

# MIKOTERM

electronic

\*New generation CPU, with RS485 RTU module for communication with BMS using ModBus protocol

\*24h maintenance program different temperatures with a setting resolution of 1h

\*OTC operating mode - compensation of boiler temperature according to outside temperature - 2 operating curves and 1 fixed temperature

\*The possibility of connecting up to 10 boilers in a cascade connection via the cascade regulator CPK09-M

\*Compact switches with high breaking capacity for safe operation

\*Certified and certified high-capacity safety valve

\*Automatic air vent valve with large flow capacity



## Technical sheet

### Electric Hot Water Boiler

# TK-Profesional 50÷240kW

MADE IN SERBIA

MIKOTERM Industrijska zona Aleksandrovo, Niška 211, 18252 Merošina, Srbija

TL-TK-Prof-50÷240kW-03/2024

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**Many years of experience and modern functionalities**

Electric hot water boilers of the TK-Profesional series, power 40 ÷ 240kW, have been produced continuously by Mikoterm for 30 years. Rich experience, reliable solutions, top-quality components proven in difficult conditions of exploitation, as well as continuous development and implementation of advanced functions, in compliance with valid directives prescribed by the European Committee for Standardization in the field of electrical engineering - are a guarantee of the quality of our devices.

**Purpose**

The TK-Profesional series of electric boilers is intended for:

- Heating of larger residential, business, tourist or industrial buildings
- Indirect preparation of domestic hot water (DHW), through a suitable heat exchanger
- Indirect heating of technological fluids in industrial processes, through a suitable heat exchanger
- Work in combination with other sources of thermal energy: gas boilers, heating oil,...
- Additional thermal energy generator, that is, support for the Heat Pump
- Independent operation, or in cascade connection (up to 10 boilers) with Cascade regulator CPK09-M

**Device description**

- Robust mechanical construction, for safe operation and a long service life. The compact dimensions of the boiler and the small distances required between the two devices allow installation even in small boiler rooms
- Hydrottested at a pressure of 6 bar, max. working pressure 4bar (limited by software), 4.5bar safety valve
- Flanges for reliable and quick connection to the hydraulic installation
- Factory installed safety fittings: "Spirotech" automatic vent valve and "Caleffi" safety valve (on the pressure pipe), "Danfoss" flow sensor (Flow Switch) and filling / emptying valve (on the return pipe) , de-sludge valve (on the lower side of the boiler)
- The outer casing of the boiler is made of pickled sheet metal protected by the electrostatic plasticization process
- Adjustable leg height for easy leveling on sloping floors, with the possibility of anchoring
- Switchboard with ambient temperature control and forced equipment cooling (for Tamb >40 °C)
- Immersed tube el. heaters made of prochrome (AiSi321), with a heating element made of a highly resistant alloy (NiFeCr)
- Contactors for turning on the heater of superior reliability, with an extremely high max. temp. ambient (90 °C)
- Original overheating protection system - safety circuit with compact switches with high interrupting power (36kA) that cut off the power supply on the signal of an independent safety thermostat, guaranteeing complete safety during operation, but also in emergency mode
- The possibility of connecting an external safety thermostat (eg in Buffer) for additional protection against overheating
- Microprocessor thermoregulator (CPU) with a clear display, showing all vital parameters on the main screen and an intuitive menu. The CPU enables accurate temperature measurement and maintenance, measures the operating time of each heater for intelligent management and even loading of all device elements...

