

SZU

ŚWIADECTWO BADANIA

Numer **O-B-01575-23**

Klient	PPH KOSTRZEWA Sp.j. ul. Przemysłowa 11A 11-500 Giżycko Polska
Wyrób	Kociół wodny
Oznaczenie typu	Twin Bio NE 16, Twin Bio NE 24
Wymogi dotyczące ekoprojektu	Rozporządzenie Komisji (UE) nr 2015/1189, Załącznik II, Art. 1 Rozporządzenie Komisji (UE) nr 2015/1187
Metoda badania	ČSN EN 303-5+A1:2023
Sposób ogrzewania	automatyczny
Preferowane paliwo	pelety drzewne

Typ		Twin Bio NE 16	Twin Bio NE 24
Moc nominalna			
CO (10% O ₂)	mg/m ³	3	76
OGC (10% O ₂)	mg/m ³	4	6
Pył (10% O ₂)	mg/m ³	21	28
NOx (10% O ₂)	mg/m ³	166	162
Sprawność	%	91,2	88,4
Sprawność użytkowa	%	83,4	80,9
Moc minimalna			
CO (10% O ₂)	mg/m ³	432	271
OGC (10% O ₂)	mg/m ³	10	5
Pył (10% O ₂)	mg/m ³	18	15
NOx (10% O ₂)	mg/m ³	144	140
Sprawność	%	87,8	89,0
Sprawność użytkowa	%	80,3	81,5

CO (10% O ₂)	mg/m ³	368	341
OGC (10% O ₂)	mg/m ³	9	5
PyI (10% O ₂)	mg/m ³	18	17
NOx (10% O ₂)	mg/m ³	147	143

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/hologram z logo SZU/

Instytut Badawczy Przemysłu Maszynowego, przedsiębiorstwo państwowe, Hudcova 424/56b, 621 00 Brno,
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/logo/
SZU

Typ		Twin Bio NE 16	Twin Bio NE 24
η_{son}	%	80,8	81,4
F1	%	3,0	3,0
F2	%	1,8	1,6
Sezonowa efektywność energetyczna ogrzewania pomieszczeń			
η_s	%	76	77
Współczynnik efektywności energetycznej			
EEI		112	113
Klasa efektywności energetycznej			
		A+	A+

Podstawa wydania świadectwa Raport nr
32-10959/1/T oraz raporty uzupełniające
wydane przez Laboratorium badawcze nr 1045.1, akredytowane
przez CAI, Certyfikat akredytacji nr 205/2022

Instytut Badawczy Przemysłu Maszynowego niniejszym świadectwem badania potwierdza przeprowadzenie dla przedmiotowego wyrobu badania i obliczeń z podanymi powyżej wynikami.

Brno, 2023-10-02

/okrągła pieczęć z logo SZU w środku i napisem w otoku: STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s.p., CZ 1/

/nieczytelny podpis odręczny/

Milan Holomek

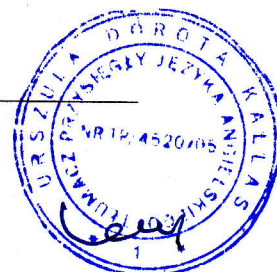
Dyrektor jednostki badawczej w zakresie urządzeń grzewczych
i ekologicznych

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Ja, Urszula Dorota Kallas, tłumacz przysięgły języka angielskiego i francuskiego,
wpisana na listę tłumaczy przysięgłych Ministra Sprawiedliwości pod numerem
TP/4520/05, stwierdzam, że niniejsze tłumaczenie w pełni odpowiada
przedstawionemu mi oryginałowi dokumentu.
Warszawa, 12.10.2023 r. Rep. Nr 910/2023





Strojírenský zkušební ústav, s.p., Brno, Česká republika
Engineering Test Institute, Public Enterprise, Czech Republic

OSVĚDČENÍ O ZKOUŠCE CERTIFICATE OF TEST

Číslo
Number

O-B-01575-23

Výrobce – *Manufacturer*

PPH KOSTRZEWA Sp.j.
ul. Przemysłowa 11A
11-500 Giżycko
Polsko – *Poland*

Výrobek – *Product*

Kotel teplovodní – *Hot-water boiler*

Typové označení – *Type designation*

Twin Bio NE 16, Twin Bio NE 24

Požadavky na ekodesign – *Ecodesign requirements*

Nařízení Komise (EU) č. 2015/1189, příloha II, čl. 1
Commission Regulation (EU) No. 2015/1189, Annex II, Art. 1
Nařízení Komise (EU) č. 2015/1187
Commission Regulation (EU) No. 2015/1187

Metoda zkoušek – *Test method*

ČSN EN 303-5+A1:2023

Způsob topení – *Heating method*

Automatické – *Automatic*

Preferované palivo – *Preferred fuel*

Dřevní pelety – *Wood pellets*

Výsledky – *Results*

Typ – *type*

Twin Bio NE 16

Twin Bio NE 24

Jmenovitý výkon – *Nominal output*

CO (10% O ₂)	mg/m ³	3	76
OGC (10% O ₂)	mg/m ³	4	6
Prach – <i>Dust</i> (10% O ₂)	mg/m ³	21	28
NOx (10% O ₂)	mg/m ³	166	162
Účinnost – <i>Efficiency</i>	%	91.2	88.4
Užitečná účinnost – <i>Useful efficiency</i>	%	83.4	80.9

Snížený výkon – *Minimal output*

CO (10% O ₂)	mg/m ³	432	271
OGC (10% O ₂)	mg/m ³	10	5
Prach – <i>Dust</i> (10% O ₂)	mg/m ³	18	15
NOx (10% O ₂)	mg/m ³	144	140
Účinnost – <i>Efficiency</i>	%	87.8	89.0
Užitečná účinnost – <i>Useful efficiency</i>	%	80.3	81.5

Sezonní emise – *Seasonal emissions*

CO (10% O ₂)	mg/m ³	368	241
OGC (10% O ₂)	mg/m ³	9	5
Prach – <i>Dust</i> (10% O ₂)	mg/m ³	18	17
NOx (10% O ₂)	mg/m ³	147	143

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Strojírenský zkušební ústav, s.p., Hudcova 424/56b, 621 00 Brno, Česká republika
Engineering Test Institute, public enterprise, Hudcova 424/56b, 621 00 Brno, Czech Republic

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Typ – type		Twin Bio Ne 16	Twin Bio Ne 24
η_{son}	%	80.8	81.4
F1	%	3.0	3.0
F2	%	1.8	1.6
Sezonní energetická účinnost – Seasonal space heating energy efficiency			
η_s	%	76	77
Index energetické účinnosti – Energy Efficiency Index			
EEI		112	113
Třída energetické účinnosti – Energy Efficiency Class			
		A+	A+

Podklad pro vydání osvědčení
Basis for Certificate issue

Protokoly č. – Reports No.
32-10959/1/T a protokoly navazující – and follow-up reports,
vydané Zkušební laboratoří č. 1045.1, akreditovanou ČIA o.p.s.,
číslo osvědčení o akreditaci 205/2022
issued by Testing Laboratory No. 1045.1, accredited by CAI,
Accreditation Certificate No. 205/2022

Strojírenský zkušební ústav, s.p. tímto osvědčením o zkoušce potvrzuje, že u předmětného výrobku provedl zkoušky a výpočty s výše uvedenými výsledky.
The Engineering Test Institute certifies by this Certificate of Test to have conducted for the given product the test and calculation with above stated results.

