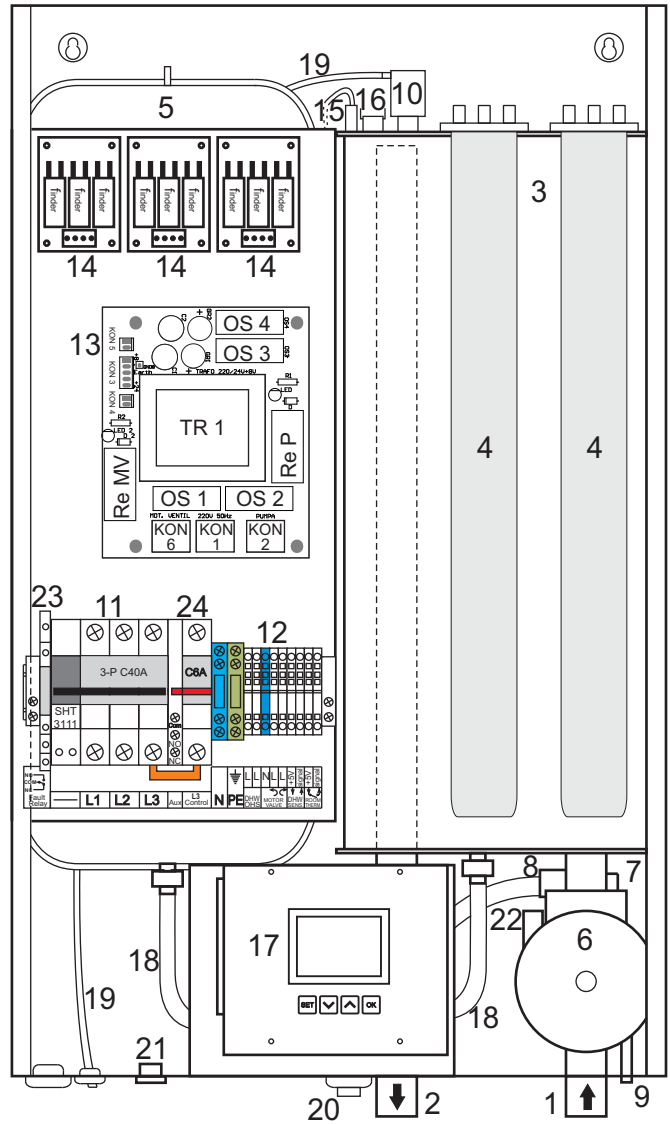


Premium electric boiler  
Service manual with data tables

# Components

- 1 -Return line of the boiler
- 2 -Flow line of the boiler
- 3 -Exchanger of the boiler
- 4 -Electric heaters
- 5 -Expansion tank Zilio 8l
- 6 -Cirkulation pump Wilo Para MSL/6-43/SC
- 7 -Valve for discharging of air (on the pump)
- 8 -Safety valve 3 bar (on the pump)
- 9 -Drain faucet (on the pump)
- 10-Automatic air discharger (on the exchanger of the boiler)
- 11-3P MCB (Automatic fuse) with upgraded shunt trip release connected to safety switch - These 3 parts build safety mechanism against overheating and overcurrent protection.
- 12-Auxiliary terminals for room thermostat, boiler temperature sensor, motor valve, and external OHS
- 13-DC Power supply board MMB2408\_VX4
- 14-Relays board PLR\_V3B
- 15-Boiler temperature sensor (KTY81-110)
- 16-Safety thermostat 95 °C (NO)
- 17-Control panel with display (EK\_CPU\_1\_3)
- 18-Flexible hose for connecting the expansion tank
- 19-Flexible air vent valve drain hose
- 20-Flexible safety valve drain hose
- 21-Switch ON/OFF
- 22-Hydraulic pressure sensor (on the pump)
- 23-Fault relay (voltage-free contact system)
- 24-1P MCB (Automatic fuse) for control circuit protection, with upgraded auxiliary contact



# Technical data

	Unit	Premium 6	Premium 9	Premium 12	Premium 18	Premium 24
Nominal power	kW	6	9	12	18	24
Degree of utilization	%	99				
Number of power levels		3	6	6	9	9
Power level division	kW	3×2	6×1,5	6×2	9×2	9×2,7
Power supply	V AC	3N ~ 400/ 230V 50Hz				
Ingress protection(IP) level		IP40				
Main fuses required for three-phase powersupply	A	3×16	3×20	3×25	3×32	3×40
Minimum crossection of the cable for three-phase powersupply	mm <sup>2</sup>	5×2,5	5×2,5	5×4	5×4	5×6
Main fuses required for single-phase powersupply	A	1×32	1×50	-	-	-
Minimum crossection of the cable for single-phase powersupply	mm <sup>2</sup>	3×4	3×6	-	-	-
Safety valve	bar	3				
Max. permissible working pressure	bar	2,2				
Min. permissible working pressure	bar	0,8				
Temperature range	°C	10 ÷ 80				
Safety thermostat	°C	95				
Volume of water in the boiler	l	12,5				
Volume of expansion tank	l	8				
Flow line connection	zoll	3/4" (DN20)MT				
Returnline connection	zoll	3/4" (DN20)MT				
Mass of device (without water)	kg	25				
Dimensions	mm	710×430×230 (H×W×L)				
Microprocessor unit		EK_CPU_1_3				

# Factory settings of the CPU unit for the PREMIUM boiler

All Premium boiler models use the same CPU unit, which when replaced must be set according to the power of the boiler in which it is to be installed. To enter the factory settings menu boiler Premium follow the procedure:

- Set boiler power to 0. Circulation pump can run, or not - does not matter.

On the screen is default view (image 1):



Image 1

Press simultaneously buttons: ▼  
and ▲ 10 seconds.  
(Note: press the ▲ key first)  
The factory setting menu appears on the display (Image 2)

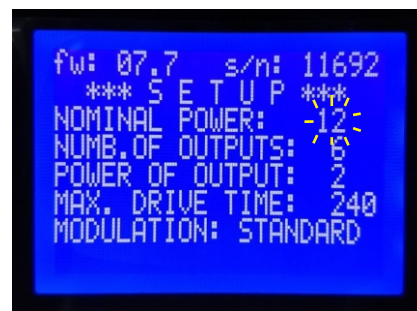


Image 2

On the top of screen (image 2), there are information about the firmware version and the serial number CPU that can not be changed. For example: firmware version is: 07.7; serial number is: 11692;

Below the inscription \*\*\* S E T U P \*\*\* placed is parameters that define the device type:

**NOMINAL POWER** → 12kW

**NUMB. OF OUTPUTS** (number of heaters "rods") → 6

**POWER OF OUTPUT** (power of single heating rods) → 2kW;

**MAX. DRIVE TIME** (maximum continuous output time expressed in minutes) → 240

**MODULATION** (Modulation of engaged power when approaching a set temperature) → **STANDARD**

Blinking **NOMINAL POWER: 12** which now can adjust to one of values: 3 - 4,5 - 6 - 9 - 12 - 16,2 - 18 - 24,3 kW by tact switches

▼ and ▲. For example, two time pres ▲ to adjust Nominal Power 18kW (image 3). To proceed the adjust next parameter, pres button "OK". (Setting time is limited to 15sec. If no key is pressed within that time, the device automatically returns back to the basic display). Now blinking **NUMB. OF OUTPUTS: 6** (image 4) which can adjust. It is possible to choose one of the values: 3, 6 ili 9. Should be chose **NUMB. OF OUTPUTS: 9**, because they are available heater cartridges 9x2kW power.. Use the following table to select the number of outputs according to the nominal power:

NOMINAL POWER	6kW	9kW	12kW	18kW	24kW
NUMB. OF OUTPUTS	3	6	6	9	9

Table 1

The **POWER OF OUTPUT** parameter is not set, but is automatically set to the appropriate value according to the set values for **NOMINAL POWER** i **NUMB. OF OUTPUTS**. In this example, where **NOMINAL POWER: 18kW** i **NUMB. OF OUTPUTS: 9**, **POWER OF OUTPUT: 2 kW** - is set automatically (Image 4).

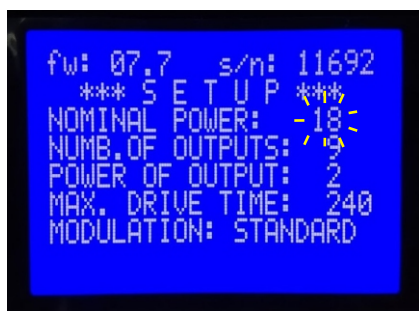


Image 3

When the nominal power is set to 18kW by pressing the "OK" button, the next parameter is set- **NUMB. OF OUTPUTS**. The number of outputs according to Table 1 should be selected, and **POWER OF OUTPUT** will automatically be set to the appropriate value.

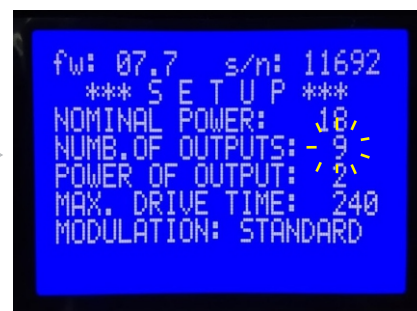


Image 4

After setting **NUMB. OF OUTPUTS**, pressing the "OK" button goes to the MAX DRIVE TIME setting, that begins to flash (Image 5). This parameter defines max. the continuous operation time of one output, after which the CPU will turn it off (if another inactive one is available) and turn on the other output. This parameter does not need to be changed because the entered value is 240 minutes max. continuous operating time of the heater rod optimal value for all types (power) of heater rods. Pressing the "SET" button confirms all current settings that are displayed on the display and returns to the basic display (Image 1). If the settings are not confirmed within 15 seconds by pressing the "SET" button, the display returns to the basic display, and the CPU will continue to work according to the "old" settings, ie changes in the parameters that define the boiler will not be accepted. Pressing the "OK" button moves to the setting of the next parameter - **MODULATION**: 1) OFF - without modulation; 2) STANDARD - boiler slightly modulates the power; .3) max - boiler rapidly modulates the power.

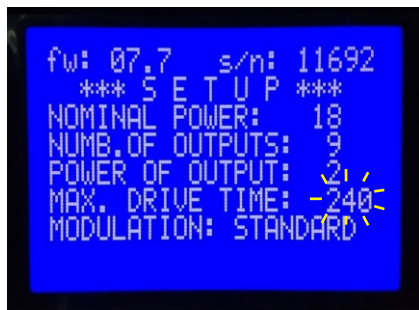
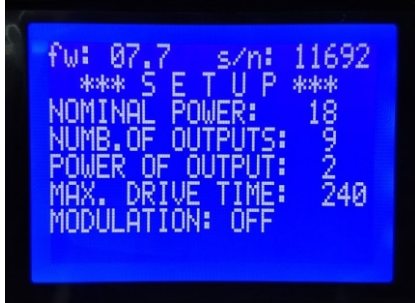


Image 5

<b>MIKOTERM</b>	
<i>Name</i>	Factory settings of the CPU unit for the PREMIUM boiler
<i>Date</i>	11.09.2013. change 13.06.2016; 28.08.2019
<i>Nr. doc</i>	14990 - V3 <span style="float: right;">Page 1/4</span>

# Factory settings of the CPU unit for the PREMIUM boiler

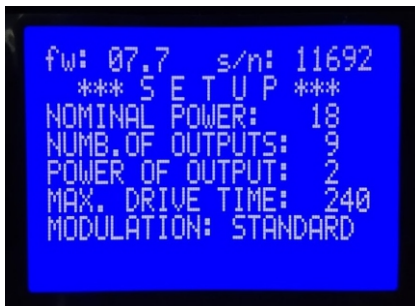
The microprocessor thermoregulator built into the Premium boilers has the ability to adjust the level of modulation of the engaged power, which is set in the SETUP menu. While the current temperature in the boiler is lower than the set temperature (Tset) by more than 6 °C, the engaged power is equal to the set power. When the current system temperature approaches the set temperature (Tset), at 6 °C, the CPU will start to reduce the engaged power - it will turn off some of the outputs (which have the longest operating time). How many outputs will be turned off depends on the selected modulation level. The factory setting is MODULATION: STANDARD. For most systems, this is the optimal setting, which reduces the number of relay on/off cycles (thus extending their service life), ensures a reduction in current temperature oscillations in relation to the set temperature, and affects the reduction of electricity consumption (3 ÷ 6%) because the power used for temperature information from the source itself is reduced.



**MODULATION: OFF** - Recommended for systems where the boiler has no power reserve, i.e. for systems where the power of the boiler is equal to the power of the installed heating elements.

If the modulation is off ("AUS"), the engaged power of the boiler is equal to the set power of the boiler, until the set temperature has been reached, when all heaters are off and the engaged power falls to 0kW. When the current temperature falls 2 °C below the set-point, all heaters are switched on again.

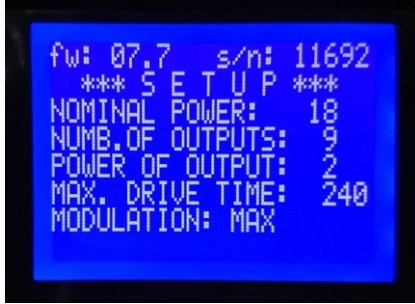
The switching on and off of individual heaters is time-shifted for 3sec.



**MODULATION: STANDARD** - Recommended for systems with slightly higher boiler power from the power of the installed heating elements (consumers).

