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Laboratorium Badawcze i Wzorcujące
Laboratorium badawcze akredytowane przez
Polskie Centrum Akredytacji, sygnatariusza porozumień EA MLA i ILAC MRA
dotyczy wzajemnego uznawania wyników badań.
Nr akredytacji AB 024

REPORT

Number B/2025/393K dated: 21.07.2025

Subject:	Interpolation calculations for UnicPel 24 solid fuel heating boiler with heat output 24 kW		
Interpolations performed for:	Mareli Systems LTD		
	Lyulin, bl.821, ap.1:		
	Sofia 1336 Bulgaria		
Interpolations performed at:	Zakłady Badań i Atestacji „ZETOM” im. Prof. F. Stauba w Katowicach		
	Sp. z o.o. - Research and Calibration Laboratory "ZETOM" Katowice		
Customer order index:	Test Order	dated:	07.07.2025
The order was registered at the laboratory under the number:			B/2025/393K
Interpolations started on:	21.07.2025	**Interpolations completed on:**	21.07.2025
The report contains:	7 pages		
3 copies have been issued to:			
1.	Mareli Systems LTD		
2.	Mareli Systems LTD		
3.	LT		
Interpolations supervised by:	Ph.D., Eng. Bartosz Węcki		
Interpolations performed by:	Józef Nowak	at laboratory:	WG
Report prepared by:	Justyna Świerkot		

Authorised by: **Approved by:**

Zakłady Badań i Atestacji „ZETOM”

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Institutions for Research and Certification “ZETOM” Ltd.

European Union notified body No. 1436,

For the following directives: construction, low voltage, machine

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FINDINGS

A. Obligatory:

1. This test report is the property of the ordering party for which the tests were performed.

2. This test report and the information contained herein may only be used with the consent of the owner of the Report.

3. This test report may only be used in its entirety.

4. All test and measurement results presented in this Report apply only to the tested objects and do not constitute an approval of their quality.

5. The work was carried out in accordance with the work implementation plan established for it, in accordance with the requirements of the Research and Calibration Laboratory management system guide.

6. When making reference to this Report, use the following (or equivalent) sentence:

Tested by the "ZETOM" Research and Calibration Laboratory in Katowice, which is accredited by the Polish Centre for Accreditation in Warsaw within the scope defined in the appendix to Certificate No. AB 024

B. Additional (listed in the Report) p.

C. Anomalies (listed in the Report) p.

When using the report’s content, the Report Owner is obliged to cite that it is using results obtained by the Testing and Calibration Laboratory of Zakłady Badań i Atestacji “ZETOM” im. Prof. F. Stauba w Katowicach Sp. z o.o., accredited by the Polish Centre for Accreditation.

Table of Contents

----END OF PAGE 3----

1. Basis of testing

1.1. Name of the ordering party's document:	Ordering Party Mareli Systems LTD for the performance of tests at the Test and Calibration Laboratory "ZETOM" Katowice
1.2. Identification of the ordering party's document:	Order no. B/2025/393K
1.3. Regards:	Performance of interpolation calculations

2. Purpose of testing

The purpose of the order was to perform interpolation calculations in accordance with PN-EN 303-5:2021+A1:2023-05.

According to PN-EN 303-5:2021+A1:2023-05, it is enough to carry out tests with the smallest and largest boiler of the same design while maintaining the ratio of the nominal heat output of the largest to the smallest boiler of less than or equalling 2: 1. However, if this ratio is greater than 2: 1 within the same series, as many intermediate sizes are to be tested as necessary to ensure that this ratio is not exceeded. The boiler manufacturer must provide a boiler whose values are determined by linear interpolation depending on the rated heating output and meet the requirements of PN-EN 303-5:2021+A1:2023-05. Based on analyses of technical documentation and drawings carried out on 21.07.2025, the UnicPel 18 i 30 boiler type series with heat output 18 and 30 kW, it is confirmed that the UnicPel 24 boiler with heat output 24 has the same design as UnicPel 18 and 30 boilers heat output 18 and 30 kW. According to the manufacturer, the UnicPel 24 boiler characterised by a nominal power of 24 kW. According to the manufacturer, the boiler as designed uses the following fuel: wood pellets. The manufacturer declared that the boilers used for the tests were sampled from serial production in an unchanged form and thus were representative of the production in terms of design and equipment. The values of the UnicPel 24 heat output 24 boiler depend on the nominal heat output determined by linear interpolation of the values specified in the UnicPel 18 heat output 18 kW and UnicPel 30 heat output 30 kW type tests. Interpolated boiler efficiency based on dry flue gas at 0° C, 1013 hPa and hypothetical oxygen content in flue gas of 10% vol. O2, (other than the energy value of the fuel supplied to the furnace), interpolated emission values and electrical power consumption values of the UnicPel 30 heat output 30 kW boiler.

