

BULDER 00 ROOMHEATER

TEST RESULTS OF INITIAL TYPE TESTING
IN ACCORDANCE WITH
EN 13240

Requested by: Avena Projekt OÜ



The test results relate only to the sample tested.

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Order email Vadim Post 20 February 2014

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Tested appliance **BULDER 00**

Testing has been undertaken according to the standard EN 13240 – Roomheaters fired by solid fuel. Requirements and test methods.

The standard EN 13240 is listed on VTT's qualification certificate as a Notified Body according to the Construction Products Regulation (CPR). VTT's Notified Body number is 0809.

Appliance description

The appliance **BULDER 00** is an intermittent burning, free standing wood stove. The appliance has a depth of 540 mm, a width of 420 mm and a height of 640. A photograph of the tested appliance **BULDER 00** is given in appendix 1. The principle picture of the tested appliance is given in appendix 2.

Type testing

The appliance construction was assessed against the requirements of Clause 4, safety against the requirements of Clause 5 and performance against the requirements of Clause 6 in accordance with the EN 13240.

The performance type testing consisted of four tests; three nominal heat output tests and a temperature safety test. In the three nominal heat output tests CO-, O₂ and CO₂-concentrations and the flue gas temperature was measured. In the temperature safety test the temperature rise of the operating components and the maximum temperatures of the trihedron walls were measured.

Test fuel properties

Nominal heat output testing was carried out using birch wood logs. A representative sample was taken from the fuel batch for analysis and it was analysed in the laboratory of Labtium Oy. The fuel moisture was analysed also by Labtium Oy. Labtium Oy is an accredited fuel laboratory T241 by Finas Oy. Type tests were made on 5 March and safety test on 6 March 2014. Fuel properties of firewood are given in table 1. Fuel properties of fir timber, which was used in safety test are given in table 2.

Table 1. Test fuel properties, Nominal heat output test.

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Birch log wood		Nominal heat output test	
		Dry basis	As fired basis
Fuel analysis	unit		
Moisture content	%	-	16.1
Net calorific value	MJ/kg	19.07	15.61
Carbon, C	%	51.3	43.0
Hydrogen, H	%	6.40	5.37
Sulphur, S	%	0.02	0.02
Nitrogen, N	%	0.20	0.17
Oxygen, O	%	41.58	34.89
Ash	%	0.5	0.4

Table 2. Test fuel properties. Safety test.

Fir timber		Safety test	
		Dry basis	As fired basis
Fuel analysis	unit		
Moisture content	%	-	15.8
Net calorific value	MJ/kg	18.89	15.52
Carbon, C	%	51.1	43.0
Hydrogen, H	%	6.2	5.2
Nitrogen, N	%	< 0.2	< 0.17
Oxygen, O	%	42.38	35.68
Ash	%	0.1	< 0.1

Fuel loading

Nominal heat output test

The mass of each batch of fuel loaded in the performance test is calculated based on the given heat output, efficiency and the frequency of adding fuel. The minimum time of burning one adding is 45 minutes. If the efficiency is not known, 50 % is used. The fuel load calculation is given in the EN13240 standard in clause A.4.2 and is as follows:

$$B_{fl} = 360\,000 \times P_n \times t_b / (H_u \times \eta), \text{ where}$$

B_{fl} is the mass of fuel load, in kg

H_u is the lower calorific value of the test fuel, on as fired basis, in kJ/kg

η is the minimum efficiency according to this appliance standard or a higher value declared by the manufacturer, in %

P_n is the nominal heat output declared by the manufacturer, 6 kW

t_b is the minimum refuelling interval, in hours, or duration as declared by the manufacturer

Based on this, the mass of fuel load during 3 nominal heat output batches of **BULDER 00** was 1.568 kg + 1.600 kg + 1.590 kg = 4.76 kg. Emission is expressed as an average of these three batches.

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Safety test

The mass of fuel load is based on the surface area floor of the appliance in accordance with the following equation:

$B_{fl} = c \times S_c / H_u$, where

B_{fl} is the mass of fuel load, in kg

c is 400 MJ/m²

S_c is surface of the firebox floor, in m²

H_u is the lower calorific value of the test fuel, on as fired basis, in kJ/kg

Based on this, the mass of fuel load during safety test of **BULDER 00** was 2.8 – 2.9 kg.

