L 1045

TEST REPORT
39-11540-T-3

Product:	Wood stove
Type designation:	DELTA Ecodesign
Customer:	PANADERO DENIA, S.L. Poligono Industrial Campollano AVDA.5a, No 13-15, 02007 Albacete Spain
Manufacturer:	PANADERO DENIA, S.L. Poligono Industrial Campollano AVDA.5a, No 13-15, 02007 Albacete Spain
Employee responsible:	Milan Holomek
Report issue date:	2018-07-23
Distribution list:	1 copy to the Customer 1 copy to the Engineering Test Institute

The Engineering Test Institute, Public Enterprise, (hereinafter referred to as SZU in Brno) performed the activity based on these documents:

- Order B-62208 of 2018-06-07
- Contract : B-62208/39 of 2018-06-13
- Amendment No 1 to Contract B-62208/39 of 2018-07-26

I. Product description

The wood stoves DELTA Ecodesign (another acceptable version of HELENA Ecodesign, LAMBDA SOAP Ecodesign, LAMBDA SAND Ecodesign, KYOTO, OSAKA) are made of steel sheets. Wood is recommended as fuel. They are designed to heat living rooms in houses, cottages, country houses or cottages. The stoves are equipped with primary and secondary combustion air control, glazed door, cast iron grill, pit with ashtray.

A detailed description is provided in the Installation and Operation Instructions, which form an integral part of the source materials.

Basic technical specifications of the wood stove (Table 1)

Type	Main dimensions (mm)			Heat output (kW)	Fuel consumption (kg/h)	Diameter of flue gas connector (mm)	Operating draught (Pa)
	Height	Width	Depth				
DELTA Ecodesign	1003	556	500	8,0	2,6	150	12

II. Sample tested

Visual inspection and tests were performed on the sample mentioned in the table below:

(Table 2)

Typ	Date	Sample Reg. No.
DELTA Ecodesign	2018-06-20	215.18.18027.007

The visual inspection, testing and evaluation of the product and technical documentation were conducted at the test station of the Engineering Test Institute in Brno in 2018-06-20 by Ing. Radek Machara.

The tests were conducted using measuring and test equipment with valid calibration.

III. Measuring and test equipment:

No.	Description	Inventory number:	Calibration valid until:
1.	Barometer	112541	01.2019
2.	Thermometer – ambient	117044	02.2022
3.	Hygrometer	117044	02.2022
4.	Draught gauge	MaR08_Tah	06.2019
5.	Scale	022151	02.2019
6.	THERM 5500-3	021990	02.2019
7.	Analytical scale	021458	04.2019
8.	Calliper	115884	10.2019
9.	Combustion product analyser, HORIBA ENDA – 680P	022305	x
10.	Elemental analyser, PE 2400 CHNS	022107	
11.	Gravimat SHC 5 - TU	022328	
12.	Kit of temperature measurement	022399-A_T	11.2020

(Table 3)

Note:
× ... Verified with use of calibration standards prior to measurement
+ ... ± 5 % of the measured values

Measurement uncertainty: (Table 4)

Parameter measured		Uncertainty of measurement
Gas analysis		
CO		≤ 6% of the measured value
CO_2		≤ 2% of the measured value
Temperature		
Flue gas		≤ 5 K
Ambient room		≤ 1.5 K
Surface		≤ 2 K
Touchable areas		≤ 2 K
Mass		
Fuel consumption		± 20 g
Residue		± 5 g
Fuel load	≤ 7.5 kg	± 5 g
	> 7.5 kg	± 10 g

"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. 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."

Verified requirement: **Structural safety**

Requirement specification: ČSN EN 13240/A2:2005 Art. 4.2.1 ÷ 4.2.12

Test sample: DELTA Ecodesign

Test results: See the Table below

Required product properties	Requirement specification	Result of evaluation	Note
Flue gases exhaust branch The flue gases exhaust branch in horizontal flue connections must be designed so that it can be inserted at a minimum distance of 40 mm. The minimum overlap in vertical flue duct connections is 25 mm. NOTE In built-in devices (designed for fireplace recesses), with a vertical chimney connection, and if the manufacturer's installation manual requires that insulation cement filling is applied around the connection in order to seal off the device and the chimney, the overlap for flue gases product exhaust may be shortened to a minimum of 6 mm.	4.2.4	+	> 25 mm
Flue gases product ducts The smallest dimension of the flue gases duct must be 30 mm except when it is permitted to reduce the duct to a minimum of 15 mm in appliances designed to burn only fuel other than black coal and peat briquettes, and when access openings for cleaning the flue gases ducts are provided. It must be possible to clean the flue gases ducts of the appliance completely, using readily available tools or brushes unless the manufacturer of the appliance has delivered service cleaning tools or brushes.	4.2.5	+	> 30 mm
Flue gases flow regulation If an exhaust damper is used, it must be of a design preventing the closing of the entire flue section. The exhaust damper must be easy to regulate, and must feature an opening of at least 20 sq cm or 3% of its cross-section area, whichever is greater. The setting of the position of the exhaust damper must be evident to the operator. If a draught stabilizer is used, the requirement for the smallest cross-section does not necessarily apply, but the equipment must be easily accessible for cleaning.	4.2.9	0	