Brno, 2023-10-02



Milan Holomek

Vedoucí zkušebny tepelných a ekologických zařízení
Head of Heat and Ecological Equipment Test Station



Testing Laboratory 1045.1 accredited by the Czech Accreditation Institute pursuant to

ČSN EN ISO/IEC 17025:2018

Strojírenský zkušební ústav, s.p. Zkušební laboratoř
(Engineering Test Institute, Public Enterprise, Testing Laboratory)
Hudcova 424/56b, Medlánky, 621 00 Brno

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TEST REPORT

32-10959/1/T

Product: Hot-water boiler for solid fuel (wood pellets) with automatic fuel supply

Type designation: Twin Bio NE 10, Twin Bio NE 12
Twin Bio NE 16, Twin Bio NE 24

Customer: PPH KOSTRZEWA Sp.j.
ul. Przemysłowa 11A
11-500 Giżycko
POLAND

Manufacturer: PPH KOSTRZEWA Sp.j.
ul. Przemysłowa 11A
11-500 Giżycko
POLAND

Employee responsible: Ing. Vladimír Foit

Report issue date: 2023-09-25

Distribution list: 1 copy to the Customer
1 copy to the Engineering Test Institute

This document may be copied in its entirety without written consent of the Engineering Test Institute. Partial copies are subject to approval. The results of the tests and verifications shall relate only to the products tested as received or presented. The testing laboratory is not responsible for the data provided by the customer specified in the report.

SP-2021-000012_1_10

I. Description of product tested

The hot-water boilers for solid fuel (wood pellets) with automatic fuel supply, Twin Bio NE are intended for heating of family houses, office buildings, small businesses, etc.

The body of boiler is from welded steel sheets. The boiler is de-signed for burning of wood pellets. The burner for wood pellets is situated on the side in the lower part of the boiler, combustion air is provided by the fan, pellets are supplied by a screw feeder from fuel hopper. The hot flue gas goes through the boiler body from combustion chamber to heat exchanger. The flue gas leaves the boiler through the socked situated at the rear side of the boiler. Water connections are at the rear of the boiler.

Boiler body is insulated with mineral insulation. The covering is made of steel sheets. Electronic control unit is situated in the upper part of the front side of the boiler.

In terms of air supply, the manufacturer has specified the product as **category 1** based on the standard ČSN EN 303-5+A1:2023 (EN 303-5+A1:2022).

Further detailed descriptions of individual assembly groups are provided in the enclosed technical documentation to task 32-10959 and 32-0484.

Since the monitored properties of product hot water boilers for solid fuel, type **Twin Bio NE**, have not changed since the last certification, the results obtained during the previous certification process were used. These results were supplemented with the required results and evaluation of the ČSN EN 303-5+A1:2023 standard.

II. Sample tested

Table 1

SZU reg. no.	Product name	Date of submission
0211.18.18280.000	Twin Bio NE 16	2018-11-30
0211.18.18281.000	Twin Bio NE 24	
0211.17.17641.000	Twin Bio NE 10	2017-10-23
0211.17.17641.000	Twin Bio NE 12	2017-10-23

Boiler output versions that are the subject of the proceedings:

Table 2

Boiler output version	Heat output	Fuel	Maximum operating pressure [MPa]	Maximum operating temperature [°C]
Twin Bio NE 10	10 kW	Wood pellets (ČSN EN ISO 17225-2:2021)	0.2	80
Twin Bio NE 12	12 kW			
Twin Bio NE 16	16 kW			
Twin Bio NE 24	23 kW			

The visual inspection, tests and verification were carried out by Bc. Petr Matoušek and Ing. Michal Havlů at the test station of SZU in Brno, in 12/2018 and 10/2017.

The tests were performed using measuring and testing equipment with valid calibration.

III. Measuring and test equipment:

Table 3

No.	Description	Inventory number	Calibration valid until	Accuracy
1.	Combustion product analyser, Horiba, type ENDA-680P	022394	calibration prior to each measurement	see CRM 190/16 see CRM 103000414644
2.	Weighing machine	022342	02/2019	see 6051-KL-H0334-17
3.	Induction flow meter	022389-C/1	10/2021	see KL 6015-KL-P0446-17
4.	Temperature measurement set	022399-D/8	11/2020	see KL-T-0116-18
5.	Thermometer, Moisture meter	116258	12/2021	see KL 10595/2018
6.	Barometer	112541	01/2019	see KL 6013-KL-K0001-14
7.	Draught gauge	MaR11-Tah	06/2019	see KL 6013-KL-C0423-17
8.	Electronic stop watch	990760	11/2022	see KL 2955E-12
9.	Gravimat SHC 501	022328	04/2022	see KL 150046-150051
10.	Analytic weighing machine Sartorius	021682	05/2019	see KL 19/KA-17
11.	Electronic thermometer	116557	03/2019	see KL 160066
12.	Electrometer	022389-A/4	05/2025	see KL 039/15/E
13.	Induction water meter	116320	04/2024	see KL Q 0254/2012
14.	Weighing machine	022151	02/2019	see 6051-KL-H0120-17
15.	Weighing machine	022211	02/2019	see 6051-KL-H0333-17
16.	Tape measure	ME 477	03/2022	see KL 1908/2017

Uncertainty of measurement

Table 4

Parameter measured	Uncertainty of measurement
CO	±10 %
THC/OGC	±10 %
NO _x	±5 %
O ₂	±5 %
CO ₂	±5 %
Dust	±10 mg/m ³ from measured values

“The above-specified extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient, $k=2$, corresponding to the coverage certainty of 95% for standard classification. The uncertainties do not reflect the impact of sample taking and lack of homogeneity. The standard uncertainty was determined in accordance with Document EA 4/02.”

IV. Methods, results of tests and verifications

Table 5

No.	Requirement	Standard or technical regulation applied	Source materials	Test evaluation*
1.	Pressurized component tightness and strength test (T 001*)	ČSN EN 303-5+A1:2023 Art. 5.4, 5.4.1, 5.4.2	Page 5	+
2.	Test for gas side soundness (T 001*)	ČSN EN 303-5+A1:2023 Art. 4.3.8, 5.16.6, 5.18.1	Page 6	+
3.	Test of hydraulic pressure drop (T 001*)	ČSN EN 303-5+A1:2023 Art. 5.10	Pages 7 – 8	+
4.	Surface temperature test (T 001*)	ČSN EN 303-5+A1:2023 Art. 5.11, 5.16.4, 4.3.7	Pages 9 – 13	+
5.	Test of heat output, input and efficiency (T 001*) Test of combustion product temperature (T 001*)	ČSN EN 303-5+A1:2023 Art. 4.4.2, 4.4.3, 5.2, 5.3, 5.6 to 5.9	Pages 14 – 22	+
6.	Electrical consumption (T 071*)	ČSN EN 303-5+A1:2023 Art. 5.7.7 ČSN EN 15456:2008 Art. 5	Page 23	+
7.	Combustion efficiency test – emissions (T 001 *)	ČSN EN 303-5+A1:2023 Art. 4.4.7, 5.6.3, 5.6.4, 5.8, 5.9.4	Pages 24 – 32	+
8.	Test of control, regulation and safety elements (T 001*) Combustion efficiency test – emissions (T 001*)	ČSN EN 303-5+A1:2023 Art. 5.13, 5.14, 5.16.1, 5.16.2, 5.16.3, 5.17 ČSN EN 303-5+A1:2023 Art. 5.8, 5.9.4	Pages 33 – 36	+
*) Evaluation / statement of conformity: +Requirement fulfilled -Requirement not fulfilled				
			0 Not applicable x Not evaluated	

Note:

The stated extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient $k=2$, corresponding to the coverage certainty of 95% as regards standard classification.

If a statement of conformity is provided, the decision rule pursuant to ILAC-G8:09/2019, Art. 4.2.1 - binary statement for the simple acceptance rule shall apply.