To achieve balanced temperature of the trihedron walls, 7 batches were burned. The weight of individual batches was as follows:

Pre-test, 1.584 kg + 1.357 kg = 2.941 kg
1. batch, 2.836 kg (6 x 33 cm + 4 x 17 cm fir timber 50 mm x 50 mm)
2. batch, 2.900 kg (6 x 33 cm + 5 x 17 cm fir timber 50 mm x 50 mm)
3. batch, 2.854 kg (6 x 33 cm + 5 x 17 cm fir timber 50 mm x 50 mm)
4. batch, 2.816 kg (6 x 33 cm + 5 x 17 cm fir timber 50 mm x 50 mm)
5. batch, 2.835 kg (6 x 33 cm + 6 x 17 cm fir timber 50 mm x 50 mm)
6. batch, 2.906 kg (6 x 33 cm + 6 x 17 cm fir timber 50 mm x 50 mm)
7. batch, 2.854 kg (6 x 33 cm + 6 x 17 cm fir timber 50 mm x 50 mm)

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Test results

The measured maximum temperatures of the operating components and the trihedron walls are given in Table 3. The measured and calculated results of the nominal heat output tests are given in Table 4.

Table 3. Temperature safety test results.

Temperature safety test	
Clearance sides (cm)	60
Clearance back (cm)	60
Mean ambient temperature (°C)	23
Maximum temperature difference to trihedron side wall (K)	42
Maximum temperature difference to trihedron back wall (K)	30
Bottom temperature (°C)	59
Maximum temperature difference to handle temperature (K)	8
Maximum temperature difference to the combustion air adjustment handle temperature (K)	12

Table 4. Results of the three performance tests.

Measured results	Test 1	Test 2	Test 3	Mean 1-3
Test duration (h)	0.80	0.81	0.76	0.79
CO ₂ concentration (%)	5.20	4.72	5.64	5.19
O ₂ concentration (%)	15.41	15.88	14.89	15.39
CO concentration (ppm)	2108	2935	3055	2699
Fuel mass (kg)	1.6	1.6	1.6	1.6
Fuel energy content (MJ)	24	25	25	25
Fuel energy content (kWh)	7	7	7	7
Flue gas mean temperature (°C)	217	211	233	220
Ambient room mean temperature (°C)	22	22	22	22
Draught in the chimney (Pa)	-11.9	-11.8	-11.7	-11.8
Calculated results	Test 1	Test 2	Test 3	Mean 1-3
Thermal heat losses (%)	26.2	27.2	25.9	26.4
Chemical heat losses (%)	2.5	3.8	3.3	3.2
Heat losses in undergrate material (%-unit)	0.5	0.5	0.5	0.5
Efficiency (%)	70.8	68.5	70.3	69.9
Thermal output (kW)	6.0	5.9	6.4	6.1
Combustion air consumption (m ³ /h at 20 °C)	33	37	33	34
Flue gas mass flow (g/s)	11	12	10	11
Emissions	Test 1	Test 2	Test 3	Mean 1-3
CO concentration at 13% O ₂ (%)	0.30	0.46	0.40	0.39
CO concentration at 13% O ₂ (mg/m ³)	3771	5728	5002	4834

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Summary

The appliance **BULDER 00** met construction requirements detailed in clause 4 of EN 13240.

The appliance **BULDER 00** met the safety requirements detailed in clause 5 of EN 13240.

The appliance **BULDER 00** met the performance requirements detailed in clause 6 of EN 13240.

The mean carbon monoxide emission, calculated at 13% oxygen content, **0.39%**, does not exceed the maximum limit value of 1.0% specified in clause 6.2 of EN 13240. The measured total efficiency at nominal heat output calculated from the mean of three tests was **70 %** and exceeded the requirement of not less than 50% specified in clause 6.3 of EN 13240. The refuelling interval was **0.79** hours and exceeded the minimum interval for intermittent wood log burning appliances detailed in clause 6.6 of EN 13240 0.75 hours.

The appliance instructions supplied by the manufacturer for the **BULDER 00** satisfied the requirements for the appliance instructions as detailed in clause 7 of EN 13240.

The appliance marking details for the **BULDER 00** satisfied the requirements for marking as detailed in clause 8 of EN 13240. A copy of the marking information is given in appendix 3.

Jyväskylä, 18 March 2014



Aimo Kolsi

Product Manager



Appendices 3 pieces

Distribution Customer

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Appendix 1



Figure 1. Photograph of the tested appliance BULDER 00.