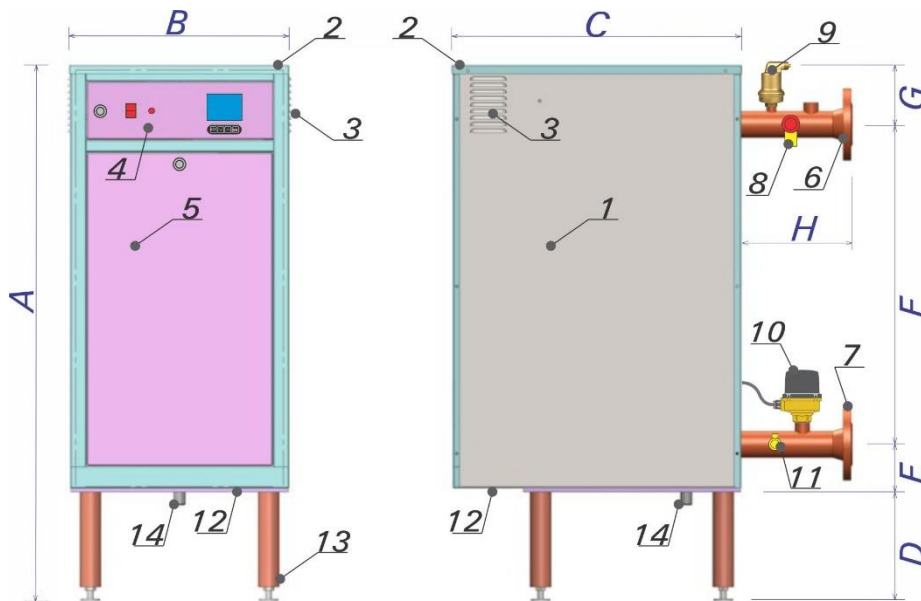
**Advanced functions**

- Remote start / stop, that is, operation of the boiler depending on external conditions (room thermostat, timer, ...)
- The possibility of choosing the level of modulation of the engaged power, for precise temperature regulation and economical consumption
- Several possible operating modes: Individual, Individual every 24h Profile, OTC, Cascade operation. Several possible operating modes allow great adaptability to different requirements, as well as energy efficiency:
  - \* Individual mode of operation: manual control on the boiler, possible monitoring and control via BMS
  - \* Operating mode "24h Profile" - operation according to a 24h program, with the possibility of programming a different temperature every 1h, (monitoring via BMS is possible, while management via BMS is only possible by changing the set power, and the set temperature cannot be changed - it is determined by the 24h program)
  - \* OTC (Outdoor Temperature Compensation) mode: Prepared for compensation ("sliding") of the boiler temperature according to the outside temperature. Comfortable and economical working curve available (defined in 5 reference points), as well as 1 fixed temperature. An external temperature sensor is required, which is not part of the standard delivery, and is delivered at an additional cost.
  - \* Cascade operation mode of up to 10 boilers of the same power connected in a cascade (possible monitoring and management of cascades via BMS).

Prepared for cascade connection, cascade regulator CPK09-M is required.

- "Boiler in operation" and "Boiler failure" signals (relays with voltage-free contacts) for remote notification of boiler status.
  - BMS: Prepared for remote monitoring and control using RS485 RTU communication and ModBus protocol. It is possible to connect a stand-alone boiler to a centralized monitoring and control system (BMS) and manage it, or connect up to 10 boilers to a cascade controller, and then connect the cascade controller to the BMS using RS485 ModBus.
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## Dimensions and positions



1. Boiler plating
2. Boiler cover
3. Ventilation openings
4. Dashboard door
5. Switchboard door
6. Pressure line of the boiler
7. Boiler return line
8. Safety valve
9. Automatic air vent valve
10. Flow Switch
11. Filling/discharging tap
12. Cable glands
13. Height adjustable legs
14. De-sludging faucet