*) Test result:
+.... Requirement fulfilled
0.... Requirement not applicable to the product in question

Accredited test number and title: T 004, T 005 — **Test of residential solid fuel burning appliances – Roomheaters; Test of heat output; Test of flue gas composition**

Test method: ČSN EN 13240/A2:2005 Art. A1-A6, FprEN 16510-1 Annexes A-I, FprEN 16510-2-1 Annexes A-I

Sample tested: DELTA Ecodesign

Measuring equipment used: Nos. 1 ÷ 12 – Measuring and test equipment

Test results: **DELTA Ecodesign**

Date of testing:	2018-06-20	t_{ok} = 29 °C	r.v. =31 %	p_a = 99,2 kPa
Place of testing:	At SZU ☒	At Manufacturer's ☐	At Customer's ☐	*Other:*

Variables measured and calculated: Rated capacity	Unit		Tests		Limit according to:				
		1	2	3	Average	EN 13240	15a B-VG	DIN plus	I.BImSch hV Stufe 2
Fuel used: beech wood	mm	330							
Combustion air setting – primary/secondary	%	70/30							
Fuel consumption	kg/hour	2,5	2,4	2,3	2,4				
Achieved input	kW	10,4	10,1	9,8	10,1				
Ambient temperature in the room and combustion air temperature	°C	29	29	29	29				
Chimney draught	Pa	12	12	12	12				
Combustion product average temperature	°C	273	271	271	272				
CO_2	%	11,92	10,33	10,42	10,89				
CO – measured	%	0,1525	0,0830	0,0801	0,1052				
CO – at O_2 = 13%	%	0,1010	0,0637	0,0601	0,0749	≤ 1,0			
CO – at O_2 = 13%	mg/Nm^3	1262	796	752	937			≤ 1500	≤ 1250
CO – at O_2 = 0%	mg/MJ	890	561	530	660		≤ 1100		
NO_x – measured	ppm	81	74	67	74				
NO_x – at O_2 =13 %	mg/Nm^3	110	116	104	110			≤ 200	
NO_x – at O_2 = 0%	mg/MJ	78	82	73	78		≤ 150		
OGC– measured	ppm	68	20	16	35				
OGC– at O_2 = 13 %	mg/Nm^3	82	28	22	44			≤120	
OGC– at O_2 = 0%	mg/MJ	58	20	16	31		≤ 50		
Chimney loss	%	16,6	18,6	18,4	17,9				
Loss of gas underburning	%	0,9	0,5	0,5	0,6				
Loss of solid underburning	%	0,5	0,5	0,5	0,5				
Efficiency	%	82,1	80,4	80,6	81,0	≥ 60	≥ 80	≥ 75	≥ 73
Total heat capacity attained	kW	8,6	8,1	7,9	8,2				
Uncertainty of total heat		0,3	0,3	0,3	0,3				
Nominal capacity	kW	8,0							
Mass flow rate of dry combustion products	g/s	6,1	6,8	6,6	6,5				

CO2	%	12,11	10,19	9,83	10,71				
Dust– measured	mg/Nm^3	34	27	22	28				
Dust– at O_2 = 13 %	mg/Nm^3	22	21	17	20			≤ 75	≤ 40
Dust– at O_2 = 0%	mg/MJ	16	15	12	14		≤ 35		

Fuel analysis: DELTA Ecodesign

Type of fuel	Beech wood			
Analytical indicator	Symbol	Unit	Value	Uncertainty
Net calorific value	Q_j	[MJ/kg]	15,18	0,14
Total water in original state	W^r_t	[% of mass]	12,13	0,02
Ash	A	[% of mass]	0,23	0,04
Carbon	C	[% of mass]	43,32	0,25
Hydrogen	H	[% of mass]	5,91	0,1

Note: Sample in original condition

Accredited test number and title: **T 004 Test of residential solid fuel burning appliances - Roomheaters**
T 005 Adjustability test

Test method: ČSN EN 13240/A2:2005 Art. A1-A6, FprEN 16510-1 Annexes A-I, FprEN 16510-2-1 Annexes A-I