Test objective:	Pressurized component tightness and strength test
Exact name of the test procedure:	T 001*
Test method:	ČSN EN 303-5+A1:2023 Art. 5.4, 5.4.1, 5.4.2
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Test results:

Requirement	Requirement specification	Test evaluation	Note
Pressure test for boilers of sheet or sheet metal of non-ferrous metal	ČSN EN 303-5+A1:2023 Art. 5.4		
Tests to be carried out before production The type test pressure is $2 \times PS$ using hydraulic pressure where PS is the maximum permissible operating pressure. The test period shall be at least 10 min and if it is to apply to a range of boilers, the test shall be carried out on at least 3 boiler sizes (smallest, medium, and largest size). No leakage or noticeable permanent deformation shall occur during the test. A record shall be made of the test, including the following details: - exact description of the boiler tested by stating the drawing number; - test pressure in bar and duration of the test; - test result; - place and date of the test, including the names of persons carrying out the test.	ČSN EN 303-5+A1:2023 Art. 5.4.1	+ + + + +	Enclosed technical documentation
Test during production Each boiler shall be tested during the production and the test pressure shall be at least $1.43 \times PS$. NOTE A hydraulic test is recommended as it is safer than a pneumatic test.	ČSN EN 303-5+A1:2023 Art. 5.4.2	+	

Test date: 2018-12-03

Ambient conditions:

22.0 °C	28.2 %	97.896 kPa
temperature	relative humidity	barometric pressure

Maximum working pressure [MPa]	Prescribed testing pressure [MPa]	Preset testing pressure [MPa]	Test medium	Test time [min]
0.20	0.40	0.40	water	30

Test evaluation:

No leakages or visible permanent deformations appeared during the test.

Test objective:	Test for gas side soundness
Exact name of the test procedure:	T 001*
Test method:	ČSN EN 303-5+A1:2023 Art. 4.3.8, 5.16.6, 5.18.1
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Test results:

Requirement	Requirement specification	Test evaluation	Note
Leakage of the boilers category 1 For boilers designed to operate with a positive pressure in the combustion chamber when tested in accordance with Art. 5.5.2.4 at a test-pressure of 1,2 times the gas side resistance at nominal heat output, the leakage rate based on mass flow shall not exceed 2 % of the flue gas mass flow at the nominal heat output. The gas side resistance shall be determined for manual stoked boilers with the fuel chamber filled to maximum capacity (as specified by the manufacturer). These requirements are fulfilled for positive pressure boilers category 3. <i>NOTE: For boilers designed to operate with negative pressure, the leakage rate measured according to Art. 5.6 characterizes the boiler.</i>	ČSN EN 303-5+A1:2023 Art. 4.3.8	0	Negative pressure
		+	
Test for gas side leakage This test is for boilers with positive pressure in the combustion chamber (category 1) and boilers category 2 and 3. The actual leakage rate of the boiler is determined using air at ambient temperature and using a test rig in accordance with (for example) Figure 2. Exhaust connection and connection to the fuel line shall be sealed tightly for boilers category 1, and the doors set as in normal use. The test rig is connected to the air input of the test boiler. For boilers category 2 and category 3 the joint to the air supply duct and flue gas evacuation system shall be part of the leakage test setup. The leakage rates measured are to be converted in accordance with the standard test condition (0°C, 1013 mbar). The requirements of 4.2.5.2 or 4.3.8 shall be met. The test shall be performed after safety and performance test (5.7 to 5.18)	ČSN EN 303-5+A1:2023 Art. 5.16.6	0	
NOTE The test for boilers category 1 operating with negative pressure can be performed under a pressure of 20 Pa (see Figure 2, measuring point 10).		+	

Test objective:	Test of hydraulic pressure drop
Exact name of the test procedure:	T 001*
Test method:	ČSN EN 303-5+A1:2023 Art. 5.10
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Test results:

Requirement	Requirement specification	Evaluation	Note
Determination of the waterside resistance The water side resistance (measured in mbar) shall be determined for the flow which is equivalent to the rated output of the boiler at a temperature difference of $\Delta t = 10\text{ K}$ and 20 K between the flow and return.	ČSN EN 303-5+A1:2023 Art. 5.10	+	

Note:

+	Compliant
-	Non-compliant
0	Not applicable
x	Not assessed

Measurement results: Twin Bio NE 10

no.	Q	ΔP
[-]	$[\text{m}^3 \cdot \text{h}^{-1}]$	[mbar]
differences of 20 K	0.452	3.0
differences of 10 K	0.904	11.0

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 12

no.	Q	ΔP
[-]	$[\text{m}^3 \cdot \text{h}^{-1}]$	[mbar]
differences of 20 K	0.493	4.0
differences of 10 K	0.986	12.0

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 16

no.	Q	ΔP
[-]	$[\text{m}^3 \cdot \text{h}^{-1}]$	[mbar]
differences of 20 K	0.645	4.6
differences of 10 K	1.290	6.4

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 24

no.	Q	ΔP
[-]	[m ³ ·h ⁻¹]	[mbar]
differences of 20 K	1.26	4.90
differences of 10 K	2.518	14.755

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Test objective:	Surface temperature test
Exact name of the test procedure:	T 001*
Test method:	ČSN EN 303-5+A1:2023 Art. 5.11, 5.16.4, 4.3.7
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Test results:

Requirement	Requirement specification	Test evaluation	Note
Surface temperature The mean surface temperature shall be measured at nominal heat output. In order to do this, a minimum of 5 points on each boiler surface shall be measured. Under the same conditions, the critical temperatures (e.g. boiler doors, operating levers) shall be measured.	ČSN EN 303-5+A1:2023 Art. 5.11	+	
The surface temperature on the outside of the boiler (including the bottom and doors but not including the flue gas outlet and maintenance openings of natural draft boilers) shall not exceed the room temperature by more than 60 K when tested in accordance with 5.12. The requirement for the bottom is not applicable for instances when the manufacturer declares that the boiler is to be installed on a non-combustible base. When tested in accordance with 5.12, the surface temperature of operating levers and all parts which shall be touched by hand during operation of the boiler shall not exceed the following values according to EN ISO 13732-1: <ul style="list-style-type: none"> - 51 °C for metals and similar materials; - 56 °C for porcelain and similar materials; - 60 °C for plastics and similar materials. 	ČSN EN 303-5+A1:2023 Art. 4.3.7	+	
Resistance to thermal conductance Temperature measurement shall be performed on the surface of the stoking device at the place next to the fuel line but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber. For boilers with integrated hopper, the temperature measurement shall be performed on the surface of the stoking device at the place next to the integrated hopper but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber. In addition, the highest surface temperature of the hopper shall be measured.	ČSN EN 303-5+A1:2023 Art. 5.16.4	+	

Note:

+	Compliant
-	Non-compliant
0	Not applicable
x	Not assessed

Test results: Twin Bio NE 10

Average temperatures of boiler walls, doors and covers (°C):		
Boiler type	Twin Bio NE 10	
Fuel type	Wood pellets	
Heat output	Nominal	Minimum
Testing date	2017-10-24	2017-10-23
Ambient temperature [°C]	21.0	23.6
Humidity [%]	30.0	31.0
Air pressure [kPa]	99.06	99.32
Front wall	33.0	25.0
Rear wall	34.0	27.0
Right wall	28.0	25.0
Left wall	29.0	25.0
Upper wall	34.0	31.0
Lower wall	32.0	32.0
Temperatures of control elements (°C):		
El. control panel (plastic)	30.0	
Safety temperature limiter – STB (plastic)	30.0	
Handle of middle door (plastic)	33.0	
Handle of lower door (plastic)	33.0	

Measurement uncertainty: 2 °C for temperatures within the range of (0 ÷ 200) °C

"The above-specified extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient, $k=2$, corresponding to the coverage certainty of 95% as regards standard classification. The uncertainties do not reflect the impact of sample taking and lack of homogeneity. The standard uncertainty was determined in accordance with Document EA 4-02."

Test evaluation: The specified temperature rise values have not been exceeded.