If this level of modulation is selected (factory setting), the boiler work with a set power until the current temperature reaches value 5 °C below the set temperature, when it will reduce the engaged power by ~ 10% in relation to the target. When the current temperature approaches 2 °C below the set-point, the power decreases by another ~ 20%. When the current temperature reaches the setpoint, the remaining part of the power is turned off.

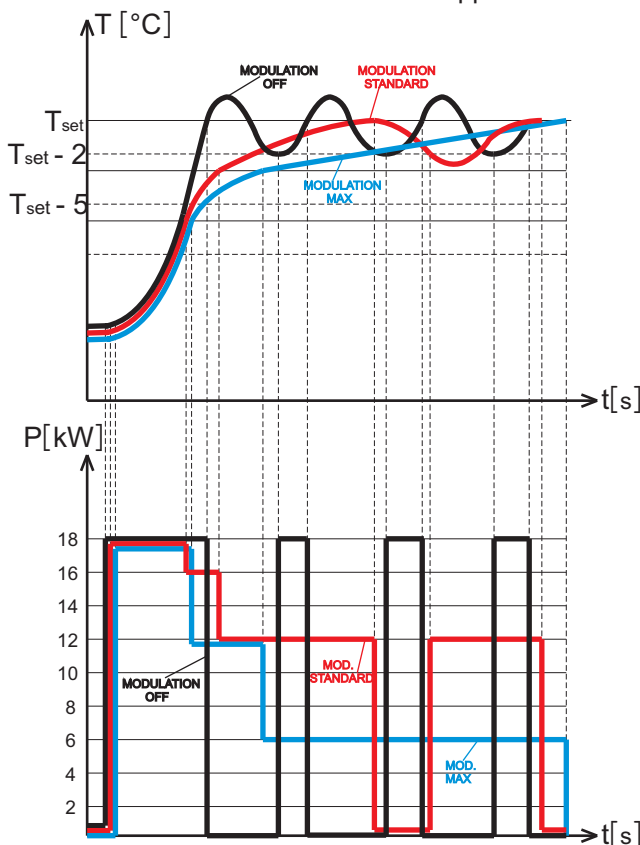
When the current temperature drops 2 °C below the set, only part of the power is re-engaged (~ 70%), and if the temperature continues to fall, the engaged power will be increased, in reverse order in relation to decreasing the power (when actual temperature approaches the set-point of temperature).



**MODULATION: MAX** - Recommended for systems where the power of the boiler is much higher than the power of the installed heating elements (consumers).

If this level of modulation is selected, the boiler work with a set power until the current temperature reaches value 5 °C below the set temperature, when it will reduce the engaged power by ~ 30% in relation to the target. When the current temperature approaches 2 °C below the set-point, the power decreases by another ~ 30%. When the current temperature reaches the setpoint, the remaining part of the power is turned off.

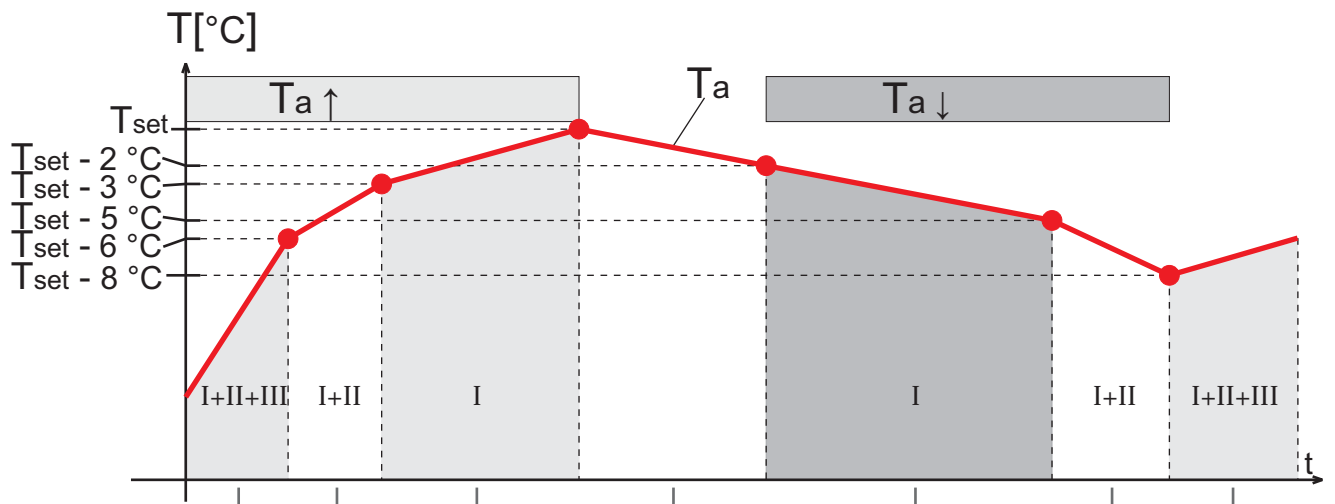
When the current temperature drops 2 °C below the set, only part of the power is re-engaged (~ 40%), and if the temperature continues to fall, the engaged power will be increased, in reverse order in relation to decreasing the power (when actual temperature approaches the set-point of temperature).



The graph (top picture) shows the temperature movement as a function from the selected modulation. It can be seen that the set temperature is the fastest reaches when the modulation is OFF, but the system temperature oscillates a lot around the set temperature. Oscillations are less in STANDARD modulation, there is no significant overshoot of the set temperature, but it takes more time to reach the set temperature. When MAX modulation is selected - it takes the longest time to reach the setpoint temperature (in some cases it may not be reached), the boiler operates most of the time with a temperature slightly below the set point.

The figure below shows the movement of engaged power depending on he selected modulation (on the example of a boiler with a nominal power of 18kW). In operation without power modulation (OFF), it can be seen that the heaters are often turned on and off during operation, while this is much less common if the STANDARD modulation is selected. When maximum power modulation (MAX) is selected the heaters are turned on/off very rarely, and the boiler operates most of the time with little engaged power.

