



## **TEST REPORT**

### **30-12287/T**

**Product:** Hot-water boiler burning Wood Pellets  
with automatic fuel supply

**Type designation:** PELLETSTAR 45  
PELLETSTAR 60

**Customer:** Herz Energietechnik GmbH  
Herzstrasse 1  
A – 7423 Pinkafeld  
Austria

**Manufacturer:** Herz Energietechnik GmbH  
Herzstrasse 1  
A – 7423 Pinkafeld  
Austria

**Person responsible for re-  
view and evaluation:** Ing. Stanislav Buchta

**Report issue date:** 2013-12-20

**Distribution list:** 1 copy to the Engineering Test Institute  
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The results of tests and the evaluations relate only to the products tested.

(\*\*) Thus indicated parts of the Report contain findings verified otherwise than by tests within the meaning of ČSN EN ISO/IEC 17025.



The tests have been conducted based on Order B-48620 of 2013-12-20, Contract B-48620/30.

Based on technical assessment of all the product versions, the following – the most complex – products have been selected as the representative samples to be tested, i.e.: the types:

PELLETSTAR 45, PELLETSTAR 60

## **I. Product description, intended use and mode of application**

The hot-water boilers burning Wood Pellets - C1 with automatic fuel supply, type PELLETSTAR 45, PELLETSTAR 60 are intended for heating of residential houses and similar buildings. The boiler comprises the boiler body, slanted fuel feed auger and ash containers.

The boiler body consists of a steel weldment, and it is divided into the combustion chamber and the heat exchanger part. In the bottom of the combustion chamber is a moving step grate with ash discharge augers for automatic ash removal underneath it. The combustion space is lined with ceramic lining. At the top of the combustion chamber is a cleaning door. The heat exchanger part consists of a double-pass heat exchanger with vertical tubing.

Water connections are in the rear wall of the boiler. The filling/emptying connection is in the bottom part of the boiler rear wall. The exhaust fan is fitted at the top of the boiler rear part.

Electronic control unit is in the top part of the front wall.

Further detailed descriptions of individual assembly groups are provided in the enclosed technical documentation to Task 30-12287.

## **II. Sample tested**

Boiler output versions that are the subject of the proceedings:

Boiler output version	Heat output [kW]	Place of testing
PELLETSTAR 45	45	Herz Energietechnik GmbH Herzstrasse 1 A – 7423 Pinkafeld Austria
PELLETSTAR 60	60	

Visual inspection, testing and evaluation were carried out by Ing. Michal Havlů, Test Engineer, at Herz Energietechnik GmbH, Herzstrasse 1, A – 7423 Pinkafeld, Austria, in 12/2013.

The tests were performed with the measurement and test equipment with valid calibration.



**III. Measuring and test equipment**

<b>No.</b>	<b>Description</b>	<b>Inventory number</b>	<b>Calibration valid until</b>	<b>Accuracy</b>
1.	Combustion product analyser, Horiba, type 680 P	92-0004	Calibration prior to each measurement	see CRM 103000237769 see CRM 103000237770
2.	Weighing machine	02-2290	10-2015	see Calibration Sheet 6051-KL-H-0651-10
3.	Water meter, NW 20	02-1575	03-2015	see Calibration Sheet AKL-P-006-2009
4.	Data collection system	02-2241	12-2013	see Calibration Sheet 110002
5.	Moisture meter, thermometer	11-6258	11-2015	see Calibration Sheet 7630F-09
6.	Barometer	11-2541	11-2016	see Calibration Sheet 613-KL-K011-08
7.	Draught gauge	11-7275	01-2016	see Calibration Sheet 0144F-11
8.	Stop watch	99-0760	10-2015	see Calibration Sheet 2850E-07
9.	Calorimeter, IKA, type C 5000	02-2236	03-2015	$\pm 0.12$ MJ/kg
10.	Elemental analyser, Perkin Elmer, type 2400 CHNS	02-2107	03-2015	$\pm 0.2$ % rel.
11.	Gravimat, SHC 501	02-2328	12-2013	see Calibration Sheet 090177 (8,9), 090180
12.	Laboratory weighing machine	02-1458	06-2015	see Calibration Sheet 6051-KL-H376-09
13.	Weighing machine, Ohaus MB 45	02-2274	06-2015	see Calibration Sheet 6051-KL-H374-09
14.	Manometer	11-1985	02-2014	see Calibration Sheet 090162
15.	Prandtl tube, 0.3 m	ME 484	11-2015	see Calibration Sheet 5012-KL-RS090-09
16.	Psychrometer H 4220	92-0005	12-2013	see Calibration Sheet 090176



#### IV. Results of tests and evaluation

No.	Requirement	Technical standard, regulation applied	Source materials	Evaluation	
				Test	Evaluation
1.**	General requirements	ČSN EN 303-5:2013 Art. 4.1	Pages 6 – 7	0	+
2.**	Construction requirements	ČSN EN 303-5:2013 Art. 4.2, 4.2.1, 4.2.1.1, 4.2.1.2, 4.2.2, 4.2.2.1, 4.2.2.2, 4.2.2.3, 4.2.2.4, 4.2.4, 4.2.4.1, 4.2.4.2, 4.2.4.3, 4.2.4.4, 4.2.4.5, 4.2.4.6, 4.2.4.7, 4.2.4.8, 4.2.4.9, 4.2.4.10, 4.2.4.11, 4.2.4.12	Pages 8 – 12	0	+
3.**	Safety requirements	ČSN EN 303-5:2013 Art. 4.3, 4.3.1, 4.3.3, 4.3.3.1, 4.3.3.2, 4.3.3.3, 4.3.3.4, 4.3.3.5, 4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.8.1, 4.3.8.2, 4.3.8.3, 4.3.8.4, 4.3.9, 4.3.9.1, 4.3.9.2, 4.3.9.3	Pages 13 – 21	0	+
4.**	Performance requirements	ČSN EN 303-5:2013 Art. 4.4, 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.6, 4.4.7	Pages 22 - 23	0	+
5.**	Marking	ČSN EN 303-5:2013 Art. 7, 7.1, 7.2, 7.3	Page 24	0	+
6.**	Technical documentation, supplied with boiler	ČSN EN 303-5:2013 Art. 8, 8.1, 8.2, 8.3, 5.16.1	Pages 25 - 28	0	+
7.	Pressurized component tightness and strength test (1001.1*)	ČSN EN 303-5:2013 Art. 5.4, 5.4.1, 5.4.2	Page 29	+	0
8.	Surface temperature test (1003*)	ČSN EN 303-5:2013 Art. 5.12, 5.16.4, 4.3.6	Pages 30 - 32	+	0
9.	Test of heat output, input and efficiency(1004.1*) Test of combustion product temperature (1004.2*)	ČSN EN 303-5:2013 Art. 4.4.2, 4.4.3, 5.7, 5.8, 5.10 ČSN EN 303-5:2013 Art. 4.4.3	Pages 33 - 37	+	0
10.	Combustion efficiency test – emissions (1005.1*)	ČSN EN 303-5:2013 Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4	Pages 38 – 39	+	0
11.	Test of heat output, input and efficiency (1004.1*) Combustion efficiency test – emissions (1005.1*)	ČSN EN 303-5:2013 Annex C, Deviation from Austria, C.2.2, C.2.3	Pages 40 – 41	+	0
		ČSN EN 303-5:2013 Annex C, C.3 Deviation from Croatia	-	0	0
		ČSN EN 303-5:2013 Annex C, Deviation from Denmark , C.4.1, C.4.2	Pages 42 – 43	+	0
		ČSN EN 303-5:2013 Annex C, Deviation from Germany, C.5.1, C.5.2	Pages 44 – 45	+	0
		ČSN EN 303-5:2013 Annex C C.6 Deviation from Switzerland	Pages 46 - 47	+	0



No.	Requirement	Technical standard, regulation applied	Source materials	Evaluation	
				Test	Evaluation
12.	<b>Test of heat output, input and efficiency (1004.1*)</b>  <b>Combustion efficiency test – emissions (1005.1*)</b>	ČSN EN 303-5:2013 Annex C C.8 Deviation from Italy	Pages 48 - 49	+	0
13.	<b>Test of control, regula- tion and safety ele- ments (1006.1*)</b> <b>Combustion efficiency test – emissions (1005.1*)</b>	ČSN EN 303-5:2013 Art. 5.13, 5.14, 5.16.2, 5.16.3 ČSN EN 303-5:2013 Art. 5.9, 5.10.4	Pages 50 – 53	+	0

Note:

No.: 1 - 6

(\*\*) Not a test

Evaluation:

+ Requirement fulfilled  
 - Requirement not fulfilled  
 x Not assessed  
 0 Not applicable



Requirement assessed: **General requirements**

Requirement specification: ČSN EN 303-5:2013 Art. 4.1

Sample assessed: PELLETSTAR 45, PELLETSTAR 60

**Evaluation results:** see the following Table

Requirement	Requirement specification	Evaluation	Note
General requirements	ČSN EN 303-5:2013 Art. 4.1		
<p>Boilers shall be fire-resistant and safe to operate. They shall be made of non-combustible materials according to EN 13501-1 and shall be resistant to deformation. They shall be made such that:</p> <p>a) they can withstand stresses arising during normal operation, the heat carrier (water) does not become heated to a dangerous extent (<math>\leq 110</math> °C);</p> <p>b) gases do not leak from the boiler or the stoking device or from an integrated hopper in dangerous quantities into the place of installation or into the fuel line,</p> <p><i>NOTE: Safety requirements regarding harmful gas concentrations of course need to be considered. Both these elements, however, strongly depend on the place of installation and the fuel storage discharge system and therefore fall outside of the scope of this standard. This requirement is deemed to be fulfilled if the requirements of the leakage of the boiler and of the emissions are met and there is no visible smoke emerging from the boiler into the test room at normal operation during type test.</i></p> <p>a) flames do not flare out and embers do not fall out when the boiler is operated correctly;</p> <p>b) dangerous accumulations of combustible gases (<math>&gt; 5</math> % CO) in the combustion chamber and in the flues are prevented.</p> <p><b>For the evaluation of the hazardous situation, the CO-concentration in the flue gas measuring section should not exceed the critical values for a time period greater than 1 min.</b></p> <p>Combustible materials shall be allowed for the following:</p> <p>c) internal components of controls and safety equipment;</p> <p>d) operating handles;</p> <p>e) electrical equipment;</p> <p>f) components of accessory (e.g. burner cover);</p> <p>g) additional or supplemental optical outer covers (e.g. an additional decorative cover).</p> <p>Component parts of covers, operating controls, safety devices and electrical accessories shall fulfil the requirements of resistance against heat and fire in either EN 60335-1 or EN 60730-1.</p>	<p>ČSN EN 303-5:2013 Art. 4.1</p>	<p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p>	



Requirement	Requirement specification	Evaluation	Note
<p>Component parts of covers, operating controls, safety devices and electrical accessories shall be arranged in such a way that their surface temperatures, under steady state conditions, do not exceed those specified either by the manufacturer or in the component part standard.</p> <p>The materials for the parts subject to pressure shall be in accordance with generally accepted technical requirements. They shall be suitable for the purpose and intended use. Documented proof of mechanical and physical properties of materials used and their chemical composition shall be obtained from the supplier.</p> <p>The design of the boiler shall be such that it can be handled safely. It shall be designed and packaged so that it can be stored safely and without damage.</p> <p>Where the weight, size or shape of the boiler or its components prevents them from being moved by hand, they shall be fitted with means to lift them easily.</p> <p>Constructional parts accessible during use and maintenance shall be free from sharp edges and corners that might cause damage or personal injury during use or maintenance.</p> <p>Motors and fans shall be mounted in such a way as to minimize noise and vibration.</p>	<p>ČSN EN 303-5:2013 Art. 4.1</p>	<p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p>	

