



## **TEST REPORT**

### **No. 31-9354/T4**

**Product:** Hot-water boilers burning wood (with manual fuel supply)

**Type designation:** Herz firestar De Luxe

**Versions:** Herz firestar 20 De Luxe

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

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

**Responsible employee:** Ing. Stanislav Buchta

**Report issue date:** 2013-11-18

**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 were conducted on the basis of Order B-47464 dated 2013-08-23, Contract B-47464/31 dated 2013-11-05.

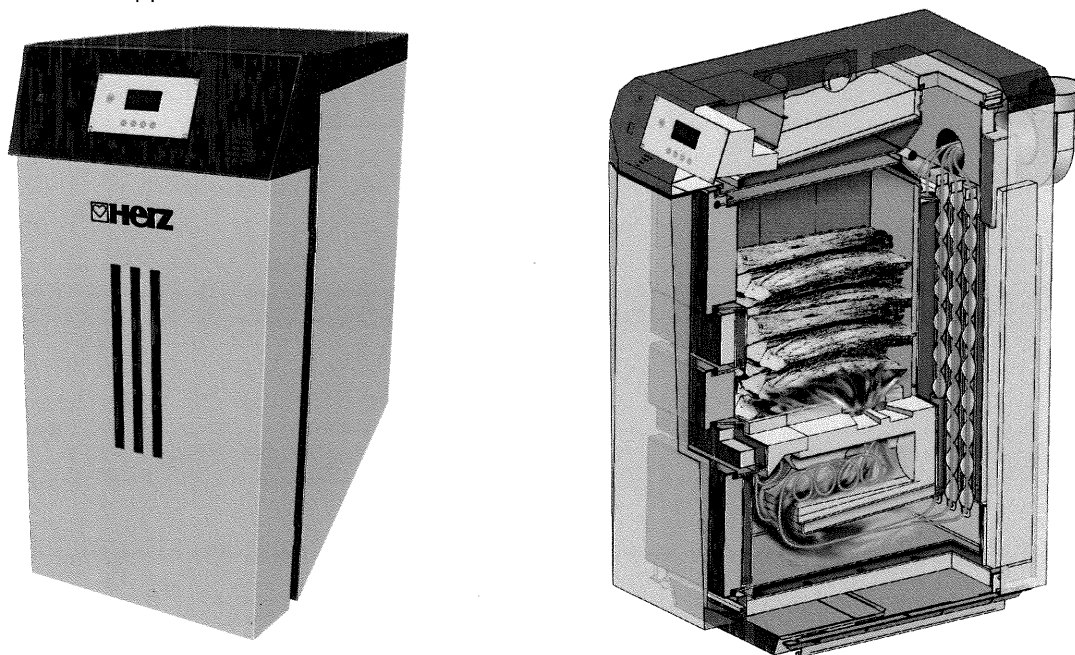
## **I. Product description, intended use and mode of application**

The test combustion chamber (boiler) burning firewood, Herz firestar 20 De luxe, produced by Herz Energietechnik G.m.b.H., with a nominal heat output of 22.0 kW, is produced as a steel sheet structure consisting of the following components: feeding chamber, combustion chamber and a tubular heat exchanger with an integrated cleaning system.

Wood is loaded in the boiler through the upper feeding door. The filling space is separated at the bottom with a grid from the combustion chamber. The boiler works on the principle of fuel downward burning, using a controlled flame. At the bottom of the filling space, the fuel is gasified with the use of primary air. With the support of an exhaust fan, flammable gases burn in the combustion chamber made of refractory material, with the addition of secondary air. Flue gases pass forward tangentially through the combustion chamber made of refractory material, in the form of two cylindrical tubes. Subsequently, the flue gases are returned and pass in the rear of the boiler in the upward direction through the tubular heat exchanger.

The control panel is situated at the top of the boiler. The entire combustion process is controlled by a microprocessor. The regulation controls the suction fan, combustion air supply, regulates the temperature of the combustion gases and the oxygen content in flue gases. The content of oxygen in the flue gases is measured using a lambda sensor.