<b>MIKOTERM</b>	
<i>Name</i>	Factory settings of the CPU unit for the PREMIUM boiler
<i>Date</i>	11.09.2013. change 13.06.2016; 28.08.2019
<i>Nr. doc</i>	14990 - V3 <span style="float: right;">Page 1/4</span>

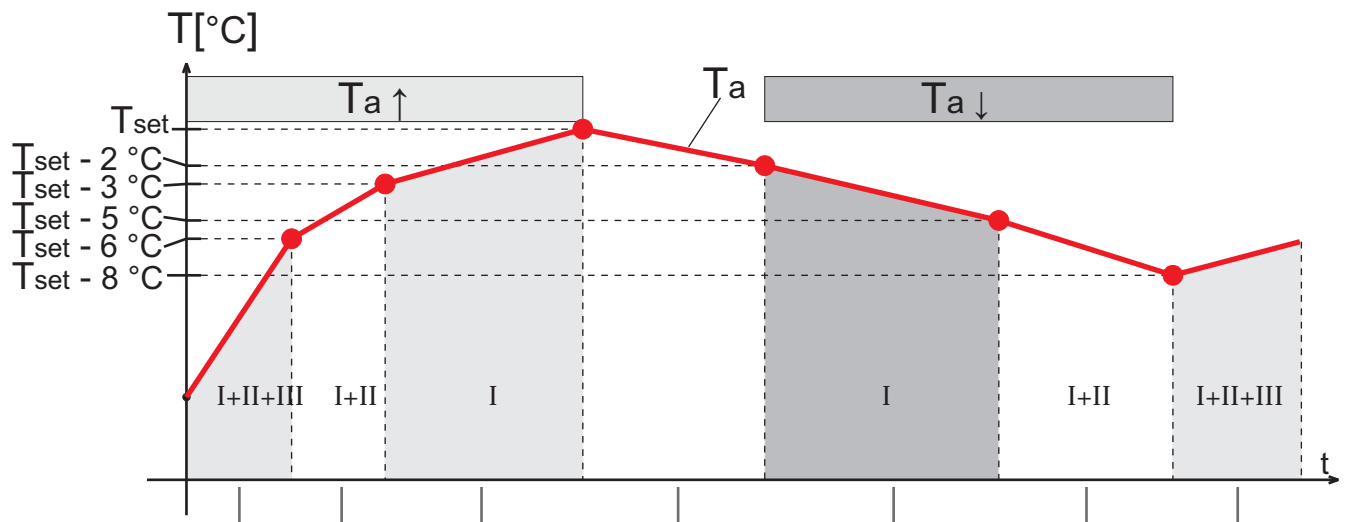


Nominal Power	Set Power	MODULATION	I+II+III	I+II	I			I	I+II	I+II+III
6kW	6kW	STANDARD	6	6	4	0		4	6	6
		MAX	6	4	2	0	2	4	6	
	4kW	STANDARD	4	4	2	0	2	4	4	
		MAX	4	4	2	0	2	4	4	
	2kW	STANDARD	2	2	2	0	2	2	2	
		MAX	2	2	2	0	2	2	2	

Nominal Power	Set Power	MODULATION	I+II+III	I+II	I			I	I+II	I+II+III
9kW	9kW	STANDARD	9	7,5	6	0		6	7,5	9
		MAX	9	6	3	0	3	6	9	
	7,5kW	STANDARD	7,5	6	4,5	0	4,5	6	7,5	
		MAX	7,5	6	3	0	3	6	7,5	
	6kW	STANDARD	6	6	4,5	0	4,5	6	6	
		MAX	6	4,5	3	0	3	4,5	6	
	4,5kW	STANDARD	4,5	4,5	3	0	3	4,5	4,5	
		MAX	4,5	3	1,5	0	1,5	3	4,5	
	3kW	STANDARD	3	3	1,5	0	1,5	3	3	
		MAX	3	3	1,5	0	1,5	3	3	
	1,5kW	STANDARD	1,5	1,5	1,5	0	1,5	1,5	1,5	
		MAX	1,5	1,5	1,5	0	1,5	1,5	1,5	

Nominal Power	Set Power	MODULATION	I+II+III	I+II	I			I	I+II	I+II+III
12kW	12kW	STANDARD	12	10	8	0		8	10	12
		MAX	12	8	4	0	4	8	12	
	10kW	STANDARD	10	8	6	0	6	8	10	
		MAX	10	8	4	0	4	8	10	
	8kW	STANDARD	8	8	6	0	6	8	8	
		MAX	8	6	4	0	4	6	8	
	6kW	STANDARD	6	6	4	0	4	6	6	
		MAX	6	4	2	0	2	4	6	
	4kW	STANDARD	4	4	2	0	2	4	4	
		MAX	4	4	2	0	2	4	4	
	2kW	STANDARD	2	2	2	0	2	2	2	
		MAX	2	2	2	0	2	2	2	

MIKOTERM	
Name	Factory settings of the CPU unit for the PREMIUM boiler
Date	11.09.2013. change 13.06.2016; 28.08.2019
Nr. doc	14990 - V3 <span style="float: right;">Page 1/4</span>



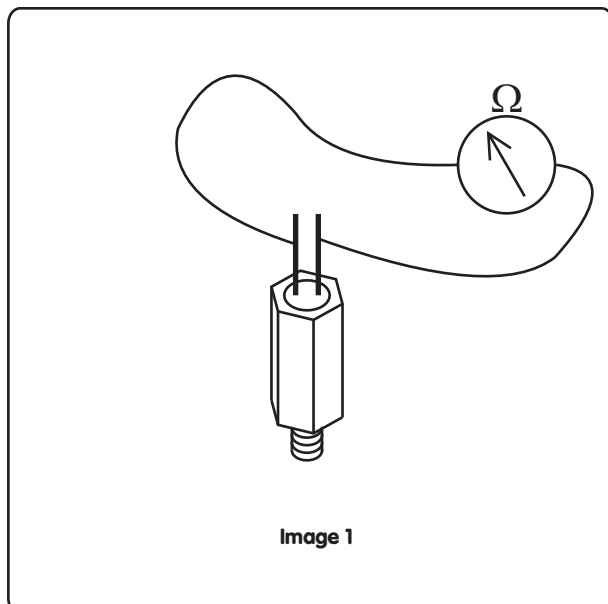
Nominal Power	Set Power	MODULATION	Ta ↑			Ta ↓			
			I+II+III	I+II	I	I	I+II	I+II+III	
18kW	18kW	STANDARD	18	16	12	0	12	16	18
		MAX	18	12	6	0	6	12	18
	16kW	STANDARD	16	14	12	0	12	14	16
		MAX	16	12	6	0	6	12	16
	14kW	STANDARD	14	12	10	0	10	12	14
		MAX	14	10	6	0	6	10	14
	12kW	STANDARD	12	10	8	0	8	10	12
		MAX	12	8	4	0	4	8	12
	10kW	STANDARD	10	8	6	0	6	8	10
		MAX	10	8	4	0	4	8	10
	8kW	STANDARD	8	8	6	0	6	8	8
		MAX	8	6	4	0	4	6	8
	6kW	STANDARD	6	6	4	0	4	6	6
		MAX	6	4	2	0	2	4	6
	4kW	STANDARD	4	4	2	0	2	4	4
		MAX	4	4	2	0	2	4	4
	2kW	STANDARD	2	2	2	0	2	2	2
		MAX	2	2	2	0	2	2	2