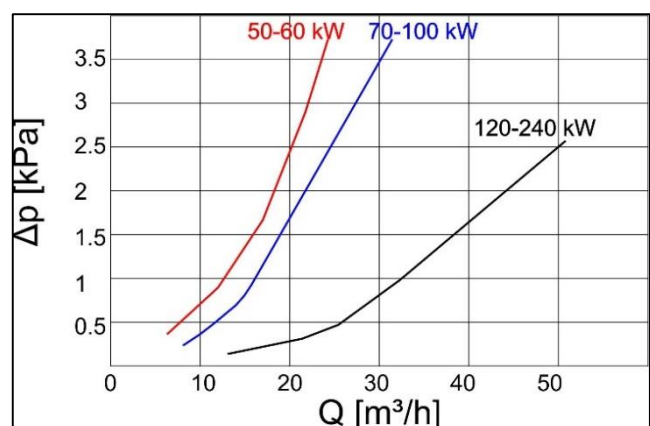
## Minimum and maximum media flow

Flow												
P [kW]	50	60	70	80	90	100	120	140	160	180	200	240
DN	40	40	50	50	50	50	65	65	65	65	65	65
Qmin [m³/h]	2.5	3	3.5	4	4.5	5	6	7	8	9	10	12
Qmax [m³/h]	8	10	11	12	15	16	20	23	26	30	33	40
ΔT [°C]	Optimum flow [m³/h] depending on the ΔT: $Q = f \{ \Delta T [^{\circ}C] \}$											
5	6.8	8.1	9.45	10.8	13.5	15	18	21	26.4	29.7	33	42
10	3.4	4.1	4.7	5.4	6.8	7.5	9.0	10.5	13.2	14.9	16.5	21.0
15	2.7	3.1	3.6	4.1	5.2	5.7	6.9	8.0	10.1	11.3	12.6	16.0
20	2.0	2.1	2.5	2.8	3.6	3.9	4.7	5.5	6.9	7.8	8.7	11.1

## Flow Switch Adjustment Range

Flow Indicator activation range					
Caleffi 626600		Min. Setup		Max. Setup	
		Flow reduction	Increasing flow	Flow reduction	Increasing flow
50÷60kW DN40 (6/4")	[l/min]	31,7	43,3	96,7	98,3
	[m³/h]	1,9	2,6	5,8	5,9
70÷100kW DN50 (2")	[l/min]	36,7	50	110	111,7
	[m³/h]	2,2	3	6,6	6,7
120÷240kW DN65 (2½")	[l/min]	61,7	83,3	191,7	195
	[m³/h]	3,7	5	11,5	11,7