The operation of the boiler is monitored - the display shows the temperatures, the content of O<sub>2</sub> and CO<sub>2</sub>, and the combustion air supply. The boiler is also equipped with a built-in security heat exchanger. The surfaces of the basic heat exchanger are cleaned with the use of turbulators, suspended in a heat exchanger and controlled automatically. Ash falls to the bottom section, accessible through the bottom door. Cleaning tools are supplied for the removal of ash.



Basic technical specifications:

Boiler type	Nominal heat output - wood [kW]	Water volume [l]	Max. operating temperature [°C]	Max. operating pressure [bar]	Weight [kg]
Herz firestar 20 De Luxe	22.0	106	90	3.0	622



## II. Sample tested

Boiler heat output version	Serial number	Place of testing
Herz firestar 20 De Luxe	0974508285	Herz Energietechnik GmbH Herzstrasse 1 7423 Pinkafeld Austria

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 08/2013.

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

## III. Measuring and testing equipment

No.	Description	Inventory number	Calibration valid until	Accuracy
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	11-2013	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	± 0.12 MJ-kg
10.	Elemental analyser, Perkin Elmer, type 2400 CHNS	02-2107	03-2015	± 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

Note: \* Calibrated prior to each measurement, with the use of certified reference material



**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, 4.3.2, 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 – 17	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 18 - 19	0	+
5.**	Marking	ČSN EN 303-5:2013 Art. 7, 7.1, 7.2, 7.3	Page 20	0	+
6.**	Technical documentation, supplied with boiler	ČSN EN 303-5:2013 Art. 8, 8.1, 8.2, 8.3, 5.16.1	Pages 21 - 24	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 25	+	0
8.	Surface temperature test (1003*)	ČSN EN 303-5:2013 Art. 5.12, 4.3.6	Pages 26 - 27	+	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, 5.7, 5.8, 5.9, 5.10 ČSN EN 303-5:2013 Art. 4.4.3	Pages 28 - 30	+	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 31 – 32	+	0
11.	Test of heat output, input and efficiency (1004.1*)  Combustion efficiency test – emissions (1005.1*)	ČSN EN 303-5:2013, Annex C, Deviations from Austria, C.2.2, C.2.3	Pages 33 – 34	+	0
		ČSN EN 303-5:2013, Annex C, C.3 Deviations from Croatia	-	0	0
		ČSN EN 303-5:2013, Annex C, Deviations from Denmark, C.4.1, C.4.2	Pages 35 – 36	+	0
		ČSN EN 303-5:2013, Annex C, Deviations from Germany, C.5.1, C.5.2	Pages 37 – 38	+	0
		ČSN EN 303-5:2013, Annex C, C.6 Deviations from Switzerland	Pages 39 - 40	+	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 Deviations from Italy	-	0	0
13.	<b>Test of control, regulation and safety elements (1006.1*)</b> <b>Combustion efficiency test – emissions (1005.1*)</b> <b>Test of device for dissipating excess heat 1006.2*</b>	ČSN EN 303-5:2013 Art. 5.13, 5.15, 5.16.3, 4.1  ČSN EN 303-5:2013 Art. 5.9, 5.10.4	Pages 41 – 43	+	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: Herz firestar 20 De Luxe

**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\text{ °C}</math>);</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</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> <p>+</p>	



Requirement	Requirement specification	Evaluation	Note
requirements of resistance against heat and fire in either EN 60335-1 or EN 60730-1.			
<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>	ČSN EN 303-5:2013 Art. 4.1	<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>	

Note:

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

Evaluation drafted by:  
 Ing. Michal Havlů

Date: 08/2013

Signed:

*P.P. Maláček*

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 08/2013

Signed:

*SB*



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: Herz firestar 20 De Luxe

**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 firebricks, 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>+</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>+</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.</p> <p><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>+</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	0	
<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: 08/2013

Signed: 

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 08/2013

Signed: 



Requirement assessed: **Safety requirements**

Requirement specification: ČSN EN 303-5:2013  
 Art. 4.3, 4.3.1, 4.3.2, 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: Herz firestar 20 De Luxe

**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.  <b>Class A:</b> Control functions which are not intended to be relied upon for the safety of the application.  <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.  <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).                      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.                      In the risk assessment, one of the above mentioned classifications of the control function shall be allocated to any identified hazard.                      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                      31-9354/E                      31-9354                      /EMC</p>