Nominal Power	Set Power	MODULATION	Ta ↑			Ta ↓			
			I+II+III	I+II	I	I	I+II	I+II+III	
24kW	24,3kW	STANDARD	24,3	21,6	16,2	0	16,2	21,6	24,3
		MAX	24,3	16,2	8,1	0	8,1	16,2	24,3
	21,6kW	STANDARD	21,6	18,9	16,2	0	16,2	18,9	21,6
		MAX	21,6	16,2	8,1	0	8,1	16,2	21,6
	18,9kW	STANDARD	18,9	16,2	13,5	0	13,5	16,2	18,9
		MAX	18,9	13,5	8,1	0	8,1	13,5	18,9
	16,2kW	STANDARD	16,2	13,5	10,8	0	10,8	13,5	16,2
		MAX	16,2	10,8	5,4	0	5,4	10,8	16,2
	13,5kW	STANDARD	13,5	10,8	8,1	0	8,1	10,8	13,5
		MAX	13,5	10,8	5,4	0	5,4	10,8	13,5
	10,8kW	STANDARD	10,8	10,8	8,1	0	8,1	10,8	10,8
		MAX	10,8	8,1	5,4	0	5,4	8,1	10,8
	8,1kW	STANDARD	8,1	8,1	5,4	0	5,4	8,1	8,1
		MAX	8,1	5,4	2,7	0	2,7	5,4	8,1
	5,4kW	STANDARD	5,4	5,4	2,7	0	2,7	5,4	5,4
		MAX	5,4	5,4	2,7	0	2,7	5,4	5,4
	2,7kW	STANDARD	2,7	2,7	2,7	0	2,7	2,7	2,7
		MAX	2,7	2,7	2,7	0	2,7	2,7	2,7

<b>MIKOTERM</b>	
Name	Factory settings of the CPU unit for the PREMIUM boiler
Date	11.09.2013. change 13.06.2016; 28.08.2019
Nr. doc	14990 - V3 <span style="float: right;">Page 1/4</span>

**TABLE OF TYPICAL RESISTANCE VALUES OF THE TEMPERATURE SENSOR  
KTY81-110**

TEMPERATURE	RESISTANCE ( $\Omega$ )		
	MIN.	TYPICAL	MAX.
-20 °C	669	<b>684</b>	698
-10 °C	733	<b>747</b>	761
0 °C	802	<b>815</b>	828
10 °C	874	<b>886</b>	898
20 °C	950	<b>961</b>	972
25 °C	990	<b>1000</b>	1010
30 °C	1029	<b>1040</b>	1051
40 °C	1108	<b>1122</b>	1136
50 °C	1192	<b>1209</b>	1225
60 °C	1278	<b>1299</b>	1319
70 °C	1369	<b>1392</b>	1416
80 °C	1462	<b>1490</b>	1518
90 °C	1559	<b>1591</b>	1623
100 °C	1659	<b>1696</b>	1733
110 °C	1762	<b>1805</b>	1847
120 °C	1867	<b>1915</b>	1963



<b>MIKOTERM</b>	
<i>Name</i>	Table of typical resistance values of the temperature sensor KTY81-110
<i>Date</i>	17.06.2014.
<i>Nr. doc</i>	14292

# TABLE OF TYPICAL VOLTAGE VALUES ON THE PRESSURE SENSOR CONNECTOR of the "Premium" Electric boiler

U (V DC)	P (bar)
1,15	0,0
1,20	0,1
1,25	0,2
1,30	0,3
1,35	0,4
1,40	0,5
1,45	0,6
1,50	0,7
1,55	0,8
1,60	0,9
1,65	1,0
1,70	1,1
1,80	1,2
1,85	1,3

U (V DC)	P (bar)
1,90	1,4
1,95	1,5
2,00	1,6
2,05	1,7
2,10	1,8
2,15	1,9
2,20	2,0
2,25	2,1
2,30	2,2
2,35	2,3
2,40	2,4
2,50	2,5
2,55	2,6
2,60	2,7

U (V DC)	P (bar)
2,65	2,8
2,70	2,9
2,75	3,0
2,80	3,1
2,85	3,2
2,95	3,3
3,05	3,4
3,15	3,5
3,25	3,6
3,35	3,7
3,40	3,8
3,45	3,9
3,55	4,0