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

Evaluation drafted by:  
 Ing. Michal Havlů

Date: 12/2013

Signed: *P. P. Malaiska*

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 12/2013

Signed: *P. P. Malaiska*



Requirement assessed:

**Construction requirements**

Requirement specification:

ČSN EN 303-5:2013 Art. 4.2, 4.2.1, 4.2.1.1, 4.2.1.2, 4.2.2, 4.2.2.1, 4.2.2.2, 4.2.2.3, 4.2.2.4, 4.2.4, 4.2.4.1, 4.2.4.2, 4.2.4.3, 4.2.4.4, 4.2.4.5, 4.2.4.6, 4.2.4.7, 4.2.4.8, 4.2.4.9, 4.2.4.10, 4.2.4.11, 4.2.4.12

Sample assessed:

PELLETSTAR 45, PELLETSTAR 60

**Evaluation results:**

see the following Table

Requirement	Requirement specification	Evaluation	Note
<b>Construction requirements</b>	ČSN EN 303-5:2013 Art. 4.2		
<b>Production documentation</b>	ČSN EN 303-5:2013 Art. 4.2.1		
<b>Drawings</b> The drawings and-or the relevant documentation shall include at least the following information: a) the specification of the material; b) the welding process, the seam type (generally the symbol for the seam type is sufficient) and the welding fillers; c) the maximum allowable operating temperature, in °C; d) the maximum allowable operating pressure, in bar; e) the type test pressure, in bar. f) the nominal heat output or the heat output range for every boiler size, in kW, in accordance with the fuel(s) recommended for use in the boiler.	ČSN EN 303-5:2013 Art. 4.2.1.1	+ + + + + +	
<b>Manufacturing controls</b> A Quality Manual shall be compiled on the inspections and tests necessary during the manufacturing process. The manual shall: 1) describe the inspection system; 2) specify the person responsible for quality assurance; 3) specify the necessary inspections and tests as well as the pertinent limit values and; 4) lay down the requisite measuring and testing equipment and their inspection.	ČSN EN 303-5:2013 Art. 4.2.1.2	+ + + +	
<b>Heating boilers made of steel and non-ferrous materials</b>	ČSN EN 303-5:2013 Art. 4.2.2		
<b>Execution of welding work</b> Boiler manufacturers who carry out welding work shall meet the requirements of EN 287-1 and EN ISO 9606-2 as follows: - only welders who are qualified in the welding of the materials to be processed shall be used; - equipment shall be available to allow defect-free welding to be carried out;	ČSN EN 303-5:2013 Art. 4.2.2.1	+ + +	Enclosed technical documentation.





Requirement	Requirement specification	Evaluation	Note
- supervision of the welding shall be carried out by staff qualified in welding (at least one supervisor shall be qualified).		+	
<p><b>Welding seams and welding fillers</b></p> <p>The materials shall be suitable for welding.</p> <p><i>NOTE 1: The materials in Table 1 are suitable for welding and do not require additional heat treatment after welding.</i></p> <p>The welded seams shall not show any cracks or lack of fusion and shall be defect free over the whole cross section for butt welds. One-sided fillet welds, and half Y-welds which have been welded through, shall be kept substantially free from bending stresses. Smoke tubes, inserted stays and similar components need not be counter welded.</p> <p>Double fillet welds are only permissible when sufficiently cooled. Projections into the flue gas side in areas of high thermal stresses shall be avoided.</p> <p>Corner welds, edge welds and similar welded connections, which shall only be subject to high bending stresses during production and operation, are to be avoided.</p> <p>When welding longitudinal stay bars or stay tubes, the shearing cross section of the fillet weld shall be 1.2 times the required stay bar or stay tube cross sectional area.</p> <p>The permissible types of weld and appropriate material thicknesses are given in Table 2 and these parameters shall be met.</p> <p>Welding fillers shall be suitable for the material being used.</p>	<p>ČSN EN 303-5:2013 Art. 4.2.2.2</p>	+	<p>Enclosed technical documentation (welding procedures).</p>
		+	
		+	
<p><i>NOTE 2: The terms given in Table 2 are in accordance with EN 22553; the reference numbers of welding processes are in accordance with ISO 857-1, ISO 857-2 and EN ISO 4063.</i></p>		+	
<p><b>Parts of steel subject to pressure</b></p> <p>The steels listed in Table 1 shall be used.</p> <p>Materials and wall thicknesses other than those specified shall only be used on the production of appropriate evidence, with regard to (at least) their equivalent corrosion resistance, heat resistance and strength to non-alloy steel at the material thicknesses specified in Table 1 for the particular application-usage.</p>	<p>ČSN EN 303-5:2013 Art. 4.2.2.3</p>	+	<p>Enclosed technical documentation (welding procedures).</p>
<p>The specification of the materials shall be documented by a works certificate in accordance with EN 10204. These certificates shall be obtained by the boiler manufacturer. This does not apply to components, e.g. sockets up to DN 50, screws and nuts.</p>		+	



Requirement	Requirement specification	Evaluation	Note
<p><b>Minimum wall thicknesses</b></p> <p>The minimum wall thicknesses listed in Table 3 have been specified in order to take into account the following:</p> <ul style="list-style-type: none"> <li>a) the maximum allowable operating pressure;</li> <li>b) the nominal heat output;</li> <li>c) the material properties.</li> </ul> <p>For boilers which consist of a combination of individual geometrically identical parts (sections), the requirements of the minimum wall thickness for the complete range of the nominal heat output of the boiler shall be in accordance with the individual boiler sections as specified in Table 3.</p> <p>The wall thickness tolerance for carbon steels shall be as specified in EN 10029.</p>	<p>ČSN EN 303-5:2013 Art. 4.2.2.4</p>	+	
<p>The minimum wall thicknesses according to Table 3 apply to pressure-loaded sheets, tubes (except immersion coils and safety heat-exchangers) and forgings.</p> <p>Smaller wall thicknesses shall be permitted upon the production of evidence demonstrating equivalence with regard to corrosion, heat resistance and strength.</p>		+	Enclosed technical documentation (semi-finished products).
<p><b>Design requirements</b></p>	<p>ČSN EN 303-5:2013 Art. 4.2.4</p>		
<p><b>Venting of the water sections</b></p> <p>The boiler and its components shall be designed in such a way that their respective water sections can be fully vented. The boiler shall be designed in a way that under normal operation in accordance with the manufacturer's instructions no undue boiling occurs.</p> <p><i>NOTE: Boiling can be detected by boiling noise.</i></p>	<p>ČSN EN 303-5:2013 Art. 4.2.4.1</p>	+	
<p><b>Cleaning of heating surfaces</b></p> <p>The heating surfaces shall be accessible from the flue gas side for inspection and cleaning with chemical agents and brushes. A sufficient number and appropriate arrangement of cleaning openings shall be provided. If special tools (for example special brushes) are required for cleaning and maintenance of the boiler, these shall be supplied.</p>	<p>ČSN EN 303-5:2013 Art. 4.2.4.2</p>	+	
<p><b>Inspection of the flame</b></p> <p>A facility shall be provided which allows inspection of the flame or fire bed. If this facility is a door, then hazard-free inspection shall be possible.</p> <p><i>NOTE The facility of an inspection window is recommended.</i></p>	<p>ČSN EN 303-5:2013 Art. 4.2.4.3</p>	+	
<p><b>Water tightness</b></p> <p>Holes for screws and similar components which are used for the attachment of removable parts shall not enter into spaces through which water flows. This does not apply to pockets for measuring or control and safety equipment</p>	<p>ČSN EN 303-5:2013 Art. 4.2.4.4</p>	+	



Requirement	Requirement specification	Evaluation	Note
<p><b>Replacement parts</b>                      Replacement and spare parts (e.g. inserts, shaped fire-bricks, turbulators etc.) shall be designed, made or marked in such a way that their installation shall be correct in accordance with the manufacturer's instructions.</p>	<p>ČSN EN 303-5:2013                      Art. 4.2.4.5</p>	<p style="text-align: center;">+</p>	
<p><b>Boiler shell tapings</b>                      Boiler shell tapings shall comply with EN 10226-1, ISO 7-2, EN ISO 228-1, EN ISO 228-2; flange connections shall comply with ISO 7005-1, ISO 7005-2 and ISO 7005-3. The arrangement of the tapings shall be such that they are easily accessible and the function of each respective connection can be adequately fulfilled. There shall be sufficient space around the connection to allow the installation of the connecting pipes (flanges, bolts) with the necessary tools.</p> <p>Threaded pipe connections above 2 inches (<b>DN 50</b>) are not recommended. Threaded pipe connections with nominal diameters above 3 inches (<b>DN 80</b>) shall not be permitted. This information shall be supplied with the boiler. If connections are fitted with flanges, the mating flanges and seals shall also be supplied except where standardised flanges and seals are available.</p> <p>The minimum size for flow outlet shall be <b>DN 20</b>.                      The boiler shall have at least one connection for filling and emptying. This connection may be common.                      The size of the connection shall be as a minimum:                      – <b>G 1-2 for nominal heat outputs up to 70 kW;</b>                      – <b>G 3-4 for nominal heat outputs above 70 kW.</b>                      It is possible to provide these connections outside the boiler if satisfactory filling and emptying of the boiler can be assured.</p>	<p>ČSN EN 303-5:2013                      Art. 4.2.4.6</p>	<p style="text-align: center;">+</p>	
<p>Every boiler shall be equipped with at least one immersion pocket which is used for temperature control, a safety temperature limiter and a thermometer. If a threaded pipe connection is required, the minimum nominal diameter shall be G 1-2. Alternative arrangements are allowed, provided that the control devices are supplied with the boiler, and that they cannot be substituted by other components. The immersion pockets shall be designed so that an unintended change of position of the temperature sensor is avoided. The position of the immersion pocket shall be chosen in such a way that the highest temperature of the boiler water is recorded with sufficient accuracy. Where additional connections for safety devices such as a pressure detector, manometer, low water cut-out device or a safety valve are provided, then their size (especially the size of the safety valve), shall be determined according to the output of the boiler.  <i>NOTE: For further information on safety valves, see EN 12828.</i></p>	<p>ČSN EN 303-5:2013 Art. 4.2.4.7</p>	<p style="text-align: center;">+</p>	



Requirement	Requirement specification	Evaluation	Note
<b>Thermal insulation</b> All boilers shall be fitted with thermal insulation. The thermal insulation shall withstand normal thermal and mechanical stresses. It shall be made of non-combustible material and shall not give off fumes during normal running.	ČSN EN 303-5:2013 Art. 4.2.4.8	+	
<b>Water side resistance of the boiler</b> The water side resistances are to be determined for those flows which correspond to the nominal heat output with two temperature differences of 10 K and 20 K between the flow and return connections of the boiler. The results are to be stated in mbar for each boiler size and shall correspond to the values indicated by the manufacturer.	ČSN EN 303-5:2013 Art. 4.2.4.9	+	
<b>Integral fuel hopper</b> A boiler with integral fuel hopper shall be made of fire resistant material according to EN 13501-2. The volume shall be limited to a maximum of 1,5 m <sup>3</sup> . The hopper shall be designed in such a way that the fuel moves freely until the hopper is empty.	ČSN EN 303-5:2013 Art. 4.2.4.10	+	
<b>Fuel chamber</b> The fuel chamber shall be designed in such a way that the fuel moves freely and the duration of the combustion period is assured.	ČSN EN 303-5:2013 Art. 4.2.4.11	+	
<b>Ash chamber</b> The capacity of the ash chamber shall be adequate for a combustion period of at least 12 h using the stipulated fuel at nominal heat output. It shall be designed to ensure the unobstructed flow of combustion air under the grate. If the system is designed with devices for automatic ash and clinker removal, the above requirement shall be considered as met.	ČSN EN 303-5:2013 Art. 4.2.4.12	+	

Note:

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

Evaluation drafted by:  
 Ing. Michal Havlů

Date: 12/2013

Signed: P. P. Matoušek

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 12/2013

Signed: P. P. Matoušek



Requirement assessed: **Safety requirements**

Requirement specification: ČSN EN 303-5:2013 Art. 4.3, 4.3.1, 4.3.3, 4.3.3.1, 4.3.3.2, 4.3.3.3, 4.3.3.4, 4.3.3.5, 4.3.4, 4.3.5, 4.3.6, 4.3.7, 4.3.8, 4.3.8.1, 4.3.8.2, 4.3.8.3, 4.3.8.4, 4.3.9, 4.3.9.1, 4.3.9.2, 4.3.9.3

Sample assessed: PELLETSTAR 45, PELLETSTAR 60

**Evaluation results:** see the following Table

Requirement	Requirement specification	Evaluation	Note
<p><b>General</b>                      Potential hazards caused by the boiler, including the operation of the firing system and any stoking device, shall be avoided by either constructional means or by, the use of safety devices. Safety shall be maintained in the event of possible failures in the safety device itself. The manufacturer shall undertake a risk assessment covering all potential hazards of the boiler and the measures how to avoid or control them in a safety concept. Control functions within the safety concept shall be classified and realized accordingly. The risk assessment shall be performed according to EN ISO 12100 with particular emphasis on the type of the boiler and the fuel fired. Control functions are classified as follows.</p> <p><b>Class A:</b> Control functions which are not intended to be relied upon for the safety of the application.</p> <p><b>Class B:</b> Control functions which are intended to prevent an unsafe state of the appliance. Failure of the control function will not lead directly to a hazardous situation. For devices used in a class B control function, a single fault assessment of the device including use of software class B according to EN 60730-1 is required.</p> <p><b>Class C:</b> Control functions which are intended to prevent special hazards such as explosion or whose failure could directly cause a hazard in the appliance. For devices used in a class C control function, a second fault assessment of the device including use of software class C according to EN 60730-1 is required. In case of safety routines realised in a programmable logic control the software shall meet the requirements of the appropriate software class B or C (including fault assessment according to EN 60730-2-5 in connection with EN 60730-1).</p> <p>This risk assessment shall cover at least the following:                      – elements given in 4.3.4 to 4.3.9;                      – boiler functions, including start-up, purge, ignition, flame supervision, flue gas flow, control of heat demand and combustion control.</p> <p>In the risk assessment, one of the above mentioned classifications of the control function shall be allocated to any identified hazard.</p> <p>The actuation of any control function class B or class C shall at least result in cutting off the fuel feed.</p>	<p>ČSN EN 303-5:2013 Art. 4.3.1</p>	<p>+</p>	<p>Class B                      30-12287/E                      30-12287                      /EMC</p>



Requirement	Requirement specification	Evaluation	Note
<p><b>Safety against back burning for automatic stoked boilers</b></p>	<p>ČSN EN 303-5:2013 Art. 4.3.3</p>	<p>+</p>	
<p><b>General</b>  Automatic stoking systems shall be designed to prevent back burning.  The hazard of back burning is classified as a risk corresponding to safety level C in accordance with 4.3.1 and is related to the driving forces thermal conductance, back-flow of ignitable gases and fire propagation backwards (see 4.3.3.2, 4.3.3.3 and 4.3.3.4). Back burning shall be avoided by constructional means and the implementation of one or more back burn safety devices.  <i>NOTE: The handling of the risk for back burning at safety level C includes the specification that sufficient safety measures need to be available.</i>  Adequate constructional means or safety devices shall:  a) work always in the closed circuit current principle;  b) avoid a back burning in the state of loss of power supply;  c) avoid a back burning in the state of failure of stoking device or interruption of stoking device.  In order to ensure that safety against back burning is adequately addressed, a risk assessment shall be undertaken. This assessment shall document the means employed to avoid the three driving forces for back burning and how they match the tested boiler. The documentation of the means employed shall include the specification of any chosen safety device.  At least one of the safety systems shall continue to provide protection in the event of interruption of the fuel feed (e.g. blockage of the feed screw).  The following mechanisms shall be avoided:  d) Thermal conductance (4.3.3.2);  e) Back flow of ignitable combustion gases (4.3.3.3);  f) Fire propagation into fuel line (4.3.3.4).</p>	<p>ČSN EN 303-5:2013 Art. 4.3.3.1</p>	<p>+ + + + + +</p>	
<p><b>Thermal conductance</b>  The surface temperature of the stoking device of the boiler (without insulation) or integrated hopper shall not exceed 85 °C in any operating state or in case of a failure. If this criterion is fulfilled by constructional means, no additional safety device is necessary.  Thermal conductance shall be verified during the tests specified in 5.7 (thermal performance for nominal load and partial load), 5.13 to 5.16 and after the stopping of the stoking device of the boiler, with a permanent temperature measurement until a maximum is reached. For further information on verification of this requirement, see 5.16.4.  Accepted solutions to prevent overheating in the stoking device due to thermal conductance are:  - an extinguishing device e.g. water sprinkler system and a safety temperature limiter adjusted to a maximum of 95 °C;</p>	<p>ČSN EN 303-5:2013 Art. 4.3.3.2</p>	<p>+ +</p>	



Requirement	Requirement specification	Evaluation	Note
<ul style="list-style-type: none"> <li>- an emergency discharge device emptying the stoking device without overflowing the boiler; which is reacting below 95 °C (alternatively 20 K increase to standard operation conditions);</li> <li>- a stoking device which is cooled by a water circuit and the temperature of the water is limited by a cut out (e.g. water circuit is part of boiler circuit).</li> </ul> <p>Accepted solutions to prevent overheating in the integrated hopper due to thermal conductance in combination with accepted solutions for stoking devices are:</p> <ul style="list-style-type: none"> <li>- an extinguishing device directly in the hopper e.g. water sprinkler system and an STB adjusted to a maximum of 95 °C;</li> <li>- sufficient insulation of the hopper from hot parts of the boiler;</li> <li>- naturally ventilated space between hopper and boiler body (separate casing).</li> </ul> <p>Criteria to verify the design of accepted solutions are listed in Table B.1. No test needs to be performed according to 5.16.4 if the chosen design is an accepted solution and the risk assessment proves the suitability for the boiler burner unit and the control algorithm interaction. If the risk assessment fails, further tests shall be required.</p>		<p style="text-align: center;">+</p> <p style="text-align: center;">0</p> <p style="text-align: center;">0</p> <p style="text-align: center;">+</p> <p style="text-align: center;">+</p>	
<p><b>Back flow of ignitable combustion gases into the fuel line or integral hoppers</b></p> <p>No significant flow of combustion gases in an ignitable concentration or carrying a critical amount of energy to ignite wood (e.g. sparks or hot gases) shall pass the constructional means or safety device(s) into the fuel line or into the hopper. Due to other safety reasons (for example to hinder poisoning by CO), any back flow of combustion gases shall be avoided (see 4.1).</p> <p><i>NOTE 1: Indications for significant back flow might include:</i></p> <ul style="list-style-type: none"> <li>a) a temperature rise of more than 20 K compared to operation without back flow;</li> <li>b) CO concentration of more than 1 vol. % CO (dry) in the fuel line caused by any operational status or failure;</li> <li>c) accumulation of smoke in an integrated hopper</li> </ul> <p>This requirement applies during the tests according to 5.7 (thermal performance for nominal load and partial load including ignition, start up, continuous operation and shut down) and 5.13 to 5.16.</p> <p>Accepted solutions to prevent back flow in the fuel line are listed as follows.</p> <ul style="list-style-type: none"> <li>- Safety device to maintain a continuous seal between the stoking device and the fuel line, e.g. cell feeder.</li> <li>- Safety device to seal the fuel line not during fuel supply but during all other phases of operation (e.g. lid) in combination with a boiler operating with a negative pressure (tightness requirements in closed state identical to continuously sealing safety devices).</li> <li>- Tight fuel hopper lid in combination with pressure equalization that works during normal operation and in case of start-up, shut down or power loss. Diffusion of hot gases into the hopper shall be avoided by a connection for</li> </ul>	<p style="text-align: center;">ČSN EN 303-5:2013 Art. 4.3.3.3</p>	<p style="text-align: center;">0</p> <p style="text-align: center;">+</p> <p style="text-align: center;">0</p>	



Requirement	Requirement specification	Evaluation	Note
pressure equalization between the combustion air supply and the fuel hopper. The dimension of the connection shall only be sufficient to equalize pressure, not to accelerate fire propagation. Hopper lid shall be fitted with an interlock switch (according to H27 of EN 60730-2-5) which stops combustion air supply in case of an open lid.			
- Tight fuel hopper lid in combination with negative pressure operation of the boiler. Diffusion of hot gasses into the hopper shall be avoided by natural draught (e.g. inclined auger). The hopper lid shall be fitted with an interlock switch (according to H27 of EN 60730-2-5) which stops combustion air supply in case of an open lid.		0	
- Use of directed flow to create stable pressure conditions, e.g. injector, safety device to control fan rotation of supply fan or relevant pressure, which closes the fuel supply in case of failure.		+	
<i>NOTE 2: Other solutions include the use of a flue gas fan to assure negative pressure condition in the boiler compared to pressure in the fuel line or hopper. The flue gas fan operation is controlled by a safety device for rotation or for pressure in combination with an additional safety device that prevents back flow in case fan failure or power loss. Criteria to verify the design of accepted solutions are listed in Table B.1.</i> No test needs to be performed according to 5.16.4 if the chosen design is an accepted solution and the risk assessment proves the suitability for the boiler burner unit and the control algorithm interaction. If the risk assessment fails, further tests shall be required.	ČSN EN 303-5:2013 Art. 4.3.3.3	0	
<b>Fire propagation into the fuel line or integral hopper</b> Fire propagation into the fuel line or integral hopper shall be avoided in any operational state or in case of any failure. This does not include the thermal reaction of a small amount of fuel at the end of the stoking device, if there is no further reaction into the fuel line. <i>NOTE: Indication for significant fire propagation might include:</i> a) a temperature raise of more than 20 K in the stoking device above normal operation; b) a temperature of more than 85 °C on the surface of the stoking device; c) an accumulation of smoke in an integral hopper. This requirement shall be proven during the tests according to 5.7 (thermal performance for nominal load and partial load) and 5.13 to 5.16 with a permanent temperature measurement until the maximum temperature is reached. Accepted solutions to hinder fire propagation to the fuel line are listed as follows.			
- An extinguishing device, e.g. water sprinkler system and an STB adjusted to a maximum of 95 °C.		+	
- A safety device to seal continuously the supply line and with a sufficient fuel free distance and fuel free cross section, (e.g. cell feeder, rotary air lock) in combination with a design to prevent overfilling.	ČSN EN 303-5:2013 Art. 4.3.3.4	+	





