IMQ primacontrol

Laboratorio notificato n° 1881
Notified Laboratory No. 1881

RAPPORTO DI PROVA *CS-09-095*
TESTING REPORT

Secondo la norma *In conformity with standard*	**EN 303-5:1999 - EN 14785:2006 (Heat losses and efficiency) TC295 WG5 N24 E - Annex A.2**
Tipo di apparecchio *Type of appliance*	**Heating boiler for solid fuel, hand stocked, nominal heat output of to 300 kW**
Prova *Testing*	**Initial Type Testing**
Fabbricante *Manufacturer*	**LAMINOX S.r.L. Zona Industriale Callarella, 261/263 62028 SARNANO (MC) - ITALY**
Marchio *Trade mark*	**LAMINOX**
Modelli *Models*	**HIDRA 24 - HIDRA 18**
Materiale pervenuto il *Goods arrival*	2009/09/02
Bolla n° *Document n°*	2043
Esso si costituisce di *It consists of*	30 pages and 1 enclosure
Laboratorio *Laboratory*	**IMQ PRIMACONTROL s.r.l. - I - 31020 Zoppè S.Vendemiano (TV) Via dell'Industria, 55 - Tel. 0438 778358 - 470255 - Fax 0438 778360**
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Data inizio test *Date test's beginning*	2009/11/11
Data fine test *Date test's ending*	2009/11/26
Data di emissione *Issue date*	2010/02/02
Il tecnico delle prove *Technical responsable of test*	Dino Grotto
Il responsabile del Laboratorio *Head Approval Department*	Nicola Bottolo

Manufacturer **LAMINOX S.r.L.**
Type **HIDRA 24; HIDRA 18** Date 2010/02/02
Test report N° **CS-09-095** Technician Dino Grotto

Summary data

Model			*HIDRA 24*	*HIDRA 18*	-----
Tested			*Laboratory*	*Laboratory*	-----
Fuel type			*Wood pellet*	*Wood pellet*	-----
Nominal heat	*Mass of test fuel hourly*	*kg/h*	*5,2*	*3,8*	-----
	Mean flue gas temperature	*°C*	*205*	*167*	-----
	Heat input	*kW*	*25,35*	*18,76*	-----
	Nominal heat output (declared)	*kW*	*22,4 (22)*	*17,3 (17)*	-----
	Water heat output (declared)	*kW*	*18,2 (18)*	*14,2 (14)*	-----
	Combustion efficiency (declared)	*%*	*88,3 (88)*	*92,2 (92)*	-----
	Water efficiency	*%*	*71,82*	*75,88*	-----
	Mean content of CO to 10% O_2	*%*	*0,011*	*0,010*	-----
	Mean content of CO to 10% O_2	*mg/Nm^3*	*135*	*128*	-----
	Mean content of CO to 13% O_2	*mg/Nm^3*	*98*	*93*	-----
	Mean content of CO to 0% O_2	*mg/MJ*	*60*	*57*	-----
	Average content of OGC to 10% O2	*mg/Nm^3*	*3*	*1*	-----
	Average content of OGC to 13% O2	*mg/Nm^3*	*2*	*1*	-----
	Average content of OGC to 0% O2	*mg/MJ*	*1*	*1*	-----
	Average content of DUSTS to 10% O2	*mg/Nm^3*	*27*	*20*	-----
	Average content of DUSTS to 13% O2	*mg/Nm^3*	*20*	*15*	-----
	Average content of DUSTS to 0% O2	*mg/MJ*	*12*	*9*	-----
	Average content of NO_x to 10% O2	*mg/Nm^3*	-----	-----	-----
	Average content of NO_x to 13% O2	*mg/Nm^3*	-----	-----	-----
	Average content of NO_x to 0% O2	*mg/MJ*	-----	-----	-----
Reduced heat	*Mass of test fuel hourly*	*kg/h*	*1,6*	*1,2*	-----
	Mean flue gas temperature	*°C*	*111*	*89*	-----
	Heat input	*kW*	*8,08*	*6,01*	-----
	Nominal heat output (declared)	*kW*	*7,3 (7)*	*5,6 (5,5)*	-----
	Water heat output (declared)	*kW*	*5,45 (5,4)*	*4,26 (4,2)*	-----
	Combustion efficiency	*%*	*90,6 (90,5)*	*93,5 (93,5)*	-----
	Water efficiency	*%*	*67,37*	*70,89*	-----
	Mean content of CO to 10% O_2	*%*	*0,109*	*0,026*	-----
	Mean content of CO to 10% O_2	*mg/Nm^3*	*1356*	*329*	-----
	Mean content of CO to 13% O_2	*mg/Nm^3*	*986*	*240*	-----
	Mean content of CO to 0% O_2	*mg/MJ*	*603*	*146*	-----
	Average content of OGC to 10% O2	*mg/Nm^3*	*47*	*39*	-----
	Average content of OGC to 13% O2	*mg/Nm^3*	*34*	*29*	-----
	Average content of OGC to 0% O2	*mg/MJ*	*21*	*17*	-----
	Average content of DUSTS to 10% O2	*mg/Nm^3*	-----	-----	-----
	Average content of DUSTS to 13% O2	*mg/Nm^3*	-----	-----	-----
	Average content of DUSTS to 0% O2	*mg/MJ*	-----	-----	-----
	Average content of NO_x to 10% O2	*mg/Nm^3*	-----	-----	-----
	Average content of NO_x to 13% O2	*mg/Nm^3*	-----	-----	-----
	Average content of NO_x to 0% O2	*mg/MJ*	-----	-----	-----
The boiler is to be installed on a non combustible base			*No*	*No*	-----
Electrical power supply		*W*	*480*	*480*	-----
Maximum operating pressure		*bar*	*3*	*3*	-----
Boiler class			*2*	*3*	-----