Sample tested: DELTA Ecodesign

Measuring equipment: Nos. 1 ÷ 7, 12 see Table – Measuring and test equipment

Test results: **DELTA Ecodesign**

Date of testing: 2018-06-20		t_{ok} = 29 °C		r.v. =31 %		p_a = 99,2 kPa	
Place of testing:	at the Engineering Test Institute ☒	at the manufacturer ☐		at the customer ☐		*other:*	

Variables measured and calculated	**Unit**	**Value**	**Limit**	**Note**
Fuel used: beech wood	mm	330		
Fuel consumption	kg/hour	0,85		
Heat input achieved	kW	2,91		
Room and combustion air temperature	°C	29		
Chimney draught	Pa	6	6 ± 1 Pa	
Average combustion product temperature	°C	236		
Period of burning	min	32		
Combustion process restoration, after (time)	min	to 3	≤20	
Note:	The power consumption of the device is adjustable in the range of 33 to 100%.			

Accredited test number and title:	**T 004** **T 005**	**Test of residential solid fuel burning appliances – Roomheaters** **Flue gas temperature and surface temperature test**
Test method:	ČSN EN 13240/A2:2005 Art. A1-A6, FprEN 16510-1 Annexes A-I, FprEN 16510-2-1 Annexes A-I	
Sample tested:	DELTA Ecodesign	
Measuring equipment:	Nos. 1 ÷ 3, 7, 12 – Measuring and test equipment	

Test results: **DELTA Ecodesign**

Date of testing:	2018-06-20		t_{ok} = 29 °C		r.v. =31 %		p_a = 99,2 kPa
Place of testing:	at the Engineering Test Institute	☒	at the manufacturer	☐	at the customer	☐	*other:*

Measured element	**Material**	**Warming (K)**	
		Measured	**Limit**
The handle of door	metal	48*)	35
Regulator of total air	metal	40*)	35

Average flue gas temperature after spigot	°C	302	-

NOTE: *)... Protective glove ("cold hand") is supplied for manipulation with control elements. The table shows the highest measured values.

Accredited test number and title:	**T 004** **T 005**	**Test of residential solid fuel burning appliances – Roomheaters** **Thermal overload test – Temperature rise of the surrounding flammable materials**

Test method: ČSN EN 13240/A2:2005 Art. A1-A6, FprEN 16510-1 Annexes A-I, FprEN 16510-2-1 Annexes A-I

Sample tested: DELTA Ecodesign

Measuring equipment used: Nos. 1 ÷ 6, 12 – see Measuring and Test Equipment, Table 3

Test results: **DELTA Ecodesign**

Date of testing:	2018-06-20		t_{ok} = 29 °C		r.v. =31 %		p_a = 99,2 kPa	
Place of testing:	at the Engineering Test Institute	☒	at the manufacturer	☐	at the customer	☐	*other:*	

During nominal output test (A.4.7)

Test no.	Ambient temp.	Flue draught	Maximum temperature rise						Quantity of fuel
			Trihedron – distance mm				Floor protector	Limit	
			400	400	800	800			
-	°C	Pa	K						kg/h
1	29	12	53	57	61	53	59	65	2,4

During thermal overload test (A.4.9.2)

Test no.	Ambient temp.	Flue draught	Maximum temperature rise						Quantity of fuel
			Trihedron – distance mm				Floor protector	Limit	
			400	400	800	800			
-	°C	Pa	K						kg
1	29	15	55	59	64	56	61	65	2,5

NOTE: Trihedron placed 400 mm away from the appliance rear wall.
Trihedron placed 400 mm away from the appliance side wall.
Trihedron placed 800 mm away from the appliance front wall.
Trihedron placed 800 mm above the appliance.

The tables show the highest measured values.

After the thermal overload test, no permanent deformation or damage to the appliance was detected.

Tested by: Ing. Radek Machara Date: 2018-06-20 Signed: Machara

Reviewed by: Ing. Jiří Dvořák Date: 2018-06-20 Signed:

IV. List of referenced documentation

- Order B-62208 of 2018-06-07
- Contract : B-62208/39 of 2018-06-13
- Amendment No 1 to Contract B-62208/39 of 2018-07-26
- Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
- ČSN EN 13240:2002/A2:2005 – Roomheaters fired by solid fuel – Requirements and test methods

Report compiled by: Ing. Radek Machara

Person accountable for correctness of the Report:

AKREDITOVANÁ ZKUŠEBNÍ LABORATOŘ č. 1045.1 STROJÍRENSKÝ ZKUŠEBNÍ ÚSTAV, s.p. 1

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