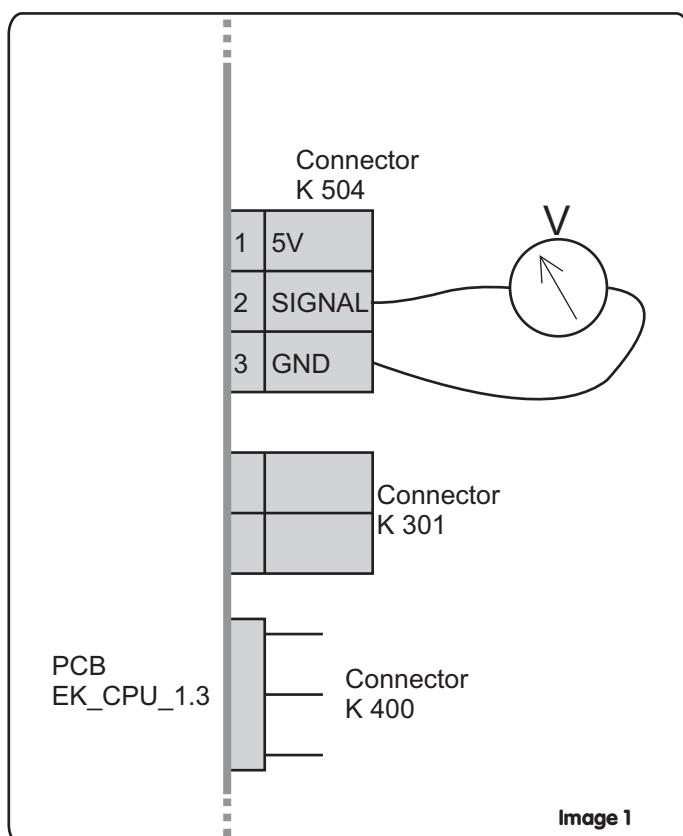
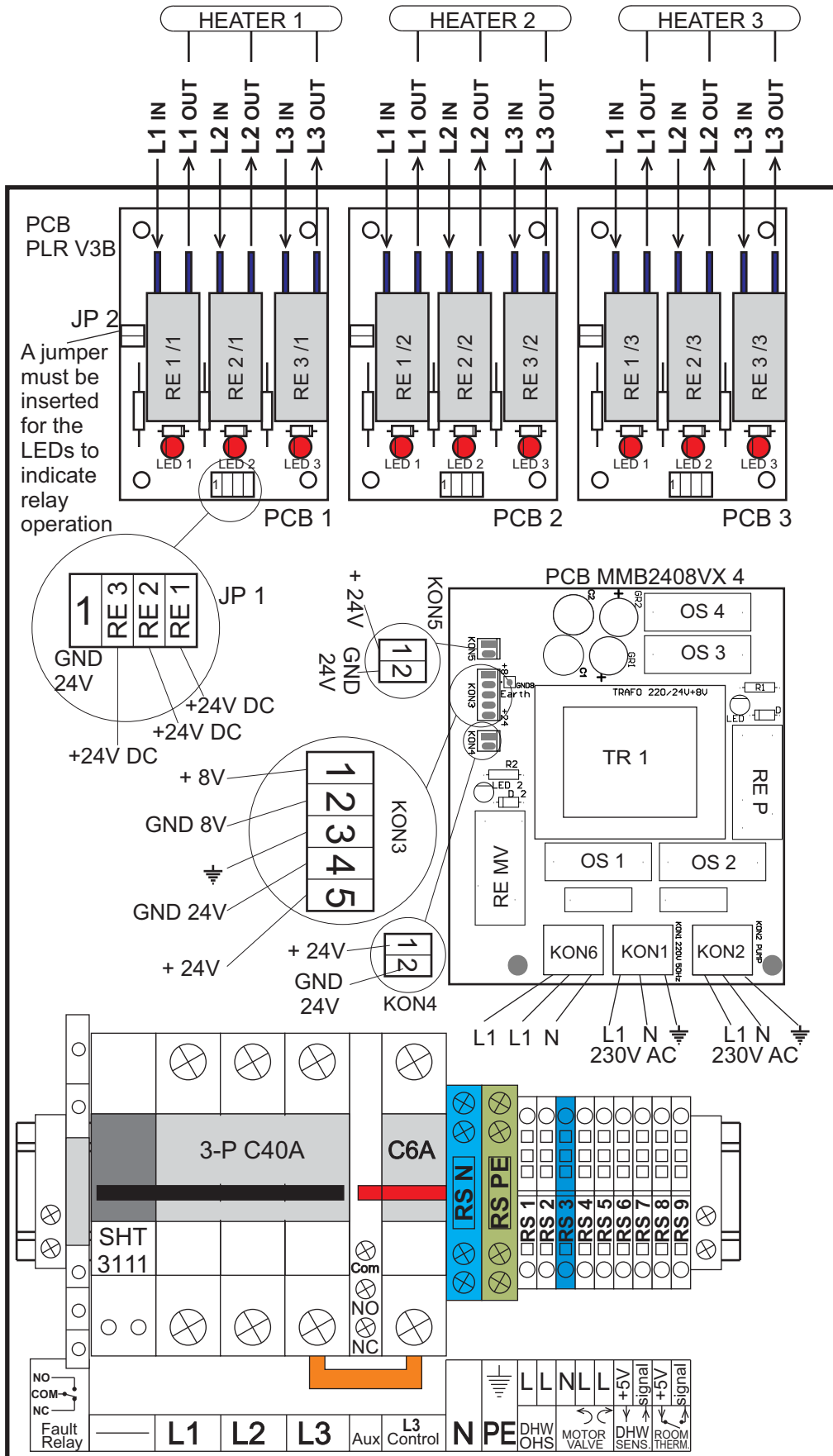


Image 1

<b>MIKOTERM</b>	
<i>Name</i>	Table of typical voltage values on the pressure sensor connector
<i>Date</i>	11.09.2013.
<i>Nr. doc</i>	14293

# VOLTAGE VALUES ON THE ELECTRICAL DISTRIBUTION BOARD



## PCB PLR\_V3B:

- JP 1 - Relays control connector
- JP 2 - Jumper za rad LED dioda
- LED1, LED2, LED3 - LEDs for indicating relay operation
- RE 1/1, RE 2/1, RE 3/1 - Heater no. 1 relays
- RE 1/2, RE 2/2, RE 3/2 - Heater no. 2 relays
- RE 1/3, RE 2/3, RE 3/3 - Heater no. 3 relays

## CPU MMB2408\_VX4:

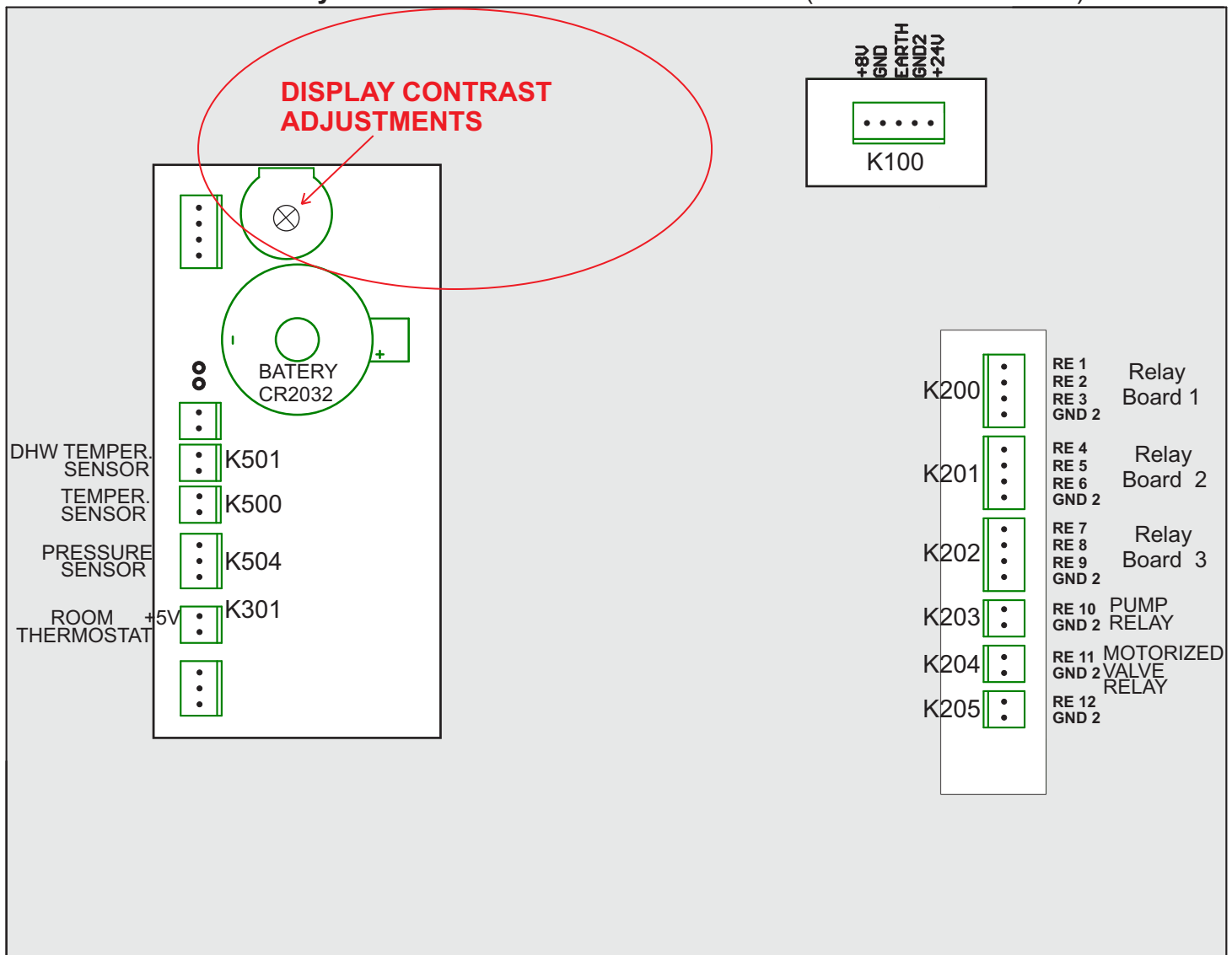
- KON1 - Power supply connector
- KON2 - Circulation pump connector
- KON3 - DC voltage connector for CPU power supply
- KON4 - Pump relay connector
- KON5 - Motorized valve relay connector
- KON6 - Motorized valve power supply connector
- OS 1 - Transformer primary fuse T0,5A (230V AC)
- OS 2 - Pump fuse T2A (230V AC)
- OS 3 - Relays coil fuses T0,5A (24VDC)
- OS 4 - CPU power supply fuse T0,5A (8VDC)
- RE P - Pump relay
- RE MV - Motorized valve relay
- 3-P C40A - 3-pole MCB - for connecting phase conductors
- SHT3111 - Shunt trip release, factory connected - no additional connections
- RS N - Neutral conductor connecting
- RS PE - Protective Earth connecting
- RS 1, RS 2, RS 3 - Motorized valve clamps
- RS 4, RS 5 - Boiler temperature sensor clamps
- RS 6, RS 7, RS 8 - Room thermostat clamps. Warning: 5V DC