Requirement	Requirement specification	Evaluation	Note
<ul style="list-style-type: none"> <li>- A safety device to seal the fuel line not during fuel supply but during all other phases of operation (e.g. lid) in combination with a boiler operating with a negative pressure (tightness requirements in closed state identical to continuously sealing safety devices), in combination with a design to prevent overfilling and with a sufficient fuel free distance and fuel free cross section.</li> <li>- An emergency discharge device emptying the stoking device without overfilling the boiler, which is reacting at a temperature limit not exceeding 95 °C (alternatively 20 K increase to standard operation conditions).</li> </ul>		+	
<ul style="list-style-type: none"> <li>- Inclined auger in combination with fuel transport slide to-in the combustion chamber and a safety limiter reacting at a temperature not exceeding 95 °C.</li> </ul> <p>Criteria for accepted solutions to verify the design are listed in Table B.1. No test needs to be performed according to 5.16.4 if the chosen design is an accepted solution and the risk assessment proves the suitability for the boiler burner unit and the control algorithm interaction. If the risk assessment fails, further tests shall be required.</p>	<p>ČSN EN 303-5:2013 Art. 4.3.3.4</p>	0  0	
<p><b>Alternative verification of safety against back burning</b></p> <p>In case of any deviations regarding 4.3.3.2 to 4.3.3.4, the safety against back burning shall be verified according to the following procedures, combining a risk assessment including reliable tests of the alternative safety devices with reference to the criteria in 5.16.1.</p> <p>If:</p> <ul style="list-style-type: none"> <li>- no accepted solution is chosen, or;</li> <li>- the risk assessment ensures no suitability of a accepted solution for the boiler design, or;</li> <li>- the accepted solutions against back burning are not applicable (e.g. the suitability of constructional means or devices or the tightness criterion for certain boiler designs),</li> </ul> <p>further tests shall be performed (see 5.16.5).</p> <p>The test shall be documented by the third party laboratory in a report which includes the description of the test sample and the test installation, the way to perform the back burning test, the test conditions and the test results.</p>	<p>ČSN EN 303-5:2013 Art. 4.3.3.5</p>	0 0 0	
<p><b>Safety against fuel overload of the boiler or interruption in fuel supply</b></p> <p>During start up and continuous operation of the boiler with the fuel feed rate of the stoking device set at maximum capacity or interruption of the stoking device, no dangerous situation shall occur.</p> <p>The test at overload mode according to 5.16.2 may be omitted if a safety device, safety level C according to 4.3.1, prevents an overload mode.</p> <p>The boiler shall be equipped with a safety device that stops the fuel supply in the event that there is either insufficient or no combustion in the burner head.</p> <p>The test for interruption of fuel supply according to 5.16.2</p>	<p>ČSN EN 303-5:2013 Art. 4.3.4</p>	+	<p>Class B 30-12287/E 30-12287 /EMC</p>



Requirement	Requirement specification	Evaluation	Note
<p>may be omitted if a safety device, safety level B or C according to 4.3.1, is used.</p> <p>In the ignition phase, a safety device shall stop the fuel supply after a safety time which shall be declared by the manufacturer of the burner start up function, if there is no or insufficient combustion. A failure in the safety device to detect insufficient combustion shall not lead to a dangerous situation.</p>			
<p><b>Safety against lack of air supply or insufficient combustion</b></p> <p>If the air supply includes fan assistance or adjustable devices to control the cross section of the air inlet, the tests according to 5.16.3 shall be performed. Neither a combination of a failure of the fan and the malposition of the adjustable devices nor the malposition of adjustable devices with separate actuators at the same time shall be taken into account.</p> <p><b>The CO concentration in the boiler shall not exceed 5 % volume.</b></p>	<p>ČSN EN 303-5:2013 Art. 4.3.5</p>	<p>+</p>	<p>Less than 5% CO</p>
<p><b>Surface temperatures</b></p> <p>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.</p> <p>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 room temperature by more than the following values:</p> <ul style="list-style-type: none"> <li>- 35 K for metals and similar materials;</li> <li>- 45 K for porcelain and similar materials;</li> <li>- 60 K for plastics and similar materials.</li> </ul>	<p>ČSN EN 303-5:2013 Art. 4.3.6</p>	<p>+</p>	
<p><b>Leakage of the combustion system</b></p> <p>For boilers designed to operate with a positive pressure in the combustion chamber when tested in accordance with 5.6 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.</p> <p>The gas side resistance shall be determined with the fuel chamber filled to maximum capacity (as specified by the manufacturer).</p> <p><i>NOTE: For boilers designed to operate with negative pressure, the leakage rate measured according to 5.6 characterises the boiler.</i></p>	<p>ČSN EN 303-5:2013 Art. 4.3.7</p>	<p>+</p>	
<p><b>Temperature control and limiting devices</b></p>	<p>ČSN EN 303-5:2013 Art. 4.3.8</p>		
<p><b>General</b></p> <p>The control and safety devices described in the sections below as well as the appropriate installation options shall be provided for each boiler, depending on the type of firing system and the type of protection provided for the installations in which the boiler is to be fitted. The equipment required in</p>	<p>ČSN EN 303-5:2013 Art. 4.3.8.1</p>	<p>+</p>	



Requirement	Requirement specification	Evaluation	Note
<p>each case shall be supplied by the boiler manufacturer along with the boiler. If equipment is not supplied, precise specifications shall be given in the installation instructions, in particular the limit values and time constants for the safety temperature limiter.</p>			
<p><b>Temperature control and limiting devices for open vented systems</b>            When used in physically protected heating installations (the temperature is limited by installation pressure) the following equipment shall be provided, according to the requirements of EN 14597:            – a temperature controller;            – a safety temperature limiter (manual reset).            The safety temperature limiter is not necessary in cases where the firing system is neither rapidly nor partly disconnectable. In these cases (e.g. for boilers without automatic force draft), the excess heat is dissipated in the form of steam through the open vented connection with the atmosphere.</p>	<p>ČSN EN 303-5:2013 Art. 4.3.8.2</p>	<p>+</p>	
<p><b>Temperature control and limiting devices for closed vented system</b>            When used in thermostatically protected heating installations, the firing system shall be either rapidly or partly disconnectable; and-or the heat or residual heat output not absorbed by the heating system shall be dissipated reliably using a safety heat exchanger or equivalent devices. Accordingly, a distinction is to be made between the following equipment variants, according to the requirements of EN 12828:</p> <p>a) The firing system is rapidly disconnectable; the necessary equipment shall consist of:</p> <ul style="list-style-type: none"> <li>- a temperature controller;</li> <li>- a safety temperature limiter (manual reset).</li> </ul> <p>b) The firing system is partly disconnectable; the necessary equipment shall consist of:</p> <ul style="list-style-type: none"> <li>- a temperature controller;</li> <li>- a safety temperature limiter (manual reset);</li> <li>- a thermal discharge safety device in accordance with 4.3.8.4 for dissipating the maximum heat output possible in the event of a malfunction;</li> </ul> <p>c) The heating system is not disconnectable and the nominal heat output is &lt; 100 kW; the necessary equipment shall consist of:</p> <ul style="list-style-type: none"> <li>- a temperature controller;</li> <li>- a thermal discharge safety device in accordance with 4.3.8.4 for dissipating the maximum heat output possible in the event of a malfunction.</li> </ul> <p><i>If the requirements are not fulfilled, the boiler shall be installed in an open vented system according to EN 12828.</i></p>	<p>ČSN EN 303-5:2013 Art. 4.3.8.3</p>	<p>+</p> <p>0</p> <p>0</p> <p>0</p>	



Requirement	Requirement specification	Evaluation	Note
<p><b>Devices for dissipating excess heat</b></p> <p>The safety heat exchanger or other devices for dissipating excess heat shall ensure that a maximum boiler water temperature of 110 °C is not exceeded in accordance with 5.14. For this purpose, a thermal discharge safety device shall be used such as an STW type Th according to EN 14597, in combination with a heat exchanger integrated in the boiler. Admissible heat exchangers include storage or circulatory water heaters, provided they are designed and sized in such a way that the heat can be transferred without any additional auxiliaries and outside energy. Fixed integrated circulatory water heaters cannot be used as operating water heaters but only as safety heat exchangers. Additionally, the following conditions shall be met</p> <ul style="list-style-type: none"> <li>– the thermal safety discharge device and the heat exchanger shall be adapted to the design and thermal properties of the boiler and be capable of reliably dissipating the maximum heat output possible in the event of malfunction or, in the case of partly disconnectable heating systems, the residual heat output;</li> <li>– if a storage water heater is used as the heat exchanger, it shall be designed so that it meets the aforementioned condition at its maximum operating temperature;</li> <li>– in the case of safety heat exchangers used exclusively to dissipate heat in the event of malfunctions, the thermal safety discharge device shall be fitted ahead of the heat exchanger in the cooling water inlet.</li> </ul> <p>Other solutions are not excluded provided they comply with the protection objectives and safety standards described above. In principle however, all devices for dissipating excess heat are only admissible for</p> <ul style="list-style-type: none"> <li>– boilers without a disconnectable firing system with rated heat outputs of maximum 100 kW,</li> <li>– boilers with a partly disconnectable firing system with residual heat outputs of up to 100 kW.</li> </ul>	<p>ČSN EN 303-5:2013 Art. 4.3.8.4</p>	<p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p> <p>0</p>	
<p><b>Heating boiler accessories</b></p>	<p>ČSN EN 303-5:2013 Art. 4.3.9</p>		
<p><b>General</b></p> <p>If the boiler is factory equipped with additional fittings which need to be serviced to ensure their correct operation and the safety of the boiler, the design shall ensure ease of access without requiring extensive dismantling work.</p>	<p>ČSN EN 303-5:2013 Art. 4.3.9.1</p>	<p>0</p>	



Requirement	Requirement specification	Evaluation	Note
<p><b>Electrical safety</b>                      The electrical safety of the boiler and the interfaces (e.g. connectors) between control devices shall comply with EN 60335-2-102.                      The electrical safety of control devices shall comply either with EN 60335-2-102, with EN 60730-1 or its relevant part 2 or with the electrical requirements of the standards listed in Annex ZBB of EN 60335-2-102:2006.                      For abnormal operation as fault condition according to 19.11.2 f) of EN 60335-2-102:2006 (failure of integrated circuits), only output signals which cause only one malfunction in one actuator shall be considered as relevant. Combinations of output signals which cause malfunction in more than one actuator are not considered relevant in the sense of abnormal operation because it is unlikely that any hazardous situation can occur.                      The documentation of the electrical connections for the individual components shall be provided by means of an electrical wiring and connection diagram.</p>	<p>ČSN EN 303-5:2013 Art. 4.3.9.2</p>	<p>+</p>	<p>Class B 30-12287/E</p>
<p><b>Electromagnetic compatibility</b>                      The EMC requirements shall be fulfilled in accordance with EN 61000-6-2 and EN 61000-6-3. For this testing, it is permissible to use an adapted version of the boiler software for simulating boiler operation.</p>	<p>ČSN EN 303-5:2013 Art. 4.3.9.3</p>	<p>+</p>	<p>30-12287/ EMC</p>

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

Evaluation drafted by:  
 Ing. Michal Havlíč

Date: 12/2013

Signed:

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 12/2013

Signed:



Requirement assessed: **Performance requirements**

Requirement specification: ČSN EN 303-5:2013 Art. 4.4, 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.6, 4.4.7

Sample assessed: PELLESTAR 45, PELLESTAR 60

**Evaluation results:** see the following Table

Requirement	Requirement specification	Evaluation	Note
<p><b>General</b>                      The following performance requirements shall be assessed in tests using the appropriate test fuel(s) specified in Table 7. These shall be selected to represent the recommended fuel(s) which it is claimed the boiler can burn.  <i>NOTE The nominal heat output and the heat output range might vary depending on the fuel.</i>                      The requirements for the boiler efficiency and the emission limits are divided into 3 classes. To meet the class requirements, all the efficiency and emission limits of that class shall be fulfilled.</p>	ČSN EN 303-5:2013 Art. 4.4.1	+	
<p><b>Boiler efficiency</b>                      The boiler efficiency, when tested in accordance with 5.7, 5.8 and 5.10, shall not be less than the formula shown in Figure 1 for the nominal heat output. For boilers above 100 kW, the requirement for class 4 is given at 84 % and class 5 is given at 89 %. For boilers above 300 kW, the requirement of class 3 is given at 82 %.</p>	ČSN EN 303-5:2013 Art. 4.4.2	+	
<p><b>Flue gas temperature</b>                      For boilers which operate with a flue gas temperature below 160 K and above room temperature at nominal heat output, the boiler manufacturer shall make recommendations regarding the flue installation in order to ensure sufficient draught and to prevent the chimney sooting up and condensation.</p>	ČSN EN 303-5:2013 Art. 4.4.3	+	Less than 160K
<p><b>Draught</b>                      The manufacturer shall specify the minimum draught at the flue gas outlet of the boiler needed for correct operation of the boiler. Where the manufacturer gives no detailed values, the figures according to Table B.2 of EN 13384-1:2002+A2:2008 shall apply.</p>	ČSN EN 303-5:2013 Art. 4.4.4	+	
<p><b>Minimum heat output</b>                      For automatically stoked boilers, the minimum heat output shall not exceed 30 % of the nominal heat output. This requirement on limiting the maximum heat output shall be achieved automatically by a control device.</p>	ČSN EN 303-5:2013 Art. 4.4.6	+	
<p>The control of the fuel and-or the air supply may be either continuous or intermittent. For manually stoked boilers where the manufacturer specifies that the boiler shall be connected to an accumulator tank, the minimum continuous heat output can be greater than 30 % of nominal heat output, provided that the manufacturer specifies in the technical document</p>		+	