----END OF PAGE 4----

3. Test object

Object name:	Solid fuel heating boiler UnicPel 24 heat output 24 kW
Ordering Party:	Mareli Systems LTD, Lyulin, bl.821, ap.1: Sofia 1336 Bulgaria
Manufacturer:	Mareli Systems LTD, Lyulin, bl.821, ap.1: Sofia 1336 Bulgaria
Place of manufacture:	Mareli Systems Industrial Zone Simitli, 2730; Region Blagoevgrad; Bulgaria
Method of delivery to test objects:	Customer

4. Characteristics of the test boiler

4.1 Boiler description

The UnicPel 24 boiler, with a nominal power of 24 kW, is designed for the combustion of wood biomass in the form of pellets. The boiler consists of a water jacket and an automatic fuel feeder along with a fuel hopper. The water jacket of the boiler is made from steel sheets joined together by welding. The internal sheets of the boiler jacket, where the heat exchange between flue gases and water occurs, have a thickness of 5 mm. The remaining sheets of the jacket are 4 mm thick. In the lower part of the boiler, a drop-in combustion chamber is located. At the rear, in the lower part of the boiler, all system connections are situated, including those for the water, flue gas, and air supply systems. The boiler jacket and doors are thermally insulated. Combustion waste is collected in the ash pan space below the combustion basket. The furnace has an access hatch with doors for ash removal. The convective section is formed by a heat exchanger with a cuboid shape, featuring a tubular exchanger at the top. The heat exchange section consists of a two-pass system of vertical fire tubes. From the last pass of the fire tubes, the flue gases exit into the flue gas outlet. The combustion chamber, along with the ash pan, has a water jacket on the side surface, and at the bottom, there is a smoke chamber. The boiler is equipped with a drawer that facilitates ash removal through the lower front doors of the boiler. In the upper part of the boiler, there is an access hatch to the upper smoke chamber, where a manually operated mechanism for shaking off deposits from the fire tubes is also located. All hatches are closed with thermally insulated doors or covers. The flue gas outlet (fan stub) is the element connecting the last pass of the heat exchanger's fire tubes to the chimney. It is located behind the boiler and directed backwards. The flue gas outlet stub has a circular shape with a diameter of 80 mm. The boiler has threaded stub connections for the supply and return side, as well as

a stub for the combustion air intake. The fuel hopper, with a capacity of 108 kg of pellets, is located at the top of the boiler, directly above the screw feeder. It is made of steel sheet and shaped to ensure the fuel slides down. The thermal insulation and casing are made of mineral wool placed in cassettes of steel sheets, which are either coated or painted on both sides.

5. Interpolation results

5.1 Comparison of interpolation results with the requirements of PN-EN 303-5:2021+A1:2023-05

Comparison of the results determined by interpolation on the basis of tests performed, registered under numbers B/2025/225K and B/2025/240K in Accredited Testing Laboratory No. AB024 with the requirements given in the standard PN-EN 303-5:2021+A1:2023-05 for Class 5, which implements the requirements of Commission Regulation (EU) 2015/1189 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council and Commission Delegated Regulation (EU) 2015/1187 of 27 April 2015 with regard to requirements for solid fuel boilers.

Table 1. Selected interpolated parameters

Parameter	Unit	**24 kW**	
		Rated output	*Minimum output*
Fuel jet	*kg/h*	5,22	1,47
Flue gas temperature	*°C*	123,99	77,56
Flue gas mass flow	*kg/h*	73,76	28,62
Water flow resistances	*mbar*	***Δ10 K*** 7,24	***Δ20 K*** 3,69

----END OF PAGE 6----

Table 2. Interpolated emission-energy and seasonal parameters

Type designation: **UnicPel 24 heat output 24 kW**

Fuel: **Wood pellets**

Emissions	**Rated output**	Carbon monoxide	E_{CO}	mg/m^3_n	290,46	≤ 500
		Nitrogen oxides, calculated as NO_2	E_{NOx}	mg/m^3_n	159,10	-
		Organic gaseous compounds	E_{OGC}	mg/m^3_n	14,40	≤ 20
		Dust	E_{PM}	mg/m^3_n	14,58	≤ 40
	Minimum output	Carbon monoxide	E_{CO}	mg/m^3_n	357,95	≤ 500
		Nitrogen oxides, calculated as NO_2	E_{NOx}	mg/m^3_n	156,25	-
		Organic gaseous compounds	E_{OGC}	mg/m^3_n	15,46	≤ 20
		Dust	E_{PM}	mg/m^3_n	19,18	≤ 40
	Seasonal	Carbon monoxide	$E_{s, CO}$	mg/m^3_n	347,83	≤ 500
		Nitrogen oxides, calculated as NO_2	$E_{s, NOx}$	mg/m^3_n	156,68	≤ 350
		Organic gaseous compounds	$E_{s, OGC}$	mg/m^3_n	15,31	≤ 20
		Dust	$E_{s,p}$	mg/m^3_n	18,49	≤ 40
Heat properties	Seasonal space heating energy efficiency in active mode		η_{son}	%	85,20	-
	Seasonal space heating energy efficiency		η_s	%	81,65	≥ 77
	Rated output	Generated useful heat	P_n	kW	24,17	-
		Useful efficiency	η_n	%	85,88	-
		Efficiency	η_{cn}	%	92,71	88,38
	Minimum output	Generated useful heat	P_p	kW	6,76	-
		Useful efficiency	η_p	%	85,08	-
		Efficiency	η_{cp}	%	91,86	87,86
Electrical characteristics	Auxiliary energy consumption, rated output		el_{max}	kW	0,0295	-
	Auxiliary energy consumption, minimum output		el_{min}	kW	0,0130	-
	Auxiliary energy consumption, standby mode		P_{SB}	kW	0,0031	-
	Boiler energy efficiency index		**EEI**	-	119,99	-
	Energy efficiency class		**-**	-	A+	-

*) the emissions listed above are related to dry exhaust gas containing 10% oxygen in the normal state, at a temperature of 273.15K and a pressure of 1013.25 mbar

6. Conclusion

The interpolation results presented in the report apply only to UnicPel 24 heat output 24 kW boilers with.

--END OF REPORT--