Test results: Twin Bio NE 12

Average temperatures of boiler walls, doors and covers (°C):		
Boiler type	Twin Bio NE 12	
Fuel type	Wood pellets	
Heat output	Nominal	Minimum
Testing date	2017-10-24	2017-10-23
Ambient temperature [°C]	23.1	23.6
Humidity [%]	31.0	32.0
Air pressure [kPa]	98.92	99.32
Front wall	33.0	25.0
Rear wall	34.0	27.0
Right wall	28.0	25.0
Left wall	29.0	25.0
Upper wall	34.0	31.0
Lower wall	32.0	32.0
Temperatures of control elements (°C):		
El. control panel (plastic)	30.0	
Safety temperature limiter – STB (plastic)	30.0	
Handle of middle door (plastic)	33.0	
Handle of lower door (plastic)	33.0	

Measurement uncertainty: 2 °C for temperatures within the range of (0 ÷ 200) °C

"The above-specified extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient, $k=2$, corresponding to the coverage certainty of 95% as regards standard classification. The uncertainties do not reflect the impact of sample taking and lack of homogeneity. The standard uncertainty was determined in accordance with Document EA 4-02."

Test evaluation: The specified temperature rise values have not been exceeded.

Test results: Twin Bio NE 16

Average temperatures of boiler walls, doors and covers (°C):		
Boiler type	Twin Bio NE 16	
Fuel type	Wood pellets	
Heat output	Nominal	Minimum
Testing date	2018-12-03	2018-12-03
Ambient temperature [°C]	21.4	22.5
Humidity [%]	27.9	36.1
Air pressure [kPa]	97.84	97.85
Front wall	28.3	27.0
Rear wall	31.6	28.8
Right wall	32.9	29.7
Left wall	32.6	31.2
Upper wall	31.9	29.9
Lower wall	45.1	31.7
Temperatures of control elements (°C):		
El. control panel (plastic)	27.0	
Main switch (plastic)	27.0	
Safety temperature limiter – STB (plastic)	26.0	
Handle of upper door cover (plastic)	31.0	
Temperatures of fuel chamber and stoking elements (°C):		
Temperature of fuel line tube (Screw feeder – flange, metallic)	32.0	

Measurement uncertainty: 2 °C for temperatures within the range of (0 ÷ 200) °C

"The above-specified extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient, $k=2$, corresponding to the coverage certainty of 95% as regards standard classification. The uncertainties do not reflect the impact of sample taking and lack of homogeneity. The standard uncertainty was determined in accordance with Document EA 4-02."

Test evaluation: The specified temperature rise values have not been exceeded.

Test results: Twin Bio NE 24

Average temperatures of boiler walls, doors and covers (°C):		
Boiler type	Twin Bio NE 24	
Fuel type	Wood pellets	
Heat output	Nominal	Minimum
Testing date	2018-12-05	2019-01-10
Ambient temperature [°C]	20.7	21.8
Humidity [%]	28.1	25.3
Air pressure [kPa]	99.79	98.49
Front wall	28.0	26.6
Rear wall	33.2	31.3
Right wall	33.9	29.1
Left wall	33.4	33.5
Upper wall	32.3	29.6
Lower wall	48.1	31.3
Temperatures of control elements (°C):		
El. control panel (plastic)	26.0	
Main switch (plastic)	26.0	
Safety temperature limiter – STB (plastic)	28.0	
Handle of upper door cover (plastic)	33.0	
Temperatures of fuel chamber and stoking elements (°C):		
Temperature of fuel line tube (Screw feeder – flange, metallic)	33.0	

Measurement uncertainty: 2 °C for temperatures within the range of (0 ÷ 200) °C

"The above-specified extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient, $k=2$, corresponding to the coverage certainty of 95% as regards standard classification. The uncertainties do not reflect the impact of sample taking and lack of homogeneity. The standard uncertainty was determined in accordance with Document EA 4-02."

Test evaluation: The specified temperature rise values have not been exceeded.

Test objective:	Test of heat output, input and efficiency Test of combustion product temperature
Exact name of the test procedure:	T 001*
Test method:	ČSN EN 303-5+A1:2023 Art. 4.4.2, 4.4.3, 5.2, 5.3, 5.6 to 5.9
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Test results: Twin Bio NE 10

Average measured and calculated values (solid fuels):

Test (period of burning):	I.	II.
Output tested:	Nominal	Minimum
Boiler type:	Twin Bio NE 10	
Fuel type:	Wood pellets	
Combustion period, (automatic) stoking	Minimally 6 hours	
Testing date:	2017-10-24	2017-10-23
Nominal heat output (specified by manufacturer) [kW]	10.0	10.0
Flue gas temperature [°C]	106.0	72.5
Fuel mass added [kg.h ⁻¹]	2.267	0.679
Inlet water temperature [°C]	58.0	59.9
Outlet water temperature [°C]	77.0	71.4
Cooling water temperature [°C]	–	–
Cooling water flow rate [m ³ .h ⁻¹]	0.4520	0.2150
Draught [Pa]	15.0	15.0
Ambient temperature [°C]	21.0	23.6
Relative air humidity [%]	30.0	31.0
Barometric pressure [kPa]	99.06	99.32

Analysis of combustion products:

Test (period of burning):	I.	II.
Oxygen O ₂ [%]	8.88	14.40
Carbon dioxide CO ₂ [%]	11.43	6.10
Carbon monoxide CO [ppm]	33	55
Higher hydrocarbons THC/OGC [ppm]	2	1
Nitrogen oxides NO _x [ppm]	97	50
Sulfur oxides SO ₂ [ppm]	< 1	< 1

Auxiliary combustion values (solid fuels):

Test (period of burning):		I.	II.
Stoichiometric oxygen volume	[m ³ .kg ⁻¹]	1.194	1.194
Stoichiometric air volume	[m ³ .kg ⁻¹]	5.687	5.687
Stoichiometric volume of dry combustion products	[m ³ .kg ⁻¹]	5.482	5.482
Maximum content of CO ₂	[%]	17.87	17.87
Stoichiometric air multiple	[-]	1.71	3.10
Volume of dry combustion products. actual	[m ³ .kg ⁻¹]	8.594	16.095
Content of H ₂ O in combustion air	[m ³ .kg ⁻¹]	0.074	0.162
Content of H ₂ O in combustion products	[m ³ .kg ⁻¹]	0.822	0.910
Flue gas mass flow	[kg.s ⁻¹]	0.00801	0.00431

Calculated values – thermal overview

Test (period of burning):		I.	II.
Loss of sensible heat of combustion products	[%]	6.4	6.5
Loss of gas underburning	[%]	0.0	0.1
Loss of mechanical underburning	[%]	0.7	0.7
Loss of heat transfer into environment	[%]	2.7	2.7
Total loss	[%]	9.9	10.1
Efficiency – indirect method	[%]	90.1	89.9
Fuel mass added - actual	[kg.h ⁻¹]	2.357	0.706
Heat input	[kW]	11.1	3.3
Heat output	[kW]	10.0	3.0
Uncertainty of determining heat output	[kW]	0.4	0.1
Output / nominal output	[%]	100.2	29.9
Efficiency (NCV) – direct method	[%]	90.0	89.7
Useful efficiency (GCV)	[%]	82.8	82.5
Seasonal efficiency	[%]	82.5	
Seasonal space heating energy efficiency	[%]	77	
Energy efficiency index	[-]	114	
Energy Efficiency Class	[-]	A+	

At nominal and minimum output, Twin Bio NE 10 when burning **wood pellets**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5+A1:2023, Fig. 1.

Twin Bio NE 10 – Wood pellets meets the seasonal space heating energy efficiency requirements as per ČSN EN 303-5+A1:2023 Art. 4.4.2.4.

Test evaluation:

The measured heat output is within the ± 8% tolerance;
At nominal output, combustion product temperature is less than 160 K above the ambient temperature;
When burning Wood pellets, the period of burning is more than 6 hours;
The minimum heat output is less than 30% of nominal heat output.

