41	00272		Gasket 1,5x18,2x11,7	5	5
42	00373		Gasket 1,5x20x13	3	4
43					
44	00647		Gasket 2x30x21	2	2
45	00115	Z-010	Pipe union 5/8"x1/2"	1	1

# 13. Technical data.

Table 1

Max.pressure	MPa	0,3								
Min.pressure	MPa	0,05								
Outflowing water temp.	°C	40 ÷ 85 (30 ÷ 60)*								
Max. water temp.	°C	100								
Overall dimensions	mm	EKCO.L1 660 x 380 x 175				EKCO.L1N 700 x 425 x 285				
Weight	kg	EKCO.L1 ~16				EKCO.L1N ~24				
Water connection		G 1/2"								
Expansion vessel (in EKCO.L1Nz only)	l	6								
Safety class		IP 21								
<b>Boiler type</b>	<b>EKCO.L1Fz, EKCO.L1NFz</b>									
		4	6	8	6	9	12	14,4		
Rated power consumption	kW	4	6	8	6	9	12	14,4		
Rated voltage		230V~				240V~				
Rated current	A	17,4	26,0	34,8	25	37,5	50	60		
Fuse rated current	A	20	32	40	32	50	63	80		
Min. connecting wires section	mm <sup>2</sup>	3 x 2,5	3 x 4	3 x 6	3 x 2,5	3 x 6	3 x 10			
Max. connecting wires section	mm <sup>2</sup>	3 x 16				3 x 25				
<b>Boiler type</b>	<b>EKCO.L1z, EKCO.L1Nz</b>									
		4	6	8	12	15	18	21	24	
Rated power consumption	kW	4	6	8	12	15	18	21	24	
Rated voltage		400V 3N~								
Rated current	A	3 x 5,7	3 x 8,7	3 x 11,7	3 x 17,3	3 x 21,7	3 x 26,0	3 x 30,3	3 x 34,6	
Fuse rated current	A	10		16	20	25	32	40		
Mini. connecting wires section	mm <sup>2</sup>	5 x 1		5 x 1,5	5 x 2,5		5 x 4		5 x 6	
Max. connecting wires section	mm <sup>2</sup>	5 x 16								

\*Relates to EKCO.p for underfloor heating