**MIKOTERM**

Name	Voltage values on the electrical distribution board
Date	16.06.2014.
Nr. doc	14294

## Conecting sensors and relays to the Premium boiler CPU

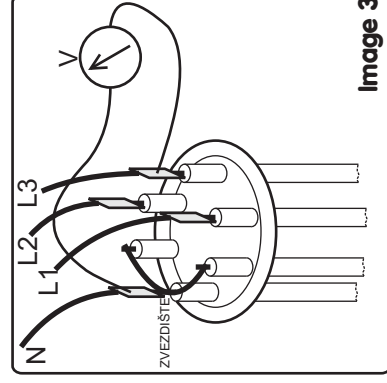
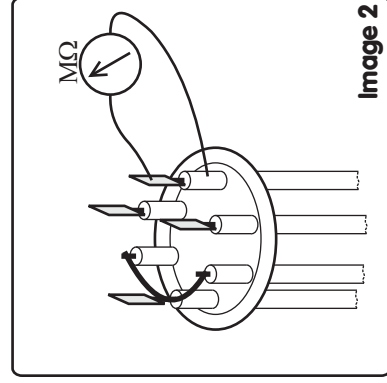
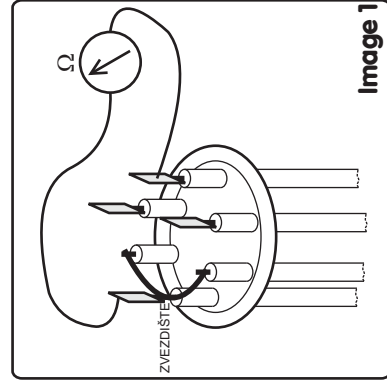
- **Room thermostat - Connector K301** ----- (Terminals RS 8, RS 9 on switchboard)
- **Presure Senzor - Connector K504** ----- (Integrated on pump)
- **Temperature sensor (KTY81-110) - Connector K500** ----- (On top of vessel)
- **DHW temperature sensor - Connector K501** ----- (Terminals RS 6, RS 7 on switchboard)
- **Power supply - Connector K100** ----- (KON3 on switchboard)
- **Relays board PLR 1 - Connector K200** ----- (PLR1 on switchboard)
- **Relays board PLR 2 - Connector K201** ----- (PLR2 on switchboard)
- **Relays board PLR 3 - Connector K202** ----- (PLR3 on switchboard)
- **Relay pump - K203** ----- (KON4 on switchboard)
- **Motorized valve relay - K204** ----- (KON5 on switchboard)



<b>MIKOTERM</b>	
<i>Name</i>	SENSORS AND RELAYS CONNECTION ON THE CPU
<i>Date</i>	24.10.2014.
<i>Nr. doc</i>	14296-1

## TYPICAL RESISTANCE, CURRENT AND VOLTAGE VALUES TABLE OF EL. HEATER

Boiler Type	Premium 06 6kW	Premium 09 9kW	Premium 12 12kW	Premium 18 18kW	Premium 24 24kW
HEATER TYPE AND NUMBER	3-phase heater 3 x 2000W - 1pcs	3-phase heater 3 x 1500W - 2pcs	3-phase heater 3 x 2000W - 2pcs	3-phase heater 3 x 2000W - 3pcs	3-phase heater 3 x 2667W - 3pcs
Typical resistance value of heater rod <i>Image 1</i>	~26Ω	~35Ω	~26Ω	~26Ω	~20Ω
Typical insulation resistance value of heater rod <i>Image 2</i>	>2MΩ	>2MΩ	>2MΩ	>2MΩ	>2MΩ
Typical current value of heater rod at Voltage U=230V 50Hz	~8,7A AC	~6,5AAC	~8,7A AC	~8,7AAC	~11,5AAC
Typical voltage value of heater rod <i>Image 3</i>	~230V AC	~230V AC	~230V AC	~230V AC	~230V AC