Requirement	Requirement specification	Evaluation	Note
<p>The control of the fuel and-or the air supply may be either continuous or intermittent. For manually stoked boilers where the manufacturer specifies that the boiler shall be connected to an accumulator tank, the minimum continuous heat output can be greater than 30 % of nominal heat output, provided that the manufacturer specifies in the technical document The boiler plate shall state the minimum accumulator tank volume.</p> <p>Manually stoked boilers do not require testing at minimum heat output if the manufacturer claims that they shall always be connected to accumulator tank.</p> <p>The following applies as a reference for the minimum accumulator tank volume:</p> $V_{Sp} = 15 T_B \times Q_N \left( 1 - 0,3 \frac{Q_H}{Q_{min}} \right)$ <p>where</p> <p><math>V_{Sp}</math> is the accumulator tank volume, in litres;  <math>Q_N</math> is the nominal heat output, in kilowatts;  <math>T_B</math> is the burning period, in hours;  <math>Q_H</math> is the heating load of the premises, in kilowatts;  <math>Q_{min}</math> is the minimum heat output, in kilowatts.</p> <p>For heating boilers using several allowable fuels, the tank size shall be based on the fuel which requires the largest accumulator tank. The minimum volume of the accumulator tank shall be 300 l.</p>		<p>0</p> <p>0</p> <p>0</p> <p>+</p>	<p>Less than 30% Qn</p>
<p><b>Emission limits</b></p> <p>Combustion shall be of low-emission. This requirement shall be satisfied if the emission values shown in Table 6 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, in accordance with 5.7, 5.9 and 5.10.</p>	<p>ČSN EN 303-5:2013 Art. 4.4.7</p>	<p>+</p>	

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

Evaluation drafted by:  
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Requirement assessed: **Marking**

Requirement specification: ČSN EN 303-5:2013 Art. 7, 7.1, 7.2, 7.3

Sample assessed: PELLESTAR 45, PELLESTAR 60

**Evaluation results:** see the following Table

Requirement	Requirement specification	Evaluation	Note
<b>Marking</b>	ČSN EN 303-5:2013 Art. 7		
<b>General</b> Each heating boiler shall have a data plate. The boiler data plate shall be written in the language of the country of destination and be affixed in an accessible spot.	ČSN EN 303-5:2013 Art. 7.1	+	
<b>Information on the boiler plate</b> The boiler plate shall contain at least the following information: a) name and company domicile of the manufacturer and, where available, the manufacturer's symbol; b) trade designation, type under which the boiler is marketed; c) production number and year of construction (coding is permissible at the manufacturer's discretion); d) nominal heat output and heat output range in kilowatts for each type of fuel; e) boiler class regarding each fuel type that was tested; f) maximum allowable operating pressure, in bar; g) maximum allowable operating temperature, in degrees Celsius; h) water content, in litres; i) electrical connection (V, Hz, A) and wattage, in watts; j) the fuel class according to Clause 1 and for fuels of class E the tested fuel.	ČSN EN 303-5:2013 Art. 7.2	+ + + + + + + + +	
<b>Boiler plate requirements</b> The material and labelling used for the plate shall be durable. The labelling shall be abrasion-proof. Under normal operating conditions, the plate shall not discolour so as to make its information difficult to read. Self-adhesive plates should not become detached as a result of moisture and temperature.	ČSN EN 303-5:2013 Art.7.3	+	

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

Evaluation drafted by:  
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Person responsible for the evaluation:  
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Requirement assessed: **Technical documentation, supplied with boiler**

Requirement specification: ČSN EN 303-5:2013 Art. 8, 8.1, 8.2, 8.3, 5.16.1

Sample assessed: PELLETSTAR 45, PELLETSTAR 60

**Evaluation results:** see the following Table

Requirement	Requirement specification	Evaluation	Note
<b>Technical documentation, supplied with boiler</b>	ČSN EN 303-5:2013 Art. 8		
<b>General</b> For each boiler, the documents listed below shall be made available in the language of the boiler's country of destination; the documents specified under 8.2 and 8.3 shall be enclosed with every boiler.	ČSN EN 303-5:2013 Art. 8.1	+	
<b>Technical information and installation instructions</b> These documents shall contain at least the following indications:			
a) necessary draught, in millibars;		+	
b) water content, in litres;		+	
c) exhaust gas temperature at nominal heat output and minimum heat output, in degrees Celsius;		+	
d) exhaust mass flow at nominal heat output and at minimum heat output, in kilograms per second;		+	
e) flue pipe diameter, in millimetres;		+	
f) water-side resistance, in millibars;		+	
g) nominal heat output and heat output range, in kilowatts;		+	Enclosed technical documentation.
h) boiler class;		+	
i) combustion period in hours at $Q_N$ ;		+	
j) setting range for the temperature controller, in degrees Celsius;		+	
k) minimal return temperature at boiler return tapping, in degrees Celsius;	ČSN EN 303-5:2013 Art. 8.2	+	
l) fuel type and water content as well as fuel size and detail information according to Table 7 for fuels type E resp. e;		+	
m) filling chamber capacity in litres and filling opening dimensions, in millimetres;		+	
n) necessary accumulator storage, in litres if $Q_{min} > 0,3 Q_N$ ;		0	
o) auxiliary power requirement at $Q_N$ and $Q_{min}$ , in watts;		+	
p) stand by power, in watts;		+	
q) cold water temperature and pressure for safety heat exchanger, in bars;		0	
r) electrical connections including appliance and main-switch-off;		+	
s) whether the heating appliance is running with or without using a fan;		+	
t) whether the heating appliance is working under over pressure or under pressure at flue gas outlet;		+	



<p>u) whether the heating appliance is working under condensing or non-condensing conditions;</p>		+	
<p>v) information about the boiler's emission of airborne noise, the method to measure the airborne noise level and the possibilities of means of reducing the noise emission of the boiler.</p> <p><i>NOTE: Noise measurements should be made according to EN 15036-1.</i></p> <p>Furthermore, the installation instructions shall contain information concerning:</p> <p>w) the on-site assembly of the boiler (if necessary) and the required water pressure test as per 5.4.2 or 5.5.2.2;</p> <p>x) the installation;</p> <p>y) the commissioning, with information on the boiler output to be set in the output range;</p> <p>z) instructions on the location and fitting of the sensors for the control, display and safety equipment.</p> <p>In addition, the technical information and installation instructions shall contain general references to the standards and regulations to be observed on the safety equipment of the installation:</p> <ul style="list-style-type: none"> <li>- take care of installed ventilations systems in the same heating room;</li> <li>- take care there is sufficient amount of clean (i.e. uncontaminated) combustion air;</li> <li>- measuring points should be self-locking and thigh;</li> <li>- emission control after first installation;</li> <li>- verbal instruction by a competent person before first using;</li> <li>- take care of the correct storage of the used fuels;</li> <li>- regularly checks if the heating appliance is in good condition;</li> <li>- take care of the correct dimensioning of the System;</li> <li>- take care of the correct dimensioning of the chimney including the connecting flue pipe;</li> <li>- take care of the necessary distances to combustible materials, if required;</li> <li>- require a shielding construction, if necessary;</li> <li>- take care of the necessary minimum distance to walls and ceilings (related to cleaning).</li> </ul>	<p>ČSN EN 303-5:2013 Art. 8.2</p>	<p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p> <p>+</p>	



Requirement	Requirement specification	Evaluation	Note
<p><b>Operating instructions</b>                      The operating instructions shall contain references to:</p> <ul style="list-style-type: none"> <li>- the operation of the boiler, stoking and opening doors without risk;</li> <li>- cleaning and cleaning intervals, including the equipment required for the cleaning operations;</li> <li>- measures to be taken in the event of malfunction;</li> <li>- the reasons for recommending a regular, competent maintenance service and the necessary maintenance intervals;</li> <li>- the type of fuel and water content and the fuel size (with the direction of the layers in the case of wood logs);</li> <li>- the maximum filling height for fuel in the filling chamber;</li> <li>- the nominal combustion period for fuel types at nominal heat output.</li> </ul> <p><b><i>Other documents (brochures, etc.) shall not contain any information that is in contradiction with that of the operating instructions.</i></b></p>	<p>ČSN EN 303-5:2013 Art. 8.3</p>	<p style="text-align: center;">+</p> <p style="text-align: center;">+</p> <p style="text-align: center;">+</p> <p style="text-align: center;">+</p> <p style="text-align: center;">+</p> <p style="text-align: center;">+</p> <p style="text-align: center;">+</p>	
<p><b>Check of the safety and risk assessment</b>                      A risk analysis shall be performed by the manufacturer according to EN ISO 12100. "Force majeure risks" shall not be taken into consideration.                      Completeness, correctness and plausibility of the risk analysis of the manufacturer shall be verified by a third party.                      The verification does not generally require testing. If tests are performed, the following conditions shall be applied.</p> <ul style="list-style-type: none"> <li>a) Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> 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.</li> <li>b) For manual stoked boilers, the boiler shall be refuelled after reaching steady state with a full batch before starting the test.</li> </ul> <p>The verification of the risk analysis can be done on the basis of one or more of the following:</p> <ul style="list-style-type: none"> <li>- implementation of accepted solutions according to this standard;</li> <li>- implementation of safety functions with verification of the shut-off function;</li> <li>- check of the characteristics of the boiler at normal operation and in the case of failures;</li> <li>- relevant references to other standards or associated test results.</li> </ul> <p>The risk analysis shall at least provide risk assessments for the following tasks and take into account possible failures in the components of the fuel supply, the air supply, the combustion and combustion control, the flue gas exit, the heat dissipation, fire prevention and the risk of injuries of persons.</p>	<p>ČSN EN 303-5:2013 Art. 5.16.1</p>	<p style="text-align: center;">+</p>	



Requirement	Requirement specification	Test evaluation	Note
<p>The following risks shall be evaluated in detail:</p> <ul style="list-style-type: none"> <li>c) fuel feed operation continuously at maximum speed, fuel overload;</li> <li>d) feed rate too low;</li> <li>e) loss of air supply;</li> <li>f) loss of power;</li> <li>g) unstable combustion chamber pressure;</li> <li>h) unclosed doors and openings within the boiler or the stoking device;</li> <li>i) open integral fuel hopper;</li> <li>j) empty integral fuel hopper;</li> <li>k) ignition failure during start up;</li> <li>l) check of the strategy for safety against back burning;</li> <li>m) safety check regarding effect of emptiness or a blockage of the stoking device;</li> <li>n) voltage variation;</li> <li>o) leakage of combustion products (e.g. flue gas fan failure, power loss, pressurized combustion chamber);</li> <li>p) lockout and restart;</li> <li>q) electric safety (documents and certificates have to be provided);</li> <li>r) risk of injuries of persons.</li> </ul> <p><i>NOTE: Additional tests are recommended.</i></p>	<p>ČSN EN 303-5:2013  Art. 5.16.1</p>	+	