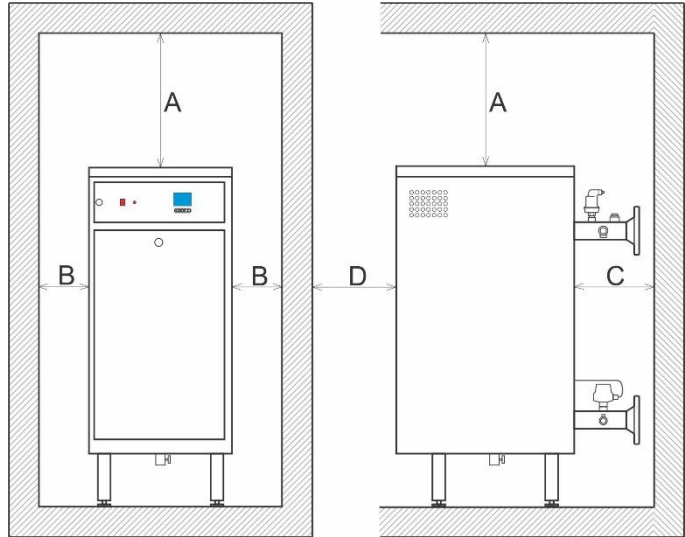
## Pressure drops through the boiler



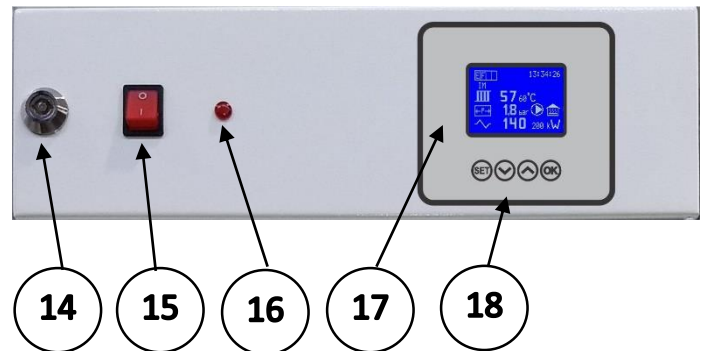
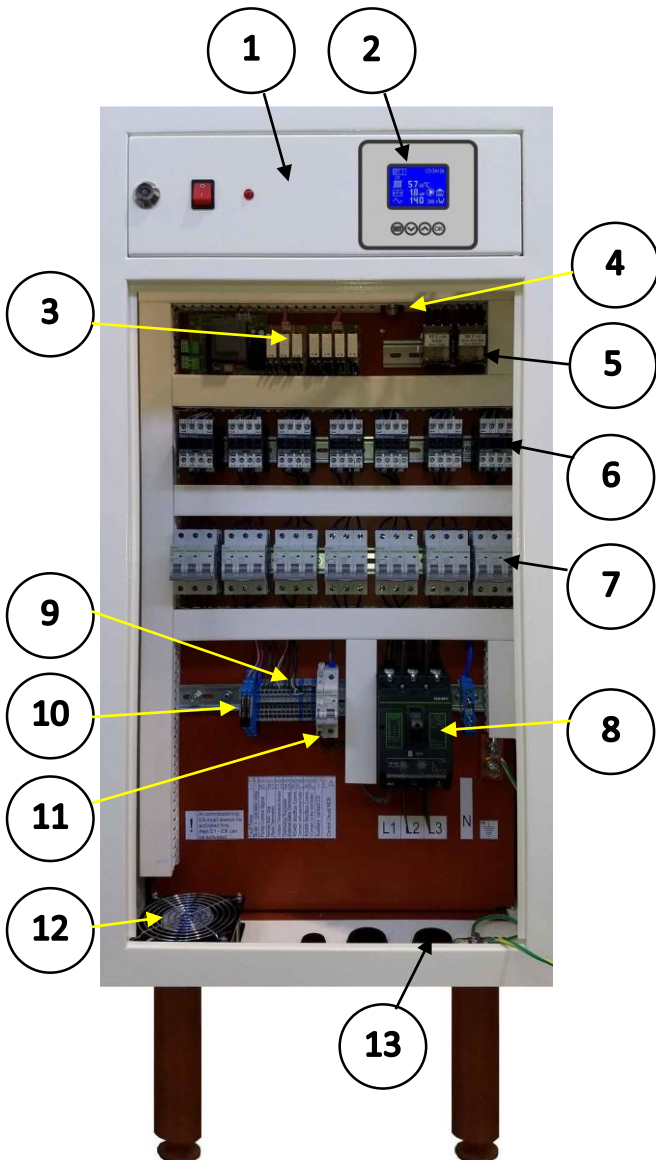
Note: The use of anti-freeze agents is not recommended, due to the reduction of the heat capacity of water and causing more corrosion of metals than pure water. If their use is necessary, the use of ethylene-glycol mixture for heating and water systems is allowed, provided that it may contain a maximum of 30% ethylene-glycol.

## Minimum dimensions of free space for installation

	A [mm]	B [mm]	C [mm]	D [mm]
50÷60kW	600	500	600	1000
70÷100kW	500	500	600	1000
120÷240kW	500	500	700	1000