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Appendix 2

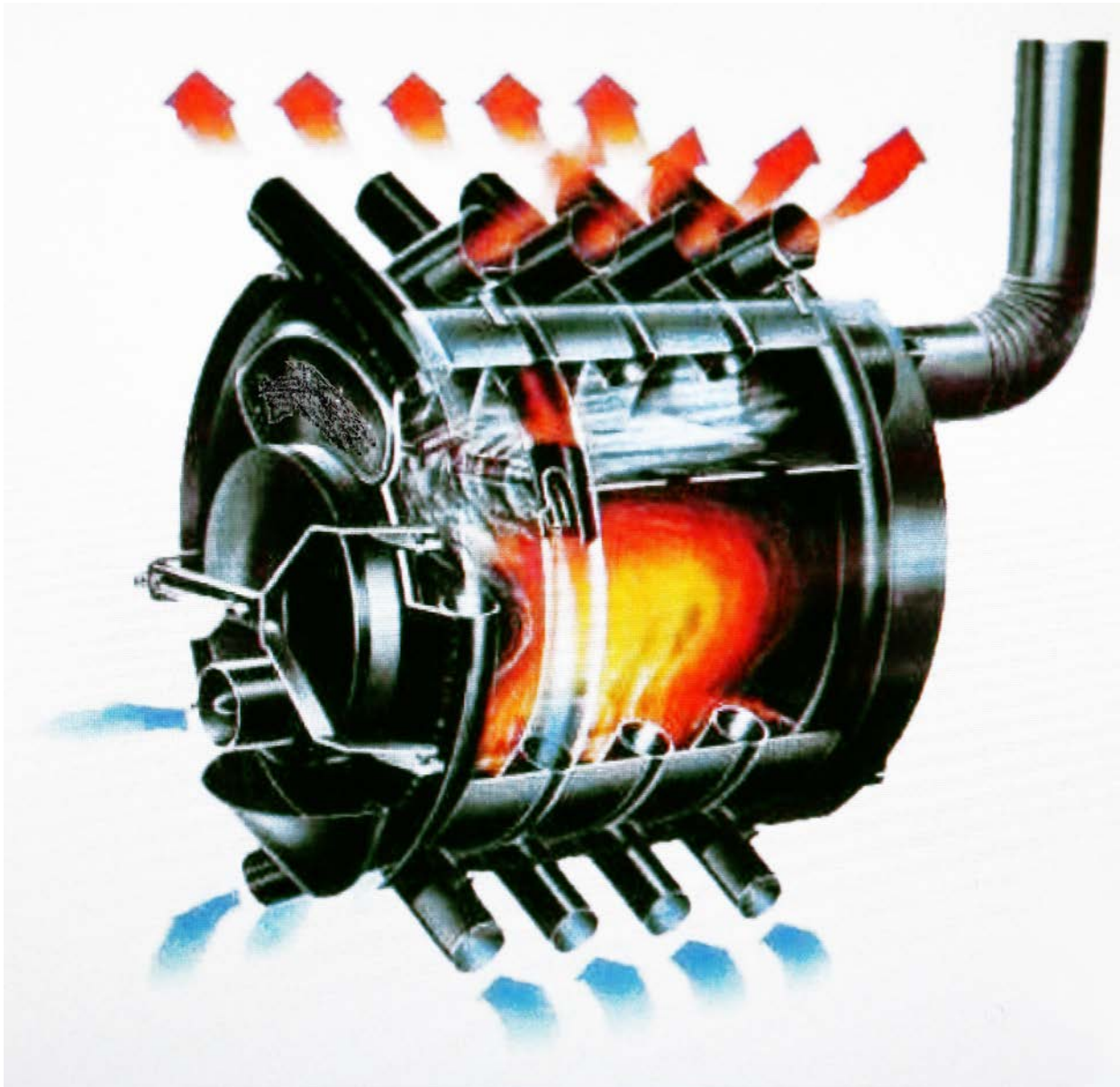


Figure 2. Principle picture of the tested appliance BULDER 00.

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Appendix 3

CE
Avena Projekt OÜ 14
<p style="text-align: center;">EN 13240:2001</p> Roomheater fired by wood logs Distance to adjacent combustible materials: back: 60 cm, side: 60 cm Emission of CO in combustion products: 0.4% Flue gas temperature: 220 °C Thermal output: 6.1 kW space heating output Energy efficiency: 70% Fuel types: Wood Logs

Figure 3. CE-marking information

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