Note:

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

Evaluation drafted by:  
Ing. Michal Haviř

Date: 12/2013

Signed: 

Person responsible for the evaluation:  
Ing. Stanislav Buchta

Date: 12/2013

Signed: 



Accredited test number: **1001.1\*** Test title: **Pressurized component tightness and strength test**

Test method: ČSN EN 303-5:2013 Art. 5.4, 5.4.1, 5.4.2

Sample tested: PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement	Requirement specification	Test evaluation	Note
<b>Pressure test for boilers of sheet or sheet metal of non-ferrous metal</b>	ČSN EN 303-5:2013 Art. 5.4		
<p><b>Tests to be carried out before production</b></p> <p>The type test pressure is <math>2 \times PS</math> using hydraulic pressure where <math>PS</math> 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.</p> <p>A record shall be made of the test, including the following details:</p> <ul style="list-style-type: none"> <li>- exact description of the boiler tested by stating the drawing number;</li> <li>- test pressure in bar and duration of the test;</li> <li>- test result;</li> <li>- place and date of the test, including the names of persons carrying out the test.</li> </ul> <p>The test report shall be signed by, as a minimum, the works tester responsible and one witness.</p>	ČSN EN 303-5:2013 Art. 5.4.1	+	Enclosed technical documentation.
<p><b>Test during production</b></p> <p>Each boiler shall be tested during the production and the test pressure shall be at least <math>1.43 \times PS</math>.</p>	ČSN EN 303-5:2013 Art. 5.4.2	+	

**Test evaluation:** No leakages or visible permanent deformations appeared during the test.

Tested by: Ing. Michal Havlů Date: 12/2013

Signed: P.P. Matoušek

Reviewed by: Ing. Stanislav Buchta Date: 12/2013

Signed: P.P. Matoušek



Accredited test number: **1003\*** Test title: **Surface temperature test**

Test method: ČSN EN 303-5:2013 Art. 5.12, 5.16.4, 4.3.6

Sample tested: PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement	Requirement specification	Test evaluation	Note
<p><b>Surface temperature</b>                      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.</p>	<p>ČSN EN 303-5:2013                      Art. 5.12</p>	+	
<p>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 room temperature by more than the following values:</p> <ul style="list-style-type: none"> <li>- 35 K for metals and similar materials;</li> <li>- 45 K for porcelain and similar materials;</li> <li>- 60 K for plastics and similar materials.</li> </ul>	<p>ČSN EN 303-5:2013                      Art. 4.3.6</p>	+	
<p><b>Resistance to thermal conductance</b>                      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.</p>	<p>ČSN EN 303-5:2013                      Art. 5.16.4</p>	+	



**Measurement results PELLETSTAR 45:**

<b>Average temperatures of boiler walls, doors and covers (°C):</b>	
<b>Fuel type</b>	<b>Wood Pellets – C1</b>
<b>Front wall</b>	25.2
<b>Rear wall</b>	28.9
<b>Right wall</b>	25.9
<b>Left wall</b>	26.6
<b>Upper wall</b>	28.9
<b>Lower wall</b> (a base was used, non-combustible material)	35.0
<b>Temperatures of control elements (°C):</b>	
<b>El. control panel – plastic</b>	32.0
<b>Temperature of fuel chamber and stoking elements (°C):</b>	
<b>Temperature of fuel line tube</b> (screw feeder - flange)	65.0



**Measurement results PELLETSTAR 60:**

Average temperatures of boiler walls, doors and covers (°C):	
Fuel type	Wood Pellets – C1
Front wall	26.1
Rear wall	29.2
Right wall	26.8
Left wall	27.2
Upper wall	29.8
Lower wall (a base was used, non-combustible material)	25.0
Temperatures of control elements (°C):	
El. control panel – plastic	32.0
Temperature of fuel chamber and stoking elements (°C):	
Temperature of fuel line tube (screw feeder - flange)	65.0

"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.

Tested by: Ing. Michal Havlů

Date: 12/2013

Signed: P. P. Molodtsov

Reviewed by: Ing. Stanislav Buchta

Date: 12/2013

Signed: [Signature]





Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
 1004.2\* **Test of combustion product temperature**

Test method: ČSN EN 303-5:2013 Art. 4.4.2, 4.4.3, 5.7 to 5.10

Sample tested: PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

***Average measured and calculated values (solid fuels):***

Test:	I.	II.
Boiler type:	PELLETSTAR 45	
Output tested:	Nominal	Minimum
Fuel type:	<b>Wood Pellets – C1</b>	
Combustion period, (manual-automatic) stoking	Minimally 6 hours	
Nominal heat output (specified by manufacturer) [ kW ]	45	45
Flue gas temperature [ °C ]	91.3	59.2
Fuel mass added [ kg/hour ]	9.76	2.92
Inlet water temperature [ °C ]	55.0	55.0
Outlet water temperature [ °C ]	74.7	74.0
Cooling water flow rate [ m3/hour ]	1.9722	0.6021
Draught [ Pa ]	10.0	10.0
Ambient temperature [ °C ]	21.9	21.1
Relative air humidity [ % ]	20.3	12.1
Barometric pressure [ kPa ]	97.56	97.56

***Analysis of combustion products:***

Test (period of burning) :	I.	II.
Oxygen, O <sub>2</sub> [ % ]	6.00	8.82
Carbon dioxide CO <sub>2</sub> [ % ]	14.60	11.89
Carbon monoxide CO [ppm]	128	87
Higher hydrocarbons THC-OGC [ppm]	2	1
Nitrogen oxides NO <sub>x</sub> [ppm]	139	97



**Auxiliary combustion values (solid fuels):**

Test (period of burning) :		I.	II.
Stoichiometric oxygen volume	[ m3/kg ]	1.021	1.021
Stoichiometric air volume	[ m3/kg ]	4.860	4.860
Stoichiometric volume of dry combustion products	[ m3/kg ]	4.732	4.732
Maximum content of CO <sub>2</sub>	[ % ]	18.82	18.82
Stoichiometric air multiple	[ - ]	1.39	1.70
Volume of dry combustion products, actual	[ m3/kg ]	6.095	7.482
Content of H <sub>2</sub> O in combustion air	[ m3/kg ]	0.022	0.026
Content of H <sub>2</sub> O in combustion products	[ m3/kg ]	0.874	0.878

**Calculated values - thermal overview:**

Test (period of burning) :		I.	II.
Loss of sensible heat of combustion products	[ % ]	3.8	2.5
Loss of gas underburning	[ % ]	0.1	0.0
Loss of mechanical underburning	[ % ]	0.1	0.1
Loss of heat transfer into environment	[ % ]	0.8	2.7
Total loss	[ % ]	4.7	5.3
Heat input	[ kW ]	48.0	14.3
<b>Heat output</b>	<b>[ kW ]</b>	<b>45.3</b>	<b>13.4</b>
Uncertainty of determining heat output	[ kW ]	1.9	0.6
<b>Efficiency – direct method</b>	<b>[ % ]</b>	<b>94.4</b>	<b>93.7</b>
Output - nominal output	[ % ]	100.6	29.9

At nominal output, when burning **Wood Pellets – C1**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5:2013, Fig. 1.

**Test evaluation:**

The measured heat output is within the  $\pm 8\%$  tolerance;  
 Boiler Class 5;

At nominal output, combustion product temperature is less than 160 K above the ambient temperature;

When burning Wood Pellets - C1, the period of burning is more than 6 hours;

The minimum heat output is less than 30% of nominal heat output.



**Test results:**

***Average measured and calculated values (solid fuels):***

Test:		I.	II.
Boiler type:		PELLETSTAR 60	
Output tested:		Nominal	Minimum
Fuel type:		<b>Wood Pellets – C1</b>	
Combustion period, (manual-automatic) stoking		Minimally 6 hours	
Nominal heat output (specified by manufacturer)	[ kW ]	60	60
Flue gas temperature	[ °C ]	101.9	59.2
Fuel mass added	[ kg/hour]	13.05	2.92
Inlet water temperature	[ °C ]	55.9	55.0
Outlet water temperature	[ °C ]	75.1	74.0
Cooling water flow rate	[ m3/hour ]	2.6841	0.6021
Draught	[ Pa ]	10.0	10.0
Ambient temperature	[ °C ]	20.5	21.1
Relative air humidity	[ % ]	20.3	12.0
Barometric pressure	[ kPa]	97.88	97.88

***Analysis of combustion products:***

Test (period of burning) :		I.	II.
Oxygen, O <sub>2</sub>	[ % ]	6.21	8.82
Carbon dioxide CO <sub>2</sub>	[ % ]	14.44	11.89
Carbon monoxide CO	[ppm]	174	87
Higher hydrocarbons THC-OGC	[ppm]	3	1
Nitrogen oxides NOx	[ppm]	153	97

***Auxiliary combustion values (solid fuels):***

Test (period of burning) :		I.	II.
Stoichiometric oxygen volume	[ m3/kg ]	1.021	1.021
Stoichiometric air volume	[ m3/kg ]	4.860	4.860
Stoichiometric volume of dry combustion products	[ m3/kg ]	4.732	4.732
Maximum content of CO <sub>2</sub>	[ % ]	18.82	18.82
Stoichiometric air multiple	[ - ]	1.41	1.70
Volume of dry combustion products, actual	[ m3/kg ]	6.159	7.482
Content of H <sub>2</sub> O in combustion air	[ m3/kg ]	0.020	0.026
Content of H <sub>2</sub> O in combustion products	[ m3/kg ]	0.872	0.877



**Calculated values - thermal overview:**

Test (period of burning) :		I.	II.
Loss of sensible heat of combustion products	[ % ]	4.5	2.5
Loss of gas underburning	[ % ]	0.1	0.0
Loss of mechanical underburning	[ % ]	0.1	0.1
Loss of heat transfer into environment	[ % ]	0.8	2.7
Total loss	[ % ]	5.4	5.3
Heat input	[ kW ]	64.2	14.3
<b>Heat output</b>	<b>[ kW ]</b>	<b>60.1</b>	<b>13.4</b>
Uncertainty of determining heat output	[ kW ]	2.5	0.6
<b>Efficiency – direct method</b>	<b>[ % ]</b>	<b>93.7</b>	<b>93.7</b>
Output - nominal output	[ % ]	100.2	22.4

At nominal output, when burning **Wood Pellets – C1**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5:2013, Fig. 1.

**Test evaluation:**

The measured heat output is within the  $\pm 8\%$  tolerance;  
 Boiler Class 5;  
 At nominal output, combustion product temperature is less than 160 K above the ambient temperature;  
 When burning Wood Pellets - C1, the period of burning is more than 6 hours;  
 The minimum heat output is less than 30% of nominal heat output.

**Electric consumption:**

	PELLETSTAR 45	PELLETSTAR 60
Maximum electrical input	1800 W	1800 W
Electrical input at nominal heat output	98 W	116 W
Electrical input at minimum heat output	63 W	63 W
Electrical input for STAND BY mode	17 W	17 W
Maximum electrical input for ignition system	1600 W	1600 W



**Fuel analysis:**

Fuel type	Wood Pellets – C1			
Analytical indicator	Symbol	Unit	Value	Uncertainty
Higher heating value	$Q_s$	[ MJ-kg ]	18.59	0.14
Lower heating value	$Q_j$	[ MJ-kg ]	17.00	0.14
All water in original condition	$W_t^r$	[ % by weight ]	6.92	0.01
Ash	A	[ % by weight ]	0.55	0.04
Carbon	C	[ % by weight ]	47.63	0.25
Hydrogen	H	[ % by weight ]	6.50	0.10
Nitrogen	N	[ % by weight ]	0.32	0.10
Sulphur	S	[ % by weight ]	0.002	0.001
Chlorine	Cl	[ % by weight ]	0.010	0.002
Oxygen – calculation for 100%	O	[ % by weight ]	38.16	
Conversion factor $f_{emis}$ for emissions in [mg/m <sup>3</sup> ] to [mg/MJ]	$f_{emis}$	[ - ]	0.26963	

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. 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”.