Requirement	Requirement specification	Evaluation	Note
<p><b>Manual stoking</b> Boilers with manual stoking shall be designed in such a way that, when the boiler is operated in accordance with the boiler manufacturer's operating instructions, the operator does not run the risk of a hazardous operation mode. Such a mode might result in an injury when opening the fuel chamber door or the combustion chamber (e.g. by ignition of gases).</p>	<p>ČSN EN 303-5:2013 Art. 4.3.2</p>	+	
<p><b>Safety against lack of air supply or insufficient combustion</b> 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 malpositions of adjustable devices with separate actuators at the same time shall be taken into account. <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><b>Surface temperatures</b> 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>Leakage of the combustion system</b> 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. The gas side resistance shall be determined with the fuel chamber filled to maximum capacity (as specified by the manufacturer). <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><b>Temperature control and limiting devices</b></p>	<p>ČSN EN 303-5:2013 Art. 4.3.8</p>		
<p><b>General</b> 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</p>	<p>ČSN EN 303-5:2013 Art. 4.3.8.1</p>	+	



Requirement	Requirement specification	Evaluation	Note
required in 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><b>Temperature control and limiting devices for open vented systems</b></p> <p>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:</p> <ul style="list-style-type: none"> <li>- a temperature controller;</li> <li>- a safety temperature limiter (manual reset).</li> </ul> <p>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><b>Temperature control and limiting devices for closed vented system</b></p> <p>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> <ul style="list-style-type: none"> <li>a) The firing system is rapidly disconnectable; the necessary equipment shall consist of: <ul style="list-style-type: none"> <li>- a temperature controller;</li> <li>- a safety temperature limiter (manual reset).</li> </ul> </li> <li>b) The firing system is partly disconnectable; the necessary equipment shall consist of: <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> </li> <li>c) The heating system is not disconnectable and the nominal heat output is &lt; 100 kW; the necessary equipment shall consist of: <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> </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>	0	
		+	
		+	
		0	



Requirement	Requirement specification	Evaluation	Note
<p><b>Devices for dissipating excess heat</b>                      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 style="text-align: center;">+</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;">0</p> <p style="text-align: center;">0</p>	
<p><b>Heating boiler accessories</b></p>	<p>ČSN EN 303-5:2013 Art. 4.3.9</p>		
<p><b>General</b>                      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 style="text-align: center;">0</p>	





Requirement	Requirement specification	Evaluation	Note
<p><b>Electrical safety</b></p> <p>The electrical safety of the boiler and the interfaces (e.g. connectors) between control devices shall comply with EN 60335-2-102.</p> <p>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.</p> <p>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.</p> <p>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 31-9354/E</p>
<p><b>Electromagnetic compatibility</b></p> <p>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>31-9354/ EMC</p>

Note:

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

Evaluation drafted by:  
 Ing. Michal Havlů

Date: 08/2013

Signed:

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 08/2013

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: Herz firestar 20 De Luxe

**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>Combustion period</b>                      The combustion period for hand-stoked boilers at nominal heat output shall be stated by the manufacturer and shall be at least:                      – 2 hours for biogenic and other solid fuels ;                      – 4 hours for fossil fuels.</p>	ČSN EN 303-5:2013 Art. 4.4.5	+	
<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	0	
<p>The control of the fuel and-or the air supply may be either continuous or intermittent. For manually stoked boilers</p>		+	



Requirement	Requirement specification	Evaluation	Note
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 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.		+	
Manually stoked boilers do not require testing at minimum heat output if the manufacturer claims that they shall always be connected to accumulator tank.		+	
The following applies as a reference for the minimum accumulator tank volume:  $V_{Sp} = 15 T_B \times Q_N \left( 1 - 0,3 \frac{Q_H}{Q_{min}} \right)$			
where $V_{Sp}$ is the accumulator tank volume, in litres; $Q_N$ is the nominal heat output, in kilowatts; $T_B$ is the burning period, in hours; $Q_H$ is the heating load of the premises, in kilowatts; $Q_{min}$ is the minimum heat output, in kilowatts.			
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.		0	
<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	+	