Test results: Twin Bio NE 12

Average measured and calculated values (solid fuels):

Test (period of burning):		I.	II.
Output tested:		Nominal	Minimum
Boiler type:		Twin Bio NE 12	
Fuel type:		Wood pellets	
Combustion period, (automatic) stoking		Minimally 6 hours	
Testing date:		2017-10-24	2017-10-23
Nominal heat output (specified by manufacturer)	[kW]	12.0	12.0
Flue gas temperature	[°C]	107.8	72.5
Fuel mass added	[kg.h ⁻¹]	2.635	0.679
Inlet water temperature	[°C]	60.2	59.9
Outlet water temperature	[°C]	80.6	71.4
Cooling water temperature	[°C]	–	–
Cooling water flow rate	[m ³ .h ⁻¹]	0.4928	0.2150
Draught	[Pa]	15.0	15.0
Ambient temperature	[°C]	23.1	23.6
Relative air humidity	[%]	31.0	32.0
Barometric pressure	[kPa]	98.92	99.32

Analysis of combustion products:

Test (period of burning):		I.	II.
Oxygen O ₂	[%]	8.76	14.40
Carbon dioxide CO ₂	[%]	11.56	6.10
Carbon monoxide CO	[ppm]	28	55
Higher hydrocarbons THC/OGC	[ppm]	2	1
Nitrogen oxides NO _x	[ppm]	99	50
Sulfur oxides SO ₂	[ppm]	< 1	< 1

Auxiliary combustion values (solid fuels):

Test (period of burning):		I.	II.
Stoichiometric oxygen volume	[m ³ .kg ⁻¹]	1.194	1.194
Stoichiometric air volume	[m ³ .kg ⁻¹]	5.687	5.687
Stoichiometric volume of dry combustion products	[m ³ .kg ⁻¹]	5.482	5.482
Maximum content of CO ₂	[%]	17.87	17.87
Stoichiometric air multiple	[-]	1.69	3.10
Volume of dry combustion products. actual	[m ³ .kg ⁻¹]	8.500	16.095
Content of H ₂ O in combustion air	[m ³ .kg ⁻¹]	0.086	0.167
Content of H ₂ O in combustion products	[m ³ .kg ⁻¹]	0.834	0.915
Flue gas mass flow	[kg.s ⁻¹]	0.00922	0.00431

Calculated values – thermal overview

Test (period of burning):		I.	II.
Loss of sensible heat of combustion products	[%]	6.3	6.5
Loss of gas underburning	[%]	0.0	0.1
Loss of mechanical underburning	[%]	0.7	0.7
Loss of heat transfer into environment	[%]	1.9	2.7
Total loss	[%]	9.0	10.1
Efficiency – indirect method	[%]	91.0	89.9
Fuel mass added - actual	[kg.h ⁻¹]	2.740	0.706
Heat input	[kW]	12.9	3.3
Heat output	[kW]	11.7	3.0
Uncertainty of determining heat output	[kW]	0.5	0.1
Output / nominal output	[%]	97.3	24.9
Efficiency (NCV) – direct method	[%]	90.2	89.7
Useful efficiency (GCV)	[%]	82.9	82.5
Seasonal efficiency	[%]	82.6	
Seasonal space heating energy efficiency	[%]	77	
Energy efficiency index	[-]	114	
Energy Efficiency Class	[-]	A+	

At nominal and minimum output, Twin Bio NE 12 when burning **wood pellets**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5+A1:2023, Fig. 1.

Twin Bio NE 12 – Wood pellets meets the seasonal space heating energy efficiency requirements as per ČSN EN 303-5+A1:2023 Art. 4.4.2.4.

Test evaluation:

The measured heat output is within the $\pm 8\%$ tolerance;
At nominal output, combustion product temperature is less than 160 K above the ambient temperature;
When burning Wood pellets, the period of burning is more than 6 hours;
The minimum heat output is less than 30% of nominal heat output.

Test results: Twin Bio NE 16

Average measured and calculated values (solid fuels):

Test (period of burning):		I.	II.
Output tested:		Nominal	Minimum
Boiler type:		Twin Bio NE 16	
Fuel type:		Wood pellets	
Combustion period, (automatic) stoking		Minimally 6 hours	
Testing date:		2018-12-03	2018-12-03
Nominal heat output (specified by manufacturer)	[kW]	16.0	16.0
Flue gas temperature	[°C]	115.1	74.8
Fuel mass added	[kg.h ⁻¹]	3.518	0.895
Inlet water temperature	[°C]	53.3	64.3
Outlet water temperature	[°C]	72.7	71.4
Cooling water temperature	[°C]	12.5	15.5
Cooling water flow rate	[m ³ .h ⁻¹]	0.6796	0.4512
Draught	[Pa]	12.1	6.6
Ambient temperature	[°C]	21.4	22.5
Relative air humidity	[%]	27.9	26.1
Barometric pressure	[kPa]	97.84	97.85

Analysis of combustion products:

Test (period of burning):		I.	II.
Oxygen O ₂	[%]	7.44	14.06
Carbon dioxide CO ₂	[%]	12.66	6.13
Carbon monoxide CO	[ppm]	3	218
Higher hydrocarbons THC/OGC	[ppm]	3	4
Nitrogen oxides NO _x	[ppm]	100	44
Sulfur oxides SO ₂	[ppm]	< 1	< 1

Auxiliary combustion values (solid fuels):

Test (period of burning):		I.	II.
Stoichiometric oxygen volume	[m ³ .kg ⁻¹]	0.947	0.947
Stoichiometric air volume	[m ³ .kg ⁻¹]	4.509	4.510
Stoichiometric volume of dry combustion products	[m ³ .kg ⁻¹]	4.425	4.426
Maximum content of CO ₂	[%]	19.47	19.47
Stoichiometric air multiple	[-]	1.54	2.99
Volume of dry combustion products. actual	[m ³ .kg ⁻¹]	6.808	14.003
Content of H ₂ O in combustion air	[m ³ .kg ⁻¹]	0.051	0.099
Content of H ₂ O in combustion products	[m ³ .kg ⁻¹]	0.848	0.896
Flue gas mass flow	[kg.s ⁻¹]	0.0097	0.0048

Calculated values – thermal overview

Test (period of burning):		I.	II.
Loss of sensible heat of combustion products	[%]	5.8	6.1
Loss of gas underburning	[%]	0.0	0.2
Loss of mechanical underburning	[%]	0.0	0.0
Loss of heat transfer into environment	[%]	2.5	5.7
Total loss	[%]	8.4	12.1
Efficiency – indirect method	[%]	91.6	87.9
Fuel mass added - actual	[kg.h ⁻¹]	3.524	0.896
Heat input	[kW]	16.6	4.2
Heat output	[kW]	15.1	3.7
Uncertainty of determining heat output	[kW]	0.6	0.2
Output / nominal output	[%]	94.3	23.1
Efficiency (NCV) – direct method	[%]	91.2	87.8
Useful efficiency (GCV)	[%]	83.4	80.3
Seasonal efficiency	[%]	80.8	
Seasonal space heating energy efficiency	[%]	76	
Energy efficiency index	[-]	112	
Energy Efficiency Class	[-]	A+	

At nominal and minimum output, Twin Bio NE 16 when burning **wood pellets**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5+A1:2023, Fig. 1.

Twin Bio NE 16 – Wood pellets meets the seasonal space heating energy efficiency requirements as per ČSN EN 303-5+A1:2023 Art. 4.4.2.4.

Test evaluation:

The measured heat output is within the $\pm 8\%$ tolerance;
At nominal output, combustion product temperature is less than 160 K above the ambient temperature;
When burning Wood pellets, the period of burning is more than 6 hours;
The minimum heat output is less than 30% of nominal heat output.