Tested by: Ing. Michal Havlů

Date: 12/2013

Signed: P.P. Melančík

Reviewed by: Ing. Stanislav Buchta

Date: 12/2013

Signed: P.P. Melančík



Accredited test number:

**1005.1\*** Test title: **Combustion efficiency test - emissions**

Test method:

ČSN EN 303-5:2013 Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4

Sample tested:

PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used:

Chapter III - Measuring and test equipment

Requirement	Requirement specification	Test evaluation	Note
<b>Emission limits</b> Combustion shall be of low-emission. This requirement shall be satisfied if the emission values shown in Table 6 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, in accordance with 5.7, 5.9 and 5.10.	ČSN EN 303-5:2013 Art. 4.4.7	+	

Table 6

Stoking	Fuel	Nominal heat output kW	Emission limits								
			CO			OGC/THC mg-m <sup>-3</sup> at 10% O <sub>2</sub>			Dust		
			Class 3	Class 4	Class 5	Class 3	Class 4	Class 5	Class 3	Class 4	Class 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 1: 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 European Standard 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.

NOTE 2: Additional test methods and emission limits which apply in some countries are given in the A-Deviations in Annex C.

<sup>a</sup> Referred to dry exit flue gas, 0 °C, 1013 mbar.

<sup>b</sup> Boilers of class 3 for type E-fuels according to 1.2.1 or e-fuels according to 1.2.3 in this Table and marked with the classification E-fuels and e-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-m<sup>3</sup> at 10 % O<sub>2</sub>.



**Measurement results:** PELLETSTAR 45 – Wood Pellets – C1

Boiler output	Average values									
	Measured values						Converted values O <sub>2</sub> =10%			
	O <sub>2</sub> [%]	CO <sub>2</sub> [%]	CO [ppm]	OGC/THC [ppm]	NO <sub>x</sub> [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	OGC/THC [mg/m <sup>3</sup> ]	NO <sub>x</sub> [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]
Nominal	6.00	14.60	128	2	139	31	117	3	210	23
Minimum	8.82	11.89	87	1	97	14	98	1	180	12

**Test evaluation:**

PELLETSTAR 45 (Wood Pellets - C1) meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5:2013 Table 6.

**Measurement results:** PELLETSTAR 60 – Wood Pellets – C1

Boiler output	Average values									
	Measured values						Converted values O <sub>2</sub> =10%			
	O <sub>2</sub> [%]	CO <sub>2</sub> [%]	CO [ppm]	OGC/THC [ppm]	NO <sub>x</sub> [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	OGC/THC [mg/m <sup>3</sup> ]	NO <sub>x</sub> [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]
Nominal	6.21	14.44	174	3	153	34	162	3	234	25
Minimum	8.82	11.89	87	1	97	14	98	1	180	12

**Test evaluation:**

PELLETSTAR 60 (Wood Pellets - C1) meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5:2013 Table 6.

Tested by: Ing. Michal Havlů Date: 12/2013

Signed: P. P. Medved

Reviewed by: Ing. Stanislav Buchta Date: 12/2013

Signed: P. P. Medved



Accredited test number: **1004.1\*** Test title: **Test of heat output input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013 Annex C,  
 Deviation from Austria, C.2.2, C.2.3

Sample tested: PELLESTAR 45, PELLESTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement	Requirement specification	Test evaluation
<b>Boiler efficiency for nominal heat output and minimum heat output</b>	ČSN EN 303-5:2013 Annex C, Deviation from Austria, C.2.2	Wood Pellets – C1
<b>Boiler</b>		+
<b>Minimum efficiency</b>		
<b>Heating boilers for solid fuels</b>		+
<b>75 %</b>		
<b>a) manually loaded</b>		+
up to 10 kW		
>10 to 200 kW		
>200 kW		+
<b>b) automatically loaded</b>		
up to 10 kW		
>10 to 200 kW	+	
<b>(72.3 + 7.7 log Pn) %</b>		
>200 kW	+	
<b>90 %</b>		
NOTE: <i>Pn is the nominal heat output (Qn in this standard)</i>		

Requirement	Requirement specification	Test evaluation				
<b>Emission limits</b>	ČSN EN 303-5:2013 Annex C, Deviation from Austria, C.2.3	Wood Pellets – C1				
<b>Small burners used for solid fuels automatically loaded</b>						
		+				
Parameter			Emission limits mg-MJ			
			Wooden Wood Pellets Room heaters	Wooden Wood Pellets Central heaters	Other wooden fuels	Other standardised biogenous fuels
CO			500 <sup>a</sup>	250 <sup>a</sup>	250 <sup>a</sup>	500 <sup>a</sup>
NO <sub>x</sub>			150	150	150	300
OGC/THC	30	30	30	30		
Dust	50	40	50	60		
<sup>a</sup> The limit value can be exceeded by 50 % during partial load operation at 30 % of nominal heat output.						





**Measurement results:** PELLETSTAR 45 – Wood Pellets - C1

Boiler output	Minimum efficiency	Measured efficiency
Nominal	85.0	94.4
Minimum		93.7

**Measurement results:** PELLETSTAR 60 – Wood Pellets - C1

Boiler output	Minimum efficiency	Measured efficiency
Nominal	86.0	93.7
Minimum		93.7

**Test evaluation:**

The measured efficiency of PELLETSTAR 45, PELLETSTAR 60 (Wood Pellets - C1) is **higher** than required.

**Measurement results:** PELLETSTAR 45 – Wood Pellets - C1

Boiler output	Average values								
	Measured values					Converted values O <sub>2</sub> =0%			
	O <sub>2</sub> [%]	CO [ppm]	NO <sub>x</sub> [ppm]	OGC/THC [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/MJ]	NO <sub>x</sub> [mg/MJ]	OGC/THC [mg/MJ]	Dust [mg/MJ]
Nominal	6.00	128	139	2	31	60	108	1	12
Minimum	8.82	87	97	1	14	50	92	1	6

**Measurement results:** PELLETSTAR 60 – Wood Pellets - C1

Boiler output	Average values								
	Measured values					Converted values O <sub>2</sub> =0%			
	O <sub>2</sub> [%]	CO [ppm]	NO <sub>x</sub> [ppm]	OGC/THC [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/MJ]	NO <sub>x</sub> [mg/MJ]	OGC/THC [mg/MJ]	Dust [mg/MJ]
Nominal	6.21	174	153	3	34	83	120	2	13
Minimum	8.82	87	97	1	14	50	92	1	6

**Test evaluation:** The measured emission values for PELLETSTAR 45, PELLETSTAR 60 (Wood Pellets - C1) **do not exceed** the specified values.

Tested by: Ing. Michal Havlů

Date: 12/2013

Signed: P.P. Maláček

Reviewed by: Ing. Stanislav Buchta

Date: 12/2013

Signed: P.P. Maláček



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
 1005.1\* **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013 Annex C,  
 Deviation from Denmark, C.4.1, C.4.2

Sample tested: PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement	Requirement specification	Test evaluation
<b>Boiler Efficiency</b>		
According to the Danish Construction Code BR08, Clause 8.5.1.4, Sub-clause 7, boilers for coal, coke, bio fuel or biomass shall have an efficiency equivalent to Class 3 in EN 303-5.	ČSN EN 303-5:2013 Annex C, Deviation from Denmark, C.4.1	Wood Pellets – C1
<b>Minimum efficiency</b> (67 + 6 log Qn) %		
For boilers above 300 kW, the requirement corresponding to 300 kW shall be used.		
		+

Requirement	Requirement specification	Test evaluation			
<b>Emission limits</b>					
According to the Danish EPA Statutory Order no. 1432 of 11-12-2007, only Class 3 (or higher) is acceptable for Denmark.					
Stoking	Fuel	Nominal heat output	Emission limit values <sup>a</sup>		
			CO	OGC/THC	Dust
			mg-m <sup>3</sup> at 10% O <sub>2</sub>		
			Class		
			3		
Manual	Biogenic	≤ 50	5000	150	150
		> 50 to 150	2500	100	
		> 150 to 300	1200		
	Fossil	≤ 50	5000	150	125
		> 50 to 150	2500	100	
		> 150 to 300	1200		
Automatic	Biogenic	≤ 50	3000		150
		> 50 to 150	2500	80	
		> 150 to 300	1200		
	Fossil	≤ 50	3000	100	125
		> 50 to 150	2500		
		> 150 to 300	1200	80	
					+

<sup>a</sup> Referring to dry exit flue gas, 0 °C, 1 013 mbar.



**Measurement results:** PELLETSTAR 45 – Wood Pellets - C1

Boiler output	Minimum efficiency	Measured efficiency
Nominal	76.9	94.4
Minimum		93.7

**Measurement results:** PELLETSTAR 60 – Wood Pellets - C1

Boiler output	Minimum efficiency	Measured efficiency
Nominal	77.7	93.7
Minimum		93.7

**Test evaluation:**

Measured efficiency for PELLETSTAR 45, PELLETSTAR 60 (Wood Pellets - C1) is **higher** than required.

**Measurement results:** PELLETSTAR 45 – Wood Pellets - C1

Boiler output	Average emission values						
	Measured values				Converted values O <sub>2</sub> =10%		
	O <sub>2</sub> [%]	CO [ppm]	OGC/THC [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	OGC/THC [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]
Nominal	6.00	128	2	31	117	3	23
Minimum	8.82	87	1	14	98	1	12

**Measurement results:** PELLETSTAR 60 – Wood Pellets - C1

Boiler output	Average emission values						
	Measured values				Converted values O <sub>2</sub> =10%		
	O <sub>2</sub> [%]	CO [ppm]	OGC/THC [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	OGC/THC [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]
Nominal	6.21	174	3	34	162	3	25
Minimum	8.82	87	1	14	98	1	12

**Test evaluation:** The measured emission values PELLETSTAR 45, PELLETSTAR 60 (Wood Pellets - C1) **do not exceed** the specified values.

Tested by: Ing. Michal Havlí

Date: 12/2013

Signed: *P.P. Měsíček*

Reviewed by: Ing. Stanislav Buchta

Date: 12/2013

Signed: *P.P. Měsíček*



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013 Annex C,  
 Deviation from Germany, C.5.1, C.5.2

Sample tested: PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement					Requirement specification	Test evaluation
<b>Emission limits</b>					ČSN EN 303-5:2013 Annex C, Deviation from Germany, C.5.1	Wood Pellets – C1
Table 7 – Emission limits The emission limits are regulated in Chapter 2, paragraphs 4, 5 and Annex 2 of the German Immission Control Ordinance "Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen - 1. BImSchV)". Boilers operated with solid fuels shall only be installed, possess the quality and be put into operation if they fulfil the following specifications of the 1. BImSchV:						
	<b>Fuel acc. to §3 (1)</b>	<b>Nominal output range kW</b>	<b>Dust g/m<sup>3</sup></b>	<b>CO g/m<sup>3</sup></b>		
Stage 1: Appliances, which will be installed after 22.3.2010	Numbers 1 to 3a	$\geq 4 \leq 500$	0.09	1.0		+
		$> 500$	0.09	0.5		
	Numbers 4 to 5	$\geq 4 \leq 500$	0.10	1.0		
		$> 500$	0.10	0.5		
	Number 5a	$\geq 4 \leq 500$	0.06	0.5		
		$> 500$	0.06	0.5		
Numbers 6 to 7	$\geq 30 \leq 100$	0.10	0.8			
	$> 100 \leq 500$	0.10	0.5			
	$> 500$	0.10	0.3			
Stage 2: Appliances, which will be installed after 31.12.2014	Numbers 1 to 5a	$\geq 4$	0.02	0.4		
		$\geq 30 \leq 500$	0.02	0.4		
	Numbers 6 to 7	$> 500$	0.02	0.3		
		Numbers 8 to 13	$\geq 4 < 100$	0.02	0.4	
NOTE: Differing from sentence 1 for firing systems (appliances) which will exclusively be fired by fuels according §3 article 1 Number 4 in the form of split logs, the limits according Stage 2 apply for firing systems (appliances) if they are installed after 31.12.2016.						