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Model **HIDRA 24; HIDRA 18** Date 2010/02/02
Test report N° **CS-09-095** Technician Dino Grotto

REPORT HISTORY

Date:	Description:	Project n°:	Examining Engineer
2010/02/02	New	CS-09-095	Dino Grotto

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Families appliances

In accordance with paragraph 5.1.3, the whole range of appliances listed in the following table has been grouped in familiy:

HIDRA 24
HIDRA 18

For each family have been tested the appliances highest and lowest power nominal heat outputs with sufficient appliances chosen within the range such the ratio of nominal heat output between each of the appliances does not exceed 2 : 1.

The results of non-tested boilers are determined by interpolation based on the nominal heat output as in accordance to the standard in the paragraph 5.1.3.

HIDRA 24
HIDRA 18

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The fuel used during the test has the following specifications:

Definition	Notation	Unit	Other tests	Other test	Safety test	Allowed (EN standard)
Size			Wood pellet	-----	-----	See Table 8
Fuel type			-----	-----	-----	-----
Report RAL N°			704574	-----	-----	-----
Sectional sizes (diameter)		mm	-----	-----	-----	-----
Length		mm	-----	-----	-----	-----
Perimeter		mm	-----	-----	-----	-----
Hydrogen content of the fuel (on dry ash free basis)	h	kg/kg	-----	-----	-----	-----
Carbon content of the fuel (on dry ash free basis)	c	kg/kg	-----	-----	-----	-----
Sulfur content of the fuel (on dry ash free basis)	s	kg/kg	-----	-----	-----	-----
Oxygen content of the fuel (on dry ash free basis)	o	kg/kg	-----	-----	-----	-----
Molar content of hydrogen	m		-----	-----	-----	-----
Molar content of hydrogen	n		-----	-----	-----	-----
Stoichiometric oxygen demand for fuel	A		-----	-----	-----	----- -----
Molar content of sulfur	p		-----	-----	-----	-----
CO_2 max content calculated	$CO_{2\ max}$	%	-----	-----	-----	-----
CO_2 max content	CO_2	%	19,0	-----	-----	-----
Moisture content	W	%	5,70	-----	-----	See Table 8
Sulfur content	S	%	0,08	-----	-----	-----
Azote content	A	%	0,12	-----	-----	-----
Carbon content	C	%	45,2	-----	-----	-----
Hydrogen content	H	%	5,15	-----	-----	-----
Net lower calorif value (wf)	H_{uwf}	kJ/kgss	18760	-----	-----	See Table 8
Net lower calorif value	H_{uw}	kJ/kg	17690	-----	-----	-----
Swelling index			-----	-----	-----	-----
Ash content		%	0,31	-----	-----	See Table 8
Volatile matter		%	86,8	-----	-----	See Table 8