Test results: Twin Bio NE 24

Average measured and calculated values (solid fuels):

Test (period of burning):	I.	II.
Output tested:	Nominal	Minimum
Boiler type:	Twin Bio NE 24	
Fuel type:	Wood pellets	
Combustion period, (automatic) stoking	Minimally 6 hours	
Testing date:	2018-12-05	2019-01-10
Nominal heat output (specified by manufacturer) [kW]	23.0	23.0
Flue gas temperature [°C]	135.8	82.2
Fuel mass added [kg.h ⁻¹]	5.065	1.502
Inlet water temperature [°C]	52.9	58.3
Outlet water temperature [°C]	70.8	71.1
Cooling water temperature [°C]	12.3	12.7
Cooling water flow rate [m ³ .h ⁻¹]	1.0365	0.4329
Draught [Pa]	13.4	11.7
Ambient temperature [°C]	20.7	21.8
Relative air humidity [%]	28.1	25.3
Barometric pressure [kPa]	99.79	98.49

Analysis of combustion products:

Test (period of burning):	I.	II.
Oxygen O ₂ [%]	7.77	12.90
Carbon dioxide CO ₂ [%]	12.71	7.31
Carbon monoxide CO [ppm]	73	159
Higher hydrocarbons THC/OGC [ppm]	5	2
Nitrogen oxides NO _x [ppm]	95	50
Sulfur oxides SO ₂ [ppm]	< 1	< 1

Auxiliary combustion values (solid fuels):

Test (period of burning):		I.	II.
Stoichiometric oxygen volume	[m ³ .kg ⁻¹]	0.925	0.947
Stoichiometric air volume	[m ³ .kg ⁻¹]	4.406	4.509
Stoichiometric volume of dry combustion products	[m ³ .kg ⁻¹]	4.322	4.425
Maximum content of CO ₂	[%]	19.44	19.47
Stoichiometric air multiple	[-]	1.58	2.56
Volume of dry combustion products. actual	[m ³ .kg ⁻¹]	6.607	11.764
Content of H ₂ O in combustion air	[m ³ .kg ⁻¹]	0.048	0.078
Content of H ₂ O in combustion products	[m ³ .kg ⁻¹]	0.845	0.875
Flue gas mass flow	[kg.s ⁻¹]	0.0137	0.0068

Calculated values – thermal overview

Test (period of burning):		I.	II.
Loss of sensible heat of combustion products	[%]	7.0	6.1
Loss of gas underburning	[%]	0.0	0.1
Loss of mechanical underburning	[%]	2.3	0.0
Loss of heat transfer into environment	[%]	2.2	4.5
Total loss	[%]	11.5	10.7
Efficiency – indirect method	[%]	88.5	89.3
Fuel mass added - actual	[kg.h ⁻¹]	5.133	1.505
Heat input	[kW]	24.1	7.1
Heat output	[kW]	21.3	6.3
Uncertainty of determining heat output	[kW]	0.9	0.3
Output / nominal output	[%]	92.7	27.4
Efficiency (NCV) – direct method	[%]	88.4	89.0
Useful efficiency (GCV)	[%]	80.9	81.5
Seasonal efficiency	[%]	81.4	
Seasonal space heating energy efficiency	[%]	77	
Energy efficiency index	[-]	113	
Energy Efficiency Class	[-]	A+	

At nominal and minimum output, Twin Bio NE 24 when burning **wood pellets**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5+A1:2023, Fig. 1.

Twin Bio NE 24 – Wood pellets meets the seasonal space heating energy efficiency requirements as per ČSN EN 303-5+A1:2023 Art. 4.4.2.4.

Test evaluation:

The measured heat output is within the ± 8% tolerance;
At nominal output, combustion product temperature is less than 160 K above the ambient temperature;
When burning Wood pellets, the period of burning is more than 6 hours;
The minimum heat output is less than 30% of nominal heat output.

Fuel analysis

Fuel type	Wood pellets			
Analytical indicator	Symbol	Unit	Value	Uncertainty
Higher heating value	Q_s	[MJ.kg ⁻¹]	18.76	0.22
Lower heating value	Q_j	[MJ.kg ⁻¹]	17.28	0.22
All water in original condition	W_{r_t}	[% of mass]	7.44	0.01
Ash	A	[% of mass]	0.15	0.002
Carbon	C	[% of mass]	46.59	0.24
Hydrogen	H	[% of mass]	6.35	0.20
Nitrogen	N	[% of mass]	0.13	0.14
Sulphur	S	[% of mass]	0.024	0.004
Chlorine	Cl	[% of mass]	0.008	0.003
Oxygen – calculation for 100%	O	[% of mass]	39.31	
Conversion factor f_{emis} for emissions in [mg/m ³] to [mg/MJ]	f_{emis}	[-]	0.25780	

Note: Sample in original condition

Measurement uncertainty: Specified in Measurement results

"The above-specified extended measurement uncertainties are calculated as a factor of the measurement uncertainty and the extension coefficient, $k=2$, corresponding to the coverage certainty of 95% for standard classification.

Test objective:	Electrical consumption
Exact name of the test procedure:	T 071*
Test method:	ČSN EN 303-5+A1:2023 Art. 5.7.7 ČSN EN 15456:2008 Art. 5
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Test results:

Requirement	Requirement specification	Test evaluation	Note
Electrical consumption The auxiliary electricity consumption at nominal heat output (e_{lmax}), the auxiliary electricity consumption at 30% part load (e_{lmin}) and auxiliary electricity consumption in standby mode (PSB) shall be measured according to EN 15456. The measurement shall include all components within the system boundary defined in the scope of this standard excluding any circulation pump supplying the water heating system. Any electricity consumption of fuel line outside the system boundary supplied by the boiler control shall be omitted and measured separately. The average electrical power consumption during standby shall be measured for a minimum duration of 10 min and shall be stated in watts. In cases where control operations influence the intrinsic energy consumption, a longer duration might be necessary.	ČSN EN 303-5+A1:2023 Art. 5.7.7	+	

Note:

- + Compliant
- Non-compliant
- 0 Not applicable
- x Not assessed

Test results: Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24

Boiler type:	Twin Bio NE 10	Twin Bio NE 12	Twin Bio NE 16	Twin Bio NE 24
Maximum electrical input	490 W	490 W	456 W	459 W
Electrical input at nominal heat output	80 W	90 W	94 W	111 W
Electrical input at minimum heat output	25 W	30 W	25 W	41 W
Maximum electrical input for ignition system	345 W	345 W	337 W	338 W
Maximum electrical input for fuel supply (fuel line)	110 W	110 W	89 W	91 W
Maximum electrical input for ventilator	27 W	27 W	27 W	27 W
Electrical input for STAND BY mode	2 W	2 W	3 W	3 W

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Test objective:	Combustion efficiency test – emissions
Exact name of the test procedure:	T 001*
Test method:	ČSN EN 303-5+A1:2023 Art. 4.4.7, 5.6.3, 5.6.4, 5.8, 5.9.4
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Requirement	Requirement specification	Test evaluation	Note
Emission limits Combustion shall be of low-emission. This requirement shall be satisfied if the emission values shown in Table 7 are not exceeded when operating at nominal heat output or, in the case of boilers with heat output range, when operating at nominal heat output and minimum heat output, determined in accordance with the requirements mentioned in 5.8 and calculated in accordance with 5.9.4.	ČSN EN 303-5+A1:2023 Art. 4.4.7.1	+	

Table 7

Table 7											
Stoking	Fuel	Nominal heat output	Emission limits								
			CO			OGC/THC			PM (dust)		
			mg/m ³ at 10% O ₂								
		kW	Class	Class	Class	Class	Class	Class	Class	Class	Class
			3	4	5	3	4	5	3	4	5
Manual	Biogenic	≤ 50	5000	1200	700	150	50	30	150	75	60
		> 50 ≤ 150	2500			100					
		> 150 ≤ 500	1200			100					
	Fossil	≤ 50	5000			150			125		
		> 50 ≤ 150	2500			100					
		> 150 ≤ 500	1200			100					
Automatic	Biogenic	≤ 50	3000	1000	500	100	30	20	150	60	40
		> 50 ≤ 150	2500			80					
		> 150 ≤ 500	1200			80					
	Fossil	≤ 50	3000			100			125		
		> 50 ≤ 150	2500			80					
		> 150 ≤ 500	1200			80					

NOTE The dust values in this Table are based on the experience of the gravimetric filter method. The method used needs to be referred to in the test report. The particulate matter emission measured according to this document does not include condensable organic compounds which may form additional particulate matter when the flue gas is mixed with ambient air. The values are therefore not directly comparable with values measured by dilution tunnel methods. Neither can they be directly translated into ambient air particulate concentrations.