**Measurement results:** PELLETSTAR 45 – Wood Pellets - C1

Boiler output	Average emission values				
	Measured values			Converted values O <sub>2</sub> =13%	
	O <sub>2</sub> [%]	CO [ppm]	Dust [mg/m <sup>3</sup> ]	CO [g/m <sup>3</sup> ]	Dust [g/m <sup>3</sup> ]
Nominal	6.00	128	31	0.085	0.017
Minimum	8.82	87	14	0.071	0.009

**Measurement results:** PELLETSTAR 60 – Wood Pellets - C1

Boiler output	Average emission values				
	Measured values			Converted values O <sub>2</sub> =13%	
	O <sub>2</sub> [%]	CO [ppm]	Dust [mg/m <sup>3</sup> ]	CO [g/m <sup>3</sup> ]	Dust [g/m <sup>3</sup> ]
Nominal	6.21	174	34	0.118	0.018
Minimum	8.82	87	14	0.071	0.009

**Test evaluation:**

The measured emission values for PELLETSTAR 45, PELLETSTAR 60 (Wood Pellets - C1) **do not exceed** the specified values.

Tested by: Ing. Michal Havlů Date: 12/2013

Signed: P. P. Maláček

Reviewed by: Ing. Stanislav Buchta Date: 12/2013

Signed: [Signature]



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013 Annex C  
 C.6 Deviation from Switzerland

Sample tested: PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement		Requirement specification	Test evaluation		
<b>Emission limits</b>					
Clause 4.4.7, Table 7 The emission limits are regulated in Annex 4 of the Swiss Ordinance on Air Pollution Control ([OAPC] SR 814.318.142.1) of 1985-12-16 (as at 2010-07-15). Boilers operated with woody biomass shall only be put on the market if they fulfil the following specifications of the OAPC: – declarations of conformity (Figure 20 OAPC); – Figures 1, 212, 23 Annex 4 OAPC; – Figures 31, 32 Annex 5 OAPC. Emissions for boilers operated with coal or wood fuels shall not exceed the following limits:		ČSN EN 303-5:2013 Annex C C.6 Deviation from Switzerland	Wood Pellets – C1		
Type of installation	<b>Particular requirements (emission limits)<sup>a</sup> for carbon monoxide (CO) and particulate matter (dust)</b>				
	CO (mg·m <sup>-3</sup> )				
Boilers for log wood and boilers for coal, manual stoking	800		50		
Boilers for chipped wood and boilers for coal, automatic stoking	400	60	+		
Boilers for Wood Pellets, automatic stoking	300	40			
<sup>a</sup> Referred to oxygen basis: – for boilers for natural state wood 13 % volume; – for boilers for coal 7 % volume.					
The sulphur content of coal, coal briquettes and coke shall not exceed 3 %. Boilers operated with non-woody biomass shall comply with the following specifications of the OAPC: – Figures 741, 742, 743 Annex 2 OAPC; – Figures 81, 82 Annex 3 OAPC. According to Figure 743, Annex 2 OAPC, non-woody biomass, such as biogenic waste and products from agriculture, may only be burnt in boilers with a heat input of at least 70 kW. Such units need an approval and shall meet stronger emission limits according to Figure 742, Annex 2 OAPC.			0		



**Measurement results:** PELLETSTAR 45 – Wood Pellets - C1

Boiler output	Average emission values				
	Measured values			Converted values O <sub>2</sub> =13%	
	O <sub>2</sub> [%]	CO [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]
Nominal	6.00	128	31	85	17
Minimum	8.82	87	14	71	9

**Measurement results:** PELLETSTAR 60 – Wood Pellets - C1

Boiler output	Average emission values				
	Measured values			Converted values O <sub>2</sub> =13%	
	O <sub>2</sub> [%]	CO [ppm]	Dust [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]
Nominal	6.21	174	40	118	18
Minimum	8.82	87	14	71	9

**Test evaluation:**

The measured emission values for PELLETSTAR 45, PELLETSTAR 60 (Wood Pellets - C1) **do not exceed** the specified values.

Tested by: Ing. Michal Havlů Date: 12/2013

Reviewed by: Ing. Stanislav Buchta Date: 12/2013

Signed: P.P. Maláček

Signed: [Signature]



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
 1005.1\* **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013 Annex C,  
 C.8 Deviations from Italy

Sample tested: PELLETSTAR 45, PELLETSTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

Requirement	Specification of requirement		Test evaluation	
<b>Italian emission limits for heating plants fuelled with biomass solid fuels</b>	Emissions refer to an 11% O <sub>2</sub>		Wood Pellets – C1	
<b>Plant nominal thermal output (MW)</b>	<b>&gt;0,035 ÷ &lt;0,15</b> (>35kW÷<150kW)	<b>&gt;0,15 ÷ &lt;1</b> (>150kW÷<1000kW)		
Total Particulate Matter	200mg/Nm <sup>3</sup>	100mg/Nm <sup>3</sup>	+	0
Total Organic Carbon (COT)		-		
Carbon Monoxide (CO)		350 mg/Nm <sup>3</sup>		
Nitrogen Dioxide (expressed as NO <sub>2</sub> )		500 mg/Nm <sup>3</sup>		
Sulphur Dioxide (expressed as SO <sub>2</sub> )		200mg/Nm <sup>3</sup>		
<b>Italian emission limits for heating plants fuelled with non-biomass solid fuels</b>				
	Emissions refer to an 6% O <sub>2</sub>			
Nominal Thermal output (MW)	>0.35 (350kW)			
Total Particulate Matter	50 mg/Nm <sup>3</sup>		0	0

**Measurement results:** PELLETSTAR 45 – Wood Pellets – C1

Boiler output	Average values										
	Measured values						Converted values O <sub>2</sub> =11%				
	O <sub>2</sub> [%]	CO [ppm]	OGC/THC [ppm]	NO <sub>x</sub> [ppm]	Dust [mg/m <sup>3</sup> ]	SO <sub>2</sub> [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	OGC/THC [mg/m <sup>3</sup> ]	NO <sub>x</sub> [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]	SO <sub>2</sub> [mg/m <sup>3</sup> ]
Nominal	6.00	128	2	139	31	0	106	2	190	21	0
Minimum	8.82	87	1	97	14	0	89	1	163	11	0





**Measurement results:** PELLETSTAR 60 – Wood Pellets – C1

Boiler output	Average values										
	Measured values						Converted values O <sub>2</sub> =11%				
	O <sub>2</sub> [%]	CO [ppm]	OGC/THC [ppm]	NO <sub>x</sub> [ppm]	Dust [mg/m <sup>3</sup> ]	SO <sub>2</sub> [mg/m <sup>3</sup> ]	CO [mg/m <sup>3</sup> ]	OGC/THC [mg/m <sup>3</sup> ]	NO <sub>x</sub> [mg/m <sup>3</sup> ]	Dust [mg/m <sup>3</sup> ]	SO <sub>2</sub> [mg/m <sup>3</sup> ]
Nominal	6.21	174	3	153	40	0	147	3	234	25	0
Minimum	8.82	87	1	97	14	0	89	1	163	11	0

**Test evaluation:**

The measured emission values for PELLETSTAR 45, PELLETSTAR 60 (Wood Pellets - C1) **do not exceed** the specified values.

Tested by: Ing. Michal Havlí

Date: 12/2013

Signed: *P. P. Melančík*

Reviewed by: Ing. Stanislav Buchta

Date: 12/2013

Signed: *S. Buchta*



Accredited test number: **1006.1\*** Test title: **Function test of control, regulation and safety elements**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013 Art. 5.13, 5.14, 5.16.1, 5.16.2, 5.16.3  
 ČSN EN 303-5:2013 Art. 5.9, 5.10.4

Sample tested: PELLESTAR 45, PELLESTAR 60

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement	Requirement specification	Test evaluation	Note
<p><b>Function check of the temperature controller and safety temperature limiter at the boiler</b></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 °C.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> 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 <math>(40 \pm 5)</math> % 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 4.1).</p>	<p>ČSN EN 303-5:2013 Art. 5.13</p>	<p>+</p>	



Requirement	Requirement specification	Test evaluation	Note
<p><b>Function test for the rapidly disconnectable firing system</b></p> <ul style="list-style-type: none"> <li>- Sudden absence of heat dissipation</li> </ul> <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 <math>Q_N</math> 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"> <li>- Loss of the electrical power supply</li> </ul> <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 <math>Q_N</math> 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 power 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>	<p>ČSN EN 303-5:2013 Art. 5.14</p>	<p style="text-align: center;">+</p>	
<p><b>Safety test of consequences of fuel overload and effect of a blockage of the fuel supply</b></p> <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 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><b>The requirements specified in 4.3.4 shall be satisfied.</b></p>	<p>ČSN EN 303-5:2013 Art. 5.16.2</p>	<p style="text-align: center;">+</p>	



Requirement	Requirement specification	Test evaluation	Note
<p><b>Function test for the rapidly disconnectable firing system</b></p> <p>– Sudden absence of heat dissipation</p> <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 <math>Q_N</math> 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> <p>- Loss of the electrical power supply</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 <math>Q_N</math> 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 power 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>	<p>ČSN EN 303-5:2013 Art. 5.14</p>	<p>+</p>	
<p><b>Safety test of consequences of fuel overload and effect of a blockage of the fuel supply</b></p> <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 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><b>The requirements specified in 4.3.4 shall be satisfied.</b></p>	<p>ČSN EN 303-5:2013 Art. 5.16.2</p>	<p>+</p>	



Requirement	Requirement specification	Test evaluation	Note
<p><b>Loss of combustion air supply</b>                      The safety of the heating boiler shall be checked at maximum heat input under the following conditions:</p> <ul style="list-style-type: none"> <li>- failure of combustion air fan;</li> <li>- failure to close of the adjustable combustion air supply.</li> </ul> <p>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.  <b>Test of combustion air supply loss.</b></p>	<p>ČSN EN 303-5:2013                      Art. 5.16.3</p>	+	

Note:

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

**Measurement results:**

<b>Temperature controller</b>		
Temperature	[°C]	Note:
Pre-set	90 °C	Temperature set on the operating thermostat regulator
Shutdown	89 °C	Fan and stoking switched off (suppression mode)
Restoration of operation	85 °C	Fan and stoking restored

<b>Temperature limiter (manual restoration of temperature) STB</b>		
Temperature	[°C]	Note:
Pre-set	90 °C	Temperature set on the temperature limiter
Shutdown	95 °C	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	

**Test evaluation:**

Proper functioning of safety elements has been verified.

Tested by: Ing. Michal Havlů

Date: 12/2013

Signed: *P. P. Maloň*

Reviewed by: Ing. Stanislav Buchta

Date: 12/2013

Signed: *P. P. Maloň*



The test methods in this Report were applied without deviations, additions or exceptions.

## **V. List of source materials**

The tests were performed based on:

- Order B-48620 of 2013-12-20
- Contract B-48620/30 of 2013-07-08
- ČSN EN 303-5:2013 – 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
- Instructions for assembly, installation and operation of the boiler
- A set of required drawing documentation as per ČSN EN 303-5:2013; PELLETSTAR 45, PELLETSTAR 60

The persons named below are accountable for the accuracy of the above-specified data:

**Ing. Stanislav Buchta**  
Head of Boilers and Industrial Heat  
Equipment Department



**Milan Holomek**  
Head of Heat and Environment-  
Friendly Equipment Test Station