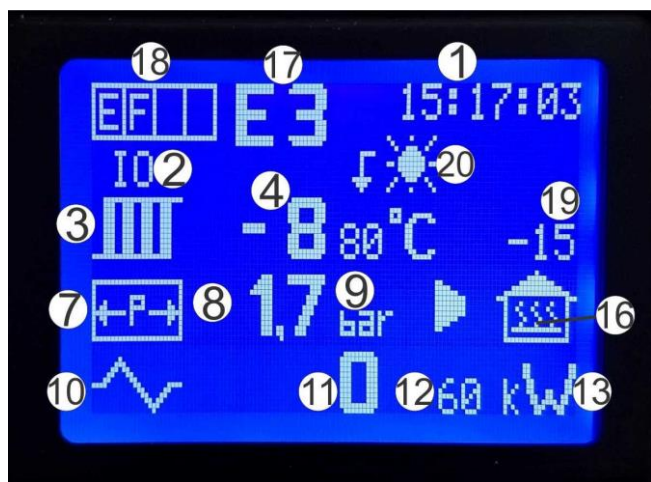
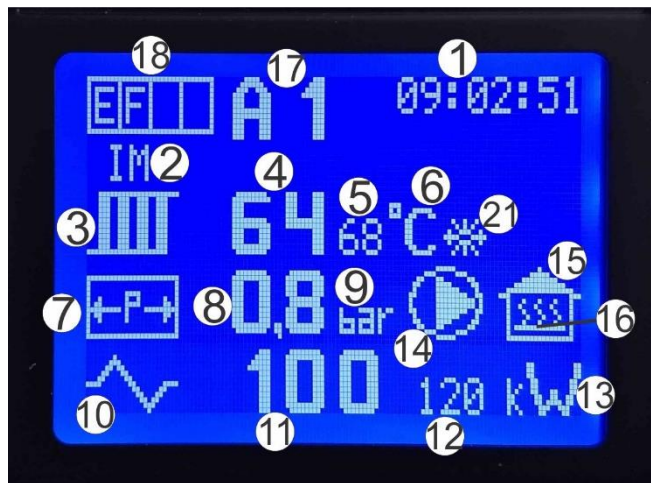


## Control and switchboard



1. Dashboard
2. Microprocessor thermoregulator
3. Relays for switching on contactors
4. Protective thermostat of the switchboard
5. Relays for adjustment of input signals
6. Contactors for turning on the heater
7. 3-pole Automatic Heater Fuses (3-p MCB)
8. Compact switch with built-in voltage release (safety circuit) - connecting the phase conductors of the power cable
9. Terminals (spring) for connecting input and output signals and ModBus communication
10. Relays (voltage-free contacts) status signals "Boiler in operation" and "Boiler error"
11. 1-pole Control circuit breaker with upgraded auxiliary contact
12. Fan for forced cooling of the switchboard environment for  $T > 40\text{ }^{\circ}\text{C}$
13. Cable glands
14. Dashboard door lock
15. ON/OFF Switch
16. Boiler error signal lamp
17. Display (LCD) of the thermoregulator with display of all vital parameters on the screen
18. Buttons for communication with the thermoregulator

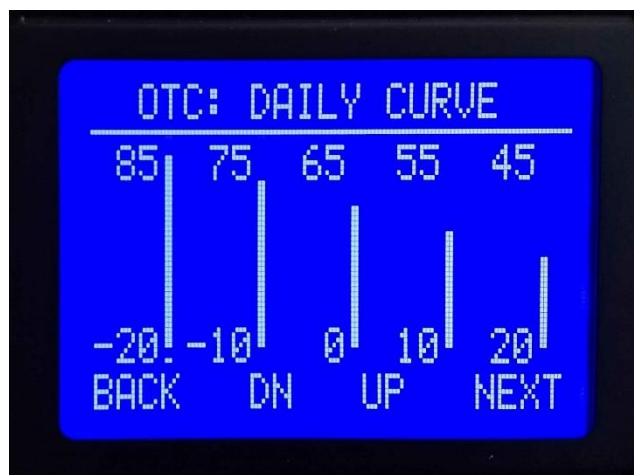
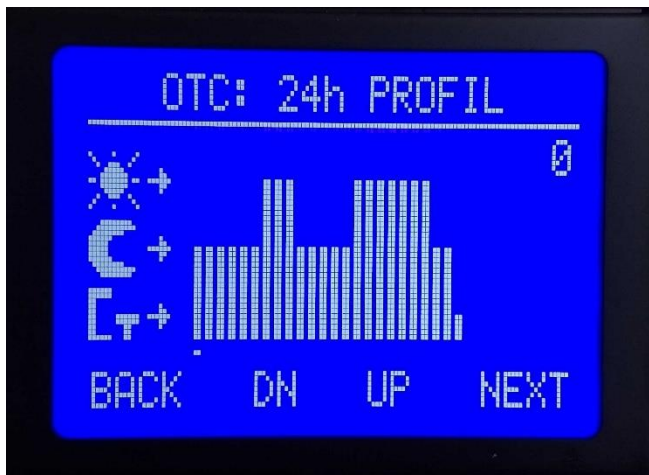
## Microprocessor Thermoregulator of boiler