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

Evaluation drafted by:  
 Ing. Michal Havlů

Date: 08/2013

Signed:

*P.P. Matěch*

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 08/2013

Signed:

*SB*



Requirement assessed: **Marking**

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

Sample assessed: Herz firestar 20 De Luxe

**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:  
 Ing. Michal Havlíč

Date: 08/2013

Signed:

Person responsible for the evaluation:  
 Ing. Stanislav Buchta

Date: 08/2013

Signed:



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: Herz firestar 20 De Luxe

**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:	ČSN EN 303-5:2013 Art. 8.2		Enclosed technical documentation.
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;		+	
h) boiler class;		+	
i) combustion period in hours at $Q_N$ ;		+	
j) setting range for the temperature controller, in degrees Celsius;		+	
k) Minimum return temperature at boiler return tapping, in degrees Celsius;		+	
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 $Q_{min} > 0,3 Q_N$ ;		+	
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;		+	
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;	+		
u) whether the heating appliance is working under condensing or non-condensing conditions;	+		



Requirement	Requirement specification	Evaluation	Note
<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>	



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>Other documents (brochures, etc.) shall not contain any information that is in contradiction with that of the operating instructions.</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>	<p style="text-align: center;">+</p>	

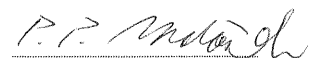
Note:

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

Evaluation drafted by:  
Ing. Michal Haviř

Date: 08/2013

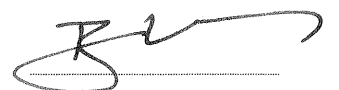
Signed:



Person responsible for the evaluation:  
Ing. Stanislav Buchta

Date: 08/2013

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:

Herz firestar 20 De Luxe

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: 08/2013

Signed: 

Reviewed by: Ing. Stanislav Buchta

Date: 08/2013

Signed: 



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

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

Sample tested: Herz firestar 20 De Luxe

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>+</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>+</p>	



**Measurement results:** Herz firestar 20 De Luxe

Average temperatures of boiler walls, doors and covers (°C):	
Fuel type	Wood – A
Front wall	32
Rear wall	30
Right wall	36
Left wall	35
Upper wall	36
Lower wall (a base was used, non-combustible material)	45
Temperatures of control elements (°C):	
El. control panel – plastic	30

**Measurement uncertainty:** 2 °C for temperatures within the range of (0 ÷ 250)°C

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

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

Tested by: Ing. Michal Havlů Date: 08/2013

Signed: P.P. Melich

Reviewed by: Ing. Stanislav Buchta Date: 08/2013

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: Herz firestar 20 De Luxe

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

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

Test period:	I.	II.	III.
Boiler type:	Herz firestar 20 De Luxe		
Output tested:	Nominal	Nominal	Minimum
Fuel type:	<b>Wood - A</b>		
Combustion period, (manual) stoking	Minimally 2 × 2 hours		
Nominal heat output (specified by manufacturer) [ kW ]	22.0	22.0	22.0
Flue gas temperature [ °C ]	103.9	104.3	79.2
Fuel mass added [ kg/hour ]	5.40	5.48	2.59
Inlet water temperature [ °C ]	54.9	55.1	55.0
Outlet water temperature [ °C ]	74.8	75.3	72.4
Cooling water flow rate [ m <sup>3</sup> /hour ]	0.8920	0.8920	0.4722
Draught [ Pa ]	20.0	20.0	20.0
Ambient temperature [ °C ]	25.0	25.0	25.0
Relative air humidity [ % ]	25.5	25.5	25.5
Barometric pressure [ kPa ]	97.99	97.99	97.99

***Analysis of combustion products:***

Test (period of burning) :	I.	II.	III.
Oxygen, O <sub>2</sub> [ % ]	5.32	5.23	7.26
Carbon dioxide, CO <sub>2</sub> [ % ]	15.41	15.42	13.88
Carbon monoxide, CO [ppm]	39	63	37
Higher hydrocarbons, THC-OGC [ppm]	2	2	3
Nitrogen oxides NO <sub>x</sub> [ppm]	199	191	132