^a Referred to dry exit flue gas, 0 °C, 1013 mbar.

^b Boilers of class 3 for non-woody biomass fuels according to 1.2 and marked with the classification non-woody biomass fuels do not need to fulfil the requirements for the dust emissions. The actual value shall be stated in the technical documentation and shall not exceed 200 mg/m³ at 10 % O₂.

Seasonal Space Heating Emissions limits For the seasonal space heating emissions see EU 2015/1189: The solid fuel boilers shall comply with the following requirements in Table 8: These requirements shall be met for the preferred fuel and for any other suitable fuel for the solid fuel boiler. Boilers tested only for fuels type non-woody biomass do not have to meet the requirements in Table 8. The calculation of the seasonal space heating emissions shall be done according to 5.9.4.4.	ČSN EN 303-5+A1:2023 Art. 4.4.7.2	+	
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Note:

+	Compliant
-	Non-compliant
0	Not applicable
x	Not assessed

Table 8

Stoking	Fuel	Nominal heat output	Seasonal space heating emissions limits			
			CO _s	OGC _s	PM _s	NO _x _s
		kW	Seasonal emissions in mg/m ³ at 10 % O ₂ ^a			
manual	biogenic	≤ 500 kW	700	30	60	200
	fossil	≤ 500 kW	700	30	60	350
automatic	biogenic	≤ 500 kW	500	20	40	200
	fossil	≤ 500 kW	500	20	40	350

NOTE The PM (dust) values in this Table are based on the experience of the gravimetric filter method. The method used needs to be referred to in the test report. The particulate matter emission measured according to this document does not include condensable organic compounds which may form additional particulate matter when the flue gas is mixed with ambient air. The values are therefore not directly comparable with values measured by dilution tunnel methods. Neither can they be directly translated into ambient air particulate concentrations.

^a Referred to dry exit flue gas, 0 °C, 1013 mbar.

Measurement results: Twin Bio NE 10 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =10%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	8.88	11.43	33	2	97	21	38	3	182	19
Minimum	14.40	6.10	55	1	50	14	115	3	171	24
Seasonal space emission values							103	3	173	23

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Test evaluation:

Twin Bio NE 10 – Wood pellets meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5+A1:2023 Table 7.

Twin Bio NE 10 – Wood pellets meets the requirements seasonal space heating emissions limits, as per ČSN EN 303-5+A1:2023 Table 8.

Boiler output	Average values			
	Measured values		Converted values (based on reference test fuel N content)	
	NO _x [ppm]	NO _x [ppm]	NO _x (O ₂ =10%) [mg.m ⁻³]	NO _x (O ₂ =13%) [mg.m ⁻³]
Nominal	97	121	226	164
Minimum	50	62	213	155

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 10 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =13%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	8.88	11.43	33	2	97	21	27	2	131	14
Minimum	14.40	6.10	55	1	50	14	83	2	124	17

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 10 – Wood pellets

Boiler output	Average values									
	Measured values					Converted values O ₂ =0%				
	O ₂ [%]	CO [ppm]	NO _x [ppm]	OGC/THC [ppm]	Dust [mg.m ⁻³]	CO [mg.MJ ⁻¹]	NO _x [mg.MJ ⁻¹]	OGC/THC [mg.MJ ⁻¹]	Dust [mg.MJ ⁻¹]	
Nominal	8.88	33	97	2	21	23	112	2	12	
Minimum	14.40	55	50	1	14	71	105	2	15	

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 12 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =10%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	8.76	11.56	28	2	99	23	32	3	182	20
Minimum	14.40	6.10	55	1	50	14	115	3	171	24
Seasonal space emission values							103	3	173	23

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Test evaluation:

Twin Bio NE 12 – Wood pellets meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5+A1:2023 Table 7.

Twin Bio NE 12 – Wood pellets meets the requirements seasonal space heating emissions limits, as per ČSN EN 303-5+A1:2023 Table 8.

Boiler output	Average values			
	Measured values		Converted values (based on reference test fuel N content)	
	NO _x [ppm]	NO _x [ppm]	NO _x (O ₂ =10%) [mg.m ⁻³]	NO _x (O ₂ =13%) [mg.m ⁻³]
Nominal	99	124	228	166
Minimum	50	62	213	155

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 12 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =13%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	8.76	11.56	28	2	99	23	23	2	133	15
Minimum	14.40	6.10	55	1	50	14	83	2	124	17

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 12 – Wood pellets

Boiler output	Average values								
	Measured values					Converted values O ₂ =0%			
	O ₂ [%]	CO [ppm]	NO _x [ppm]	OGC/THC [ppm]	Dust [mg.m ⁻³]	CO [mg.MJ ⁻¹]	NO _x [mg.MJ ⁻¹]	OGC/THC [mg.MJ ⁻¹]	Dust [mg.MJ ⁻¹]
Nominal	8.76	28	99	2	23	20	112	2	12
Minimum	14.40	55	50	1	14	71	105	2	15

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 16 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =10%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	7.44	12.66	3	3	100	26	3	4	166	21
Minimum	14.06	6.13	218	4	44	11	432	10	144	18
Seasonal space emission values							368	9	147	18

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Test evaluation:

Twin Bio NE 16 – Wood pellets meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5+A1:2023 Table 7.

Twin Bio NE 16 – Wood pellets meets the requirements seasonal space heating emissions limits, as per ČSN EN 303-5+A1:2023 Table 8.

Boiler output	Average values			
	Measured values		Converted values (based on reference test fuel N content)	
	NO _x [ppm]	NO _x [ppm]	NO _x (O ₂ =10%) [mg.m ⁻³]	NO _x (O ₂ =13%) [mg.m ⁻³]
Nominal	100	77	128	93
Minimum	44	34	110	80

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 16 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =13%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	7.44	12.66	3	3	100	26	2	3	121	15
Minimum	14.06	6.13	218	4	44	11	314	8	104	13

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 16 – Wood pellets

Boiler output	Average values								
	Measured values					Converted values O ₂ =0%			
	O ₂ [%]	CO [ppm]	NO _x [ppm]	OGC/THC [ppm]	Dust [mg.m ⁻³]	CO [mg.MJ ⁻¹]	NO _x [mg.MJ ⁻¹]	OGC/THC [mg.MJ ⁻¹]	Dust [mg.MJ ⁻¹]
Nominal	7.44	3	100	3	26	2	83	2	10
Minimum	14.06	218	44	4	11	216	72	5	9

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 24 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =10%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	7.77	12.71	73	5	95	34	76	6	162	28
Minimum	12.90	7.31	159	2	50	11	271	5	140	15
Seasonal space emission values							241	5	143	17

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Test evaluation:

Twin Bio NE 24 – Wood pellets meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5+A1:2023 Table 7.

Twin Bio NE 24 – Wood pellets meets the requirements seasonal space heating emissions limits, as per ČSN EN 303-5+A1:2023 Table 8.