1. Time
2. Status code of the operating mode in which the boiler is located
3. The radiator symbol, to the right of it are the current and set temperature of the boiler
4. Current temperature (possible display  $-99 \div 120$  °C)
5. Set temperature (possible display  $-10 \div 90$  °C)
6. Symbol of the temperature measurement unit ( °C )
7. Pressure vessel symbol (indicates that the current pressure is displayed to the right of it)
8. Pressure in the system (possible display  $0 \div 4,3$  bar)
9. Pressure unit symbol (bar)
10. Symbol of electrical power (indicates that the current and set temperature are displayed to the right of it)
11. Current engaged power of the boiler in kW
12. Set power of the boiler in kW
13. Symbol of the unit of measurement of electric power (kW)
14. Circulation pump symbol (appears when the CPU sends command voltage to turn in the pump relay). The triangle in the pump symbol is static if the Flow Switch is not detecting flow. If there is sufficient fluid flow through the boiler, the triangle is animated - symbolizing fluid flow.
15. The symbol of the heated space (house)
16. Remote start signal symbol (allowed operation of the boiler)
17. Warning symbol (A1 ÷ A4) or error (E0 ÷ E9)
18. Labels of selected optional conditions for boiler operation:
  - 1. field: "E" - If its "E" in field, testing of the external working condition is allowed (remote start/stop), .
  - 2. field: "F" - Testing of the "Flow Switch" is allowed.
  - 3. field: "S" - Testing of the safety thermostat is allowed
  - 4. field: "L" - Testing of the water level in the boiler is permitted (not all options are supported in some versions)
19. Outside temperature (if the outdoor temp. sensor is connected)
20. O.T.C. mode symbol (sun/moon) or daily profile
21. Snowflake symbol ( ❄ ) indicates that it is activated "Antifreeze Liquid" mode - the boiler is protected against freezing with antifreeze.

## 24h profile in OTC mode and definition of working curves

The picture on the left below shows the layout of the submenu for programming the 24h profile in OTC mode. It can be seen that for each period of 1h, the desired operating curve is set: Comfortable (☀), Economical (☐), or a constant temperature value. A similar setting principle is used for Individual work per 24h profile (in the second submenu), but temperatures are set there for every 1h. The image on the right shows the layout of the submenu for setting the Comfortable operating curve in OTC mode. For the 5 reference points of the external temperature, the boiler pressure line temperatures are set. The same adjustment principle applies to the Economic Operating Curve.