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

Test (period of burning) :		I.	II.	III.
Stoichiometric oxygen volume	[ m3/kg ]	0.893	0.893	0.893
Stoichiometric air volume	[ m3/kg ]	4.253	4.253	4.253
Stoichiometric volume of dry combustion products	[ m3/kg ]	4.148	4.148	4.148
Maximum content of CO <sub>2</sub>	[ % ]	18.98	18.98	18.98
Stoichiometric air multiple	[ - ]	1.33	1.32	1.52
Volume of dry combustion products, actual	[ m3/kg ]	5.109	5.105	5.670
Content of H <sub>2</sub> O in combustion air	[ m3/kg ]	0.047	0.047	0.054
Content of H <sub>2</sub> O in combustion products	[ m3/kg ]	0.934	0.933	0.940

**Calculated values - thermal overview**

Test (period of burning) :		I.	II.	III.
Loss of sensible heat of combustion products	[ % ]	4.4	4.4	3.3
Loss of gas underburning	[ % ]	0.0	0.0	0.0
Loss of mechanical underburning	[ % ]	0.5	0.5	0.5
Loss of heat transfer into environment	[ % ]	2.5	2.5	5.3
Total loss	[ % ]	7.5	7.5	9.1
Heat input	[ kW ]	22.8	23.1	10.9
<b>Heat output</b>	<b>[ kW ]</b>	<b>21.0</b>	<b>21.3</b>	<b>9.9</b>
Uncertainty of determining heat output	[ kW ]	0.9	0.9	0.4
<b>Efficiency – direct method</b>	<b>[ % ]</b>	<b>92.3</b>	<b>92.2</b>	<b>90.5</b>
Output / nominal output	[ % ]	95.7	97.0	45.0

At nominal output, when burning **Wood – A**, 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 – A, the period of burning is more than 2 hours;

**Electric consumption**

Maximum electrical input	100 W
Electrical input at nominal heat output	100 W
Electrical input at minimum heat output (50%)	46 W
Electrical input for STAND BY mode	17 W



**Fuel analysis**

Fuel type	Wood – A			
Analytical indicator	Symbol	Unit	Value	Uncertainty
Heat of combustion	$Q_s$	[ MJ/kg ]	17.22	0.14
Caloric value	$Q_j$	[ MJ/kg ]	15.64	0.14
All water in original condition	$W'_t$	[ % by weight ]	9.59	0.06
Ash	A	[ % by weight ]	2.11	0.01
Carbon	C	[ % by weight ]	44.32	0.25
Hydrogen	H	[ % by weight ]	6.13	0.10
Nitrogen	N	[ % by weight ]	0.33	0.10
Sulphur	S	[ % by weight ]	0.012	0.001
Chlorine	Cl	[ % by weight ]	0.006	0.001
Oxygen – calculation for 100%	O	[ % by weight ]	37.50	
Conversion factor $f_{emis}$ for emissions in [mg/m <sup>3</sup> ] to [mg/MJ]	$f_{emis}$	[ - ]	0.27056	

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: 08/2013

Signed: 

Reviewed by: Ing. Stanislav Buchta Date: 08/2013

Signed: 



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: Herz firestar 20 De Luxe

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	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	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:** Herz firestar 20 De Luxe

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 (average values)	5.27	15.41	51	2	195	19	45	2	280	13
Minimum	7.26	13.88	37	3	132	17	37	4	218	14

**Test evaluation:**

Herz firestar 20 De Luxe (Wood - A) 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: 08/2013

Signed: P. P. Michal Havlů

Reviewed by: Ing. Stanislav Buchta Date: 08/2013

Signed: Stanislav Buchta





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: Herz firestar 20 De Luxe

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 - A		
<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	79 %				
<b>&gt;10 to 200 kW</b>	<b>(71.3 + 7.7 log Pn) %</b>		+		
>200 kW	89 %				
<b>a) automatically loaded</b>					
up to 10 kW	80 %				
>10 to 200 kW	(72.3 + 7.7 log Pn) %				
>200 kW	90 %				
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 - A		
Small burners used for solid fuels automatically loaded					
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:** Herz firestar 20 De Luxe

Boiler output	Minimum efficiency	Measured efficiency
Nominal	81.6	92.3
Minimum		90.5

**Test evaluation:**

The measured efficiency of Herz firestar 20 De Luxe (Wood - A) is **higher** than required.