Boiler output	Average values			
	Measured values		Converted values (based on reference test fuel N content)	
	NO _x [ppm]	NO _x [ppm]	NO _x (O ₂ =10%) [mg.m ⁻³]	NO _x (O ₂ =13%) [mg.m ⁻³]
Nominal	95	73	124	90
Minimum	50	38	107	78

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 24 – Wood pellets

Boiler output	Average values									
	Measured values						Converted values O ₂ =13%			
	O ₂ [%]	CO ₂ [%]	CO [ppm]	OGC/THC [ppm]	NO _x [ppm]	Dust [mg.m ⁻³]	CO [mg.m ⁻³]	OGC/THC [mg.m ⁻³]	NO _x [mg.m ⁻³]	Dust [mg.m ⁻³]
Nominal	7.77	12.71	73	5	95	34	55	5	118	21
Minimum	12.90	7.31	159	2	50	11	197	3	101	11

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Measurement results: Twin Bio NE 24 – Wood pellets

Boiler output	Average values								
	Measured values					Converted values O ₂ =0%			
	O ₂ [%]	CO [ppm]	NO _x [ppm]	OGC/THC [ppm]	Dust [mg.m ⁻³]	CO [mg.MJ ⁻¹]	NO _x [mg.MJ ⁻¹]	OGC/THC [mg.MJ ⁻¹]	Dust [mg.MJ ⁻¹]
Nominal	7.77	73	95	5	34	37	79	3	14
Minimum	12.90	159	50	2	11	135	70	2	7

Note: Testing date and ambient conditions – see Test No. T 001* (Test of heat output, input and efficiency)

Test objective:	Function test of control, regulation and safety elements Combustion efficiency test - emissions
Exact name of the test procedure:	T 001*
Test method:	ČSN EN 303-5+A1:2023 Art. 5.13, 5.14, 5.16.1, 5.16.2, 5.16.3, 5.17 ČSN EN 303-5+A1:2023 Art. 5.8, 5.9.4
Sample tested:	Twin Bio NE 10, Twin Bio NE 12, Twin Bio NE 16, Twin Bio NE 24
Measuring equipment used:	see Chapter III

Test results:

Requirement	Requirement specification	Test evaluation	Note
<p>Function check of the temperature controller and safety temperature limiter at the boiler</p> <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output P_N of the boiler. A steady state condition shall be reached and the outlet pressure at the flue gas section shall be according to the nominal heat output setting. For manual stoked boilers, the boiler shall be refuelled after reaching steady state with a full batch before starting the test.</p> <p>The dissipated output shall be reduced to $(40 \pm 5) \%$ of the nominal heat output of the boiler; circulating pump running in continuous operation; temperature controller adjusted to maximum set value.</p> <p>When the temperature controller is operating normally, the measured flow temperature shall not exceed 100 °C; the safety temperature cut out or limiter or the device for dissipating excess heat shall not trigger.</p> <p>Repeat the test with the temperature controller out of function. This time, check if the safety temperature limiter/detector switches off the firing system at the highest value specified by the boiler manufacturers and if all hazardous operation states are avoided (see 4.2).</p>	<p>ČSN EN 303-5+A1:2023 Art. 5.13</p>	<p>+</p>	

Requirement	Requirement specification	Test evaluation	Note
Function test for the rapidly disconnectable firing system – Sudden absence of heat dissipation <p>The water-side flow rate shall comply with that specified for the nominal output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output P_N of the boiler, a steady state condition is reached and the outlet pressure at the flue spigot is according to the rated heat output.</p> <p>The heat consumption is set to 0; water circulation in the boiler is permitted; temperature controller is adjusted to manufacture recommended maximum set value.</p> <p>Check if the safety temperature limiter or the temperature controller switches off the firing system and all hazardous operation states are avoided.</p> <ul style="list-style-type: none"> - Loss of the electrical power supply <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output P_N of the boiler, a steady state condition is reached and the outlet pressure at the flue gas section is according to the rated heat output.</p> <p>The electrical supply including the circulation is cut off, check that no hazardous operation conditions occur.</p> <p>For the evaluation of the temperatures and the CO-concentrations, only mean values at a maximum average time of one minute shall be considered.</p>	ČSN EN 303-5+A1:2023 Art. 5.14	+	
Safety test of consequences of fuel overload and effect of a blockage of the fuel supply <p>The safety of the boiler shall be checked at continuous operation of the boiler with the fuel feed rate of the stoking device set at possible maximum capacity, taking into account failures according to the risk analyses and the electrical safety. If other fuel feed rates lower than the maximum are categorised as critical by the risk analysis, these shall also be tested.</p> <p>The functionality of the safety device for the shut-down of the fuel line shall occur by prevention of the ignition after release of fuel if no or insufficient combustion in the combustion chamber occurs.</p> <p>The test for blocked fuel line shall be achieved by deactivating the stoking device.</p> <p>The requirements specified in 4.3.5 shall be satisfied.</p>	ČSN EN 303-5+A1:2023 Art. 5.16.2	+	

Requirement	Requirement specification	Test evaluation	Note
Loss of combustion air supply The safety of the heating boiler shall be checked at maximum heat input under the following conditions: <ul style="list-style-type: none"> – failure of combustion air fan; – failure to close of the adjustable combustion air supply. In each case, only one failure shall be simulated. The CO concentrations in the boiler shall not exceed 5 % volume. The measurement of CO concentration shall be carried out in the flue gas measuring section.	ČSN EN 303-5+A1:2023 Art. 5.16.3	+	
Check of safety for condensing operation The boiler is operated at nominal load. The condensate drainage is blocked. The measurement of CO concentration shall be carried out in the flue gas measuring section. Increased condensate formation can be simulated by adding water to the condensation system. It shall be checked and recorded whether the boiler shuts down or reaches the steady-state condition.	ČSN EN 303-5+A1:2023 Art. 5.17	0	

Note:

+	Compliant
-	Non-compliant
0	Not applicable
x	Not assessed

Measurement results:

Temperature controller		
Temperature	[°C]	Note:
Pre-set	80.0	Temperature set on the operating thermostat regulator
Shutdown	83.3	Fan and stoking switched off (suppression mode)
Restoration of operation	70.0	Fan and stoking restored

Note: Date of testing and ambient conditions - see Test No. T 001* (Test of heat output, input and efficiency)

Temperature limiter (manual restoration of temperature) STB		
Temperature	[°C]	Note:
Pre-set	95	Temperature set on the temperature limiter
Shutdown	105	Fan and stoking switched off
Restoration of operation	The boiler irreversibly switched off. In order to restore operation, a manual intervention required, after the temperature drops under the limiter switching temperature	

Note: Date of testing and ambient conditions - see Test No. T 001* (Test of heat output, input and efficiency)

Test evaluation:

Proper functioning of safety elements has been verified.

Tested by: Bc. Petr Matoušek
Reviewed and approved by: Ing. Vladimír Foit

Date: 2023-09-25
Date: 2023-09-25

Signed: 
Signed: 

V. A list of referenced documents

- Order of 2023-06-23 (Order reg. no. B-79715, received on 2023-06-23)
- Contract B-79715/32
- ČSN EN 303-5+A1:2023 - Heating boilers - Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW - Terminology, requirements, testing and marking
- ČSN EN 15456:2008 - Heating boilers - Electrical power consumption for heat generators - System boundaries - Measurements
- ČSN ISO 80000-1:2011 - Quantities and units – Part 1: General
- Test report 32-0484/1/T of 2019-01-21
- Test report 32-0484/2/T of 2019-01-21
- Test report 39-11308/T1 of 2018-02-22
- Test report 39-11308/T2 of 2018-02-22

Test Report compiled by: Ing. Filip Molčan



Test Report approved by: 
Ing. Stanislav Buchta
Deputy Head of Heat and Environment-Friendly Equipment Test Station

– End of Test Report –