## Technical data TK-Profesional 50 ÷ 100kW



		Unit	TK-Profesional 50kW	TK-Profesional 60kW	TK-Profesional 70kW	TK-Profesional 80kW	TK-Profesional 90kW	TK-Profesional 100kW
<b>Power</b>		kW	50	60	70	80	90	100
<b>Dimensions</b>	<b>A</b>	mm	1165	1165	1220	1220	1220	1220
	<b>B</b>	mm	400	400	500	500	500	500
	<b>C</b>	mm	530	530	665	665	665	665
	<b>D</b>	mm	215	215	235	235	235	235
	<b>E</b>	mm	80	80	110	110	110	110
	<b>F</b>	mm	740	740	735	735	735	735
	<b>G</b>	mm	130	130	140	140	140	140
	<b>H</b>	mm	215	215	255	255	255	255
<b>Device mass (empty)</b>		kg	72	75	92	106	110	120
<b>Volume of water in the boiler</b>		ℓ	60	60	90	90	90	90
<b>Connections to the hydraulic network</b>			DN40 (6/4'') PN16	DN40 (6/4'') PN16	DN50 (2'') PN16	DN50 (2'') PN16	DN50 (2'') PN16	DN50 (2'') PN16
<b>Max. concentration of glycol in the medium</b>		%	30					
<b>Max. allowable working pressure (software)</b>		bar	4,0					
<b>Min. allowable working pressure (software)</b>		bar	0,4					
<b>Safety valve</b>		bar	½'' 4,5bar	½'' 4,5bar	¾'' 4,5bar	¾'' 4,5bar	¾'' 4,5bar	¾'' 4,5bar
<b>Level of protection</b>			IP20					
<b>Connection voltage</b>		V AC	3N ~ 400/230V 50Hz					
<b>Level of efficiency</b>		%	99	99	99	99	99	99
<b>Heaters</b>		kW	5×10	6×10	7×10	8×10	9×10	10×10
<b>Heating group</b>		kW	5×10	6×10	7×10	8×10	9×10	10×10
<b>Heater fuses</b>		A	5 x 3p C25A	6 x 3p C25A	7 x 3p C25A	8 x 3p C25A	4 x 3p C40A + 1 x 3p C25A	5 x 3p C40A
<b>Compact switch (36kA) with voltage release</b>			Noark Ex9M1S 160A (36kA)	Noark Ex9M1S 160A (36kA)	Noark Ex9M1S 160A (36kA)	Noark Ex9M1S 160A (36kA)	Noark Ex9M1S 160A (36kA)	Noark Ex9M1S 160A (36kA)
<b>Nominal current</b>		A	3×72,5	3×87	3×101,5	3×116	3×130	3×145
<b>Recommended main fuses</b>		A	3×80	3×100	3×125	3×125	3×160	3×160
<b>Minimum cross-section of the power cable</b>		mm <sup>2</sup>	Kabl Cu 3×25	Kabl Cu 3×35	Kabl Cu 3×35	Kabl Cu 3×50	Kabl Cu 3×50	Kabl Cu 3×70
<b>Minimum cross-section of the protective conductor</b>		mm <sup>2</sup>	Cu 1×16	Cu 1×16	Cu 1×25	Cu 1×25	Cu 1×25	Cu 1×35
<b>Range of boiler temperature regulation</b>		°C	10 ÷ 90					
<b>Safety thermostat</b>		°C	95					
<b>Microprocessor thermoregulator (CPU)</b>			EK_CPU_1_5 fw: vs15.03.005					
<b>Communication with cascade / protocol</b>			RS485_RTU / ModBus					
<b>Communication with BMS / protocol</b>			RS485_RTU / ModBus					