**Measurement results:** Herz firestar 20 De Luxe

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 (average values)	5.27	51	195	2	19	24	148	1	7
Minimum	7.26	37	132	3	17	20	115	2	7

**Test evaluation:**

The measured emission values for Herz firestar 20 De Luxe (Wood – A) **do not exceed** the specified values.

Tested by: Ing. Michal Havlů

Date: 08/2013

Signed: *P.P. Meláich*

Reviewed by: Ing. Stanislav Buchta

Date: 08/2013

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,  
 Deviation from Denmark, C.4.1, C.4.2

Sample tested: Herz firestar 20 De Luxe

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement	Requirement specification	Test evaluation
<b>Boiler Efficiency</b>	ČSN EN 303-5:2013 Annex C, Deviation from Denmark , C.4.1	Wood - A
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.		
<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>	ČSN EN 303-5:2013 Annex C, Deviation from Denmark , C.4.2	Wood – A	
According to the Danish EPA Statutory Order no. 1432 of 11-12-2007, only Class 3 (or higher) is acceptable for Denmark.			

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



**Measurement results:** Herz firestar 20 De Luxe

Boiler output	Minimum efficiency	Measured efficiency
Nominal	75.1	92.3
Minimum		90.5

**Test evaluation:**

Measured efficiency for Herz firestar 20 De Luxe (Wood - A) is **higher** than required.

**Measurement results:** Herz firestar 20 De Luxe

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 (average values)	5.27	51	2	19	45	2	13
Minimum	7.26	37	3	17	37	4	14

**Test evaluation:**

The measured emission values Herz firestar 20 De Luxe (Wood – A) **do not exceed** the specified values.

Tested by: Ing. Michal Havlí

Date: 08/2013

Signed: *P.P. Melaidh*

Reviewed by: Ing. Stanislav Buchta

Date: 08/2013

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,  
 Deviation from Germany, C.5.1, C.5.2

Sample tested: Herz firestar 20 De Luxe

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 - A
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	$\geq 4 \leq 500$	<b>0.10</b>	<b>1.0</b>		
		$> 500$	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	$\geq 4$	<b>0.02</b>	<b>0.4</b>		
		$\geq 30 \leq 500$	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:** Herz firestar 20 De Luxe

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 (average values)	5.27	51	19	0.033	0.010
Minimum	7.26	37	17	0.027	0.010

**Test evaluation:**

The measured emission values for Herz firestar 20 De Luxe (Wood – A) **do not exceed** the specified values.

Tested by: Ing. Michal Havlí

Date: 08/2013

Signed: *P.P. Mlýnský*

Reviewed by: Ing. Stanislav Buchta

Date: 08/2013

Signed: *SB*



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: Herz firestar 20 De Luxe

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

Requirement		Requirement specification	Test evaluation												
<p>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:</p>		<p>ČSN EN 303-5:2013  Annex C  C.6 Deviation from Switzerland</p>	Wood - A												
Type of installation	<p><b>Particular requirements (emission limits)<sup>a</sup> for carbon monoxide (CO) and particulate matter (dust)</b></p> <table border="1"> <thead> <tr> <th></th> <th>CO (mg-m<sup>3</sup>)</th> <th>Dust (mg-m<sup>3</sup>)</th> </tr> </thead> <tbody> <tr> <td><b>Boilers for log Wood - And boilers for coal, manual stoking</b></td> <td>800</td> <td>50</td> </tr> <tr> <td>Boilers for chipped Wood - And boilers for coal, automatic stoking</td> <td>400</td> <td>60</td> </tr> <tr> <td>Boilers for Wood Pellets, automatic stoking</td> <td>300</td> <td>40</td> </tr> </tbody> </table>			CO (mg-m <sup>3</sup> )	Dust (mg-m <sup>3</sup> )	<b>Boilers for log Wood - And boilers for coal, manual stoking</b>	800	50	Boilers for chipped Wood - And boilers for coal, automatic stoking	400	60	Boilers for Wood Pellets, automatic stoking	300	40	
	CO (mg-m <sup>3</sup> )		Dust (mg-m <sup>3</sup> )												
<b>Boilers for log Wood - And boilers for coal, manual stoking</b>	800		50												
Boilers for chipped Wood - And boilers for coal, automatic stoking	400	60													
Boilers for Wood Pellets, automatic stoking	300	40													
			+												
<p><sup>a</sup> Referred to oxygen basis:  – for boilers for natural state wood 13 % volume;  – for boilers for coal 7 % volume.</p>															
<p>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.</p>			0												