**MIKOTERMA**

Name

Typical resistance, current and voltage values table of el. heater

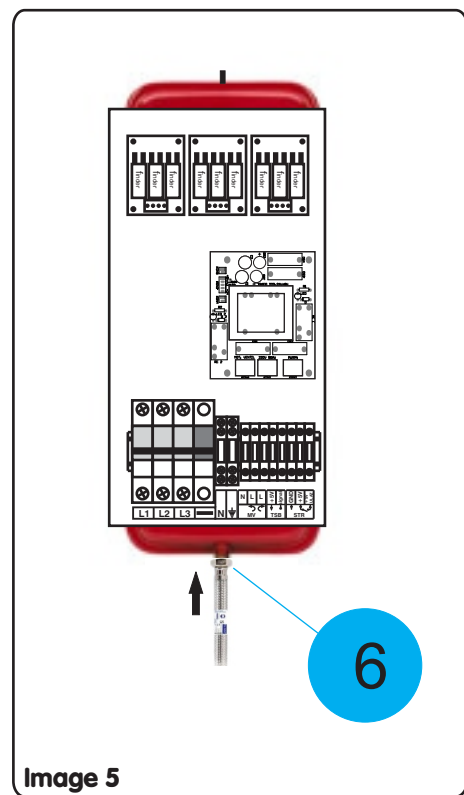
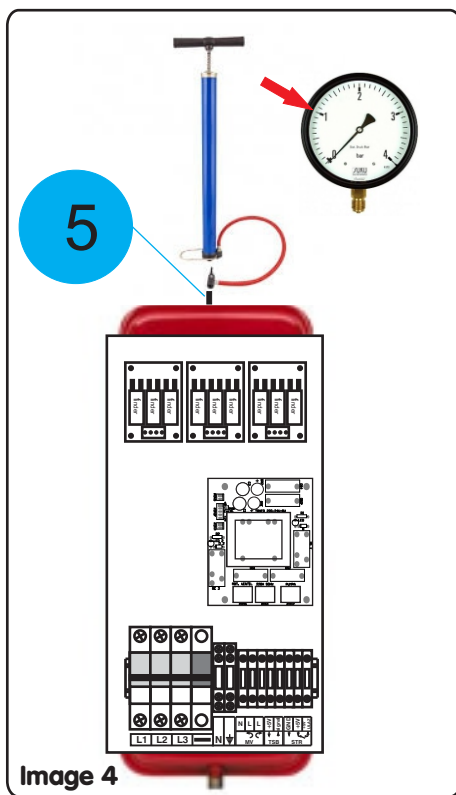
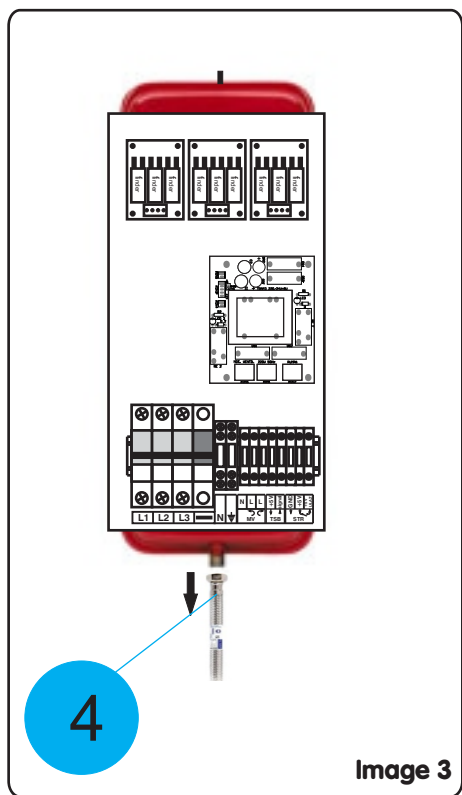
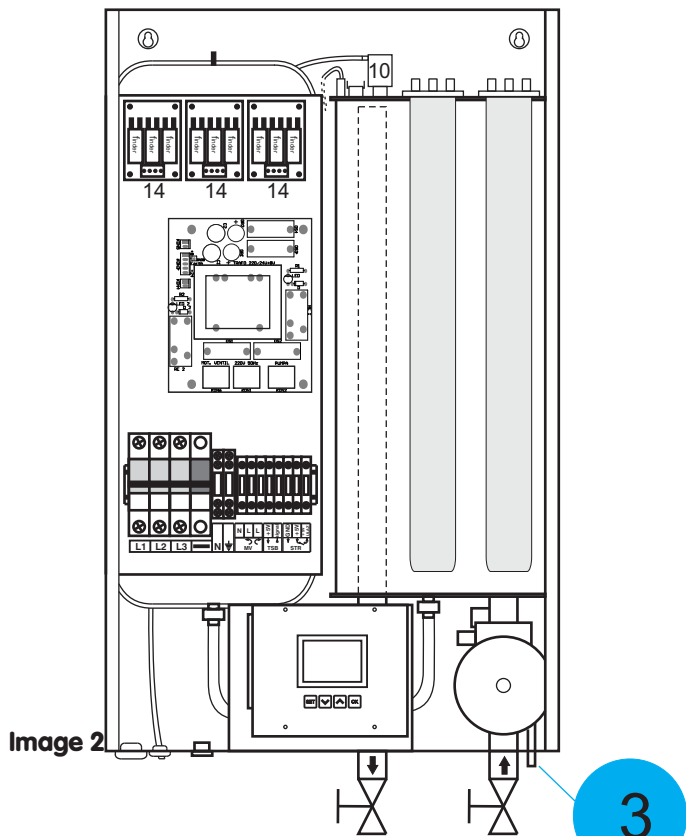
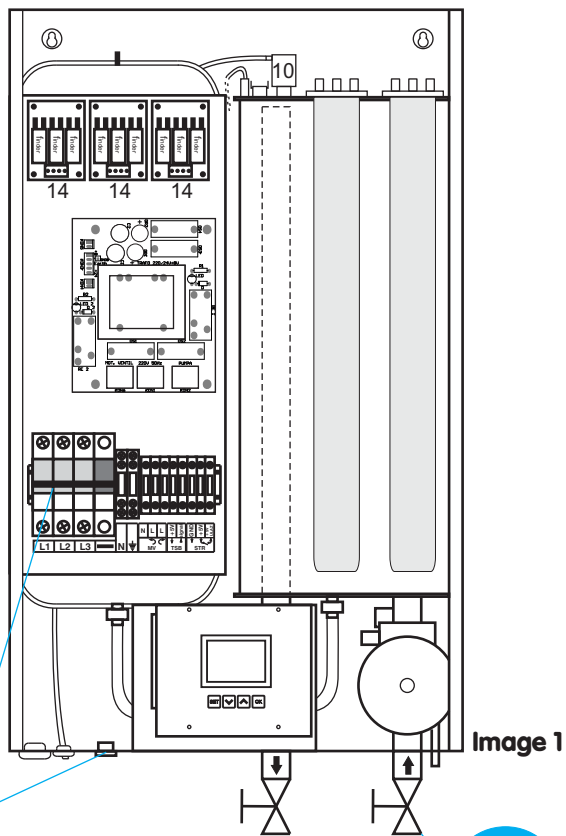
Date

10.09.2013.

Nr. doc

14191

# Expansion tank Pressure



- 1 - Turn off MCB and switch
- 2 - Turn off valves on hydraulics instalation
- 3 - Drain the boiler (drain tap on pump)
- 4 - Disconnect flex pipe from exp. tank
- 5 - Fill exp. tank with air (1bar)
- 6 - Connect flexibile tube to exp. tank and fill the system withwater.

<b>MIKOTERM</b>	
Name	Expansion tank Pressure
Date	25.10.2018.
Nr. doc	14392