## Tehnickal data TK– Profesional 120 ÷ 240kW

	Unit	TK-Profesional 120kW	TK-Profesional 140kW	TK-Profesional 160kW	TK-Profesional 180kW	TK-Profesional 200kW	TK-Profesional 240kW
Power	kW	120	140	160	180	200	240
Dimensions	A	mm	1470	1470	1470	1470	1470
	B	mm	605	605	605	605	605
	C	mm	665	665	665	665	665
	D	mm	255	255	255	255	255
	E	mm	120	120	120	120	120
	F	mm	765	765	765	765	765
	G	mm	330	330	330	330	330
	H	mm	250	250	250	250	250
Device mass (empty)	kg	150	170	190	220	240	270
Volume of water in the boiler	ℓ	165	165	165	165	165	165
Connections to the hydraulic network		DN65 (2½'') PN16	DN65 (2½'') PN16	DN65 (2½'') PN16	DN65 (2½'') PN16	DN65 (2½'') PN16	DN65 (2½'') PN16
Max. concentration of glycol in the medium	%	30					
Max. allowable working pressure (software)	bar	4,0					
Min. allowable working pressure (software)	bar	0,4					
Safety valve	bar	¾'' 4,5bar	¾'' 4,5bar	¾'' 4,5bar	¾'' 4,5bar	¾'' 4,5bar	¾'' 4,5bar
Level of protection		IP20					
Connection voltage	V AC	3N ~ 400/230V 50Hz					
Level of efficiency	%	99	99	99	99	99	99
Heaters	kW	6×20	7×20	8×20	9×20	10×20	12×20
Heating group	kW	6×20	7×20	8×20	9×20	10×20	6×40
Heater fuses	A	6 x 3-p C40A	7 x 3-p C40A	8 x 3-p C40A	9 x 3-p 40A	10 x 3-p C40A	12 x 3-p C40A
Compact switch (36kA) with voltage release		2 x Noark Ex9M1S 160A (36kA)	2 x Noark Ex9M1S 160A (36kA)	2 x Noark Ex9M1S 160A (36kA)	2 x Noark Ex9M1S 160A (36kA)	2 x Noark Ex9M1S 160A (36kA)	2 x Noark Ex9M2S 250A (36kA)
Nominal current	A	3×174	3×203	3×232	3×261	3×290	3×348
Recommended main fuses	A	3×200	3×250	3×250	3×300	3×315	3×400
Minimum cross-section of the power cable	mm <sup>2</sup>	2 Kabla Cu 3×35	2 Kabla Cu 3×50	2 Kabla Cu 3×50	2 Kabla Cu 3×70	2 Kabla Cu 3×70	2 Kabla Cu 3×95
Minimum cross-section of the protective conductor	mm <sup>2</sup>	Cu 1×35	Cu 1×35	Cu 1×50	Cu 1×50	Cu 1×70	Cu 1×70
Range of boiler temperature regulation	°C	10 ÷ 90					
Safety thermostat	°C	95					
Microprocessor thermoregulator (CPU)		EK_CPU_1_5 fw: vs15.03.005					
Communication with cascade / protocol		RS485_RTU / ModBus					
Communication with BMS / protocol		RS485_RTU / ModBus					

## Technical sheet (in accordance with the regulation EU br. 811/2013)

1.	Manufacturer		MIKOTERM DOO
2.	Product name		TK-Profesional
3.	Models	I	TK-Profesional 50kW
		II	TK-Profesional 60kW
		III	TK-Profesional 70kW
		IV	TK-Profesional 80kW
		V	TK-Profesional 90kW
		VI	TK-Profesional 100kW
		VII	TK-Profesional 120kW
		VIII	TK-Profesional 140kW
		IX	TK-Profesional 160kW
		X	TK-Profesional 180kW
		XI	TK-Profesional 200kW
		XII	TK-Profesional 240kW

				I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
4.	Room heating: seasonal class of energy efficiency			D	D	D	D	D	D	D	D	D	D	D	D
5.	Room heating: Nominal heat output (*8) (*11)	Prated	kW	50	60	70	80	90	100	120	140	160	180	200	240
6.	Room heating: Seasonal energy efficiency (*8)	$\eta_s$	%	37,87	37,95	38	38,02	38,04	38,07	38,09	38,12	38,20	38,24	38,27	38,30
7.	Annual energy consumption (*8)	QHE	kWh	59425	71310	83195	95080	106965	118550	142620	166390	190160	213930	237700	285240
8.	Noise level, internal	LWA unutrašnja	dB(A)	50	52	54	55	56	58	60	62	64	66	68	70
9.	 All special precautions for assembly, installation and maintenance are described in the operating and installation instructions. Read and follow the instructions for use and installation.														
10.	 All data included in the product information are determined by applying the specifications of the relevant European directives. Differences in data reported elsewhere may result in different test conditions. Only the information contained in this product data sheet is applicable and valid.														

(\*8) For average climatic conditions

(\*11) For boilers and combined boilers with a heat pump, the rated thermal power "Prated" is equal to the design load in the heating mode "Pdesignh", and the rated thermal power for the auxiliary boiler "Psup" is equal to the additional heating output "sup" (Tj)

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