**Measurement results:** Herz firestar 20 De Luxe

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 (average values)	5.27	51	19	33	10
Minimum	7.26	37	17	27	10

**Test evaluation:** The measured emission values for Herz firestar 20 De Luxe (Wood – A) **do not exceed** the specified values.

Tested by: Ing. Michal Havlů

Date: 08/2013

Signed: P. P. Melaidh

Reviewed by: Ing. Stanislav Buchta

Date: 08/2013

Signed: [Signature]





Accredited test number: **1006.1\*** Test title:  
**1005.1\*** **Function test of control, regulation and safety elements**  
**1006.2\*** **Combustion efficiency test – emissions**  
**Test of device for dissipating excess heat**

Test method: ČSN EN 303-5:2013  
 Art. 5.13, 5.15, 5.16.3  
 ČSN EN 303-5:2013  
 Art. 5.9, 5.10.4

Sample tested: Herz firestar 20 De Luxe

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 on the device for dissipating excess heat (partly or non-disconnectable firing system)</b> Adjust the firing so that it corresponds to the nominal heat output QN of the boiler, a steady state condition is reached and the outlet pressure at the flue gas section is according to the nominal heat output. Put the temperature controller out of function. Maintain the function of the safety temperature limiter. The heat consumption is set to 0; water circulation in the boiler is permitted. Check if the safety temperature limiter switches off the firing system and the device for dissipating excess heat works properly and all hazardous operation states are avoided. <b>The cold water shall be kept at a temperature of (10 ± 5) °C and a pressure of maximum 2 bar. (Deviations are permissible if they are specified in the installation instructions.)</b> 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. 5.15</p>	<p>+</p>	
<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: – failure of combustion air fan; – failure to close of the adjustable combustion air supply. In each case, only one failure shall be simulated. The CO concentrations in the boiler shall not exceed 5 % volume. The measurement of CO concentration shall be carried out in the flue gas measuring section. <b>Test of combustion air supply loss</b></p>	<p>ČSN EN 303-5:2013 Art. 5.16.3</p>	<p>+</p>	
<p>The heat carrier (water) does not become heated to a dangerous extent (<math>\leq 110</math> °C);</p>	<p>ČSN EN 303-5:2013 Art. 4.1</p>	<p>+</p>	

Note:

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



**Measurement results:**

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

<b>Temperature limiter (manual restoration of temperature) STB</b>		
<b>Temperature</b>	<b>[ °C ]</b>	<b>Note:</b>
Pre-set	90 °C	Temperature set on the temperature limiter
Shutdown	103 °C	Fan 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.

**Test results:**

<b>Measurement and calculated values:</b>	<b>Unit</b>	<b>Value</b>	<b>Limit</b>	<b>Note</b>
Outlet water temperature - max	°C	90	110	
Water cooling temperature – inlet from safety valve - average	°C	10		
Water cooling temperature – outlet from safety valve - average	°C	45		
Water flow - max	kg/hod	1050		
Outlet water temperature during open the valve for cooling water	°C	88		
Pressure of cooling water	bar	2		

**Test evaluation:**

During the safety temperature regulator test, the water temperature at the output from the boiler did not exceed 110°C.

Tested by: Ing. Michal Havlů

Date: 08/2013

Signed: P. P. Melanich

Reviewed by: Ing. Stanislav Buchta

Date: 08/2013

Signed: [Signature]



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-47464 of 2013-08-23
- Contract B-47464/31 of 2013-11-05
- 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; Boiler Herz firestar 20 De Luxe

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