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ESSENTIAL REQUIREMENTS OF EN 303-5:1999 - HEATING BOILERS - PART 5: HEATING BOILER FOR SOLID FUELS, HAND AND AUTOMATICALLY STOCKED, NOMINAL HEAT OUTPUT OF UP TO 300KW	
4 REQUIREMENTS	
4,1 Construction requirements	
4.1.1 General requirement	
Boilers shall be fire-resistant and safe to operate.. They shall be made of non-combustible materials and shall be resistant to deformation. It shall be such that:	
- withstand the stresses during normal operation	✓
- the water shall not become heated to a dangerous extent	✓
- gases shall not leak into the place of installation	✓
- flames do not flare out and embers do not fall out	✓
- no dangerous accumulations of combustible gases in the combustion chamber	✓
Combustible materials are admissible for:	
- components of accessories (when fitted outside the boiler)	✓
- internal components of controls and safety equipment	✓
- operating handles	✓
- electrical equipment	✓
The surface temperature of the component parts of covers, shall not exceed those specified either by the manufacturer or in the component part standard	✓
Materials for parts subject to pressure shall be suitable for the purpose and treatment intended.	✓
4.1.2 Production documentation	
4.1.2.1 Drawings	
The following shall be specified in the boiler drawings or in the relevant documents:	
- materials used	✓
- welding process, the seam type, and the welding fillers	✓
- max operating temperature in °C allowed	✓
- max operating pressure in bar allowed	✓
- nominal heat output or the heat output range for every boiler size in KW in accordance with the fuel.	✓
4.1.2.2 Manufacturing controls	
A Q.M. shall be compiled on the inspections and tests necessary during the manufacturing process. The Manual shall:	
- describe the inspection system	✓
- specify the necessary inspections and tests as well as the pertinent limit values	✓
- lay down the requisite measuring and testing equipment and their inspection	✓

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4.1.3 Heating boilers made of steel and non-ferrous materials	
4.1.3.1 Execution of welding work Boiler manufacturers who carry out welding work shall meet the requirements of EN 287-1 and EN 287-2.	✓
4.1.3.2 Welding seams and welding fillers The materials shall be suitable for welding (see materials listed in Tab. 1)	✓
The welded seams shall not show any cracks or bonding faults and shall be defect free over the whole cross-section for butt welds.	✓
Double fillet welds are only permissible when sufficiently cooled. Projections into the flue gas side in areas of high thermal stresses shall be avoided.	✓
Corner welds, edge welds and similar welded connections which are subject to high bending stresses during production and operation are to be avoided.	✓
See table 2 for recommendation (dimensions in mm) and for the parameters that shall be met. Welding fillers shall be suitable for the material being used.	✓
4.1.3.3 Parts of steel subject to pressure The steels listed in table 1 shall be used. The specification of the materials shall be documented by a works certificate (EN 10204). These certificates shall be obtained the boiler manufacturer.	✓
4.1.3.4 Minimum wall thicknesses The minimum wall thicknesses (see tab. 3) shall take account of:	
- the maximum allowable operating pressure	✓
- the normal heat output	✓
- the material properties	✓
Boilers consisting of individual geometrically identical parts, the requirements of the minimum wall thickness for the complete range shall be in accordance with the boiler with the lowest nominal heat output.	✓
The wall thickness tolerance for carbon steels shall be as specified in EN 10029.	
The nominal minimum wall thicknesses of Tab. 3 apply to pressure-loaded sheets, tubes and forgings.	✓
Smaller wall thicknesses shall be permitted on production of evidence showing equivalence as regards corrosion and heat resistance and strength.	✓

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4.1.4 Boilers made of cast materials	
The manufacturer shall have personnel and equipment capable of carrying out the necessary material tests.	-----
During the manufacture of the boiler and other cast iron parts subject to pressure the following tests shall be carried out using separately cast test pieces for each batch:	
1) tensile test (ISO 185)	-----
2) chemical analysis	-----
3) brinell hardness test (EN 10003-1)	-----
4) izod impact	-----
The results of the tests shall either be recorded in registers countersigned by the work tester responsible.	-----
The repair by welding of parts subject to pressure is not permissible	-----
4.1.4.1 Cast iron parts subject to pressure	
The mechanical properties of cast iron used for parts subject to pressure shall correspond to the values listed in Tab. 4.	-----
4.1.4.2 Minimum wall thicknesses	
The wall thicknesses given in the production drawing shall not be less than the minimum wall thicknesses listed in Tab. 5	-----
The minimum wall thicknesses of the boiler section and of the other parts subject to pressure shall be more than 0.8 times the thickness given in the drawing.	-----
Smaller wall thicknesses are only permissible on production showing equivalent performance.	-----
Boilers consisting of individual geometrically identical parts, the requirements of the minimum wall thickness for the complete range shall be in accordance with the boiler with the lowest nominal heat output.	-----
4.1.5 Safety and design requirements	
4.1.5.1 Venting of the water sections and flue gas passages	✓
The boiler and its components shall be designed in such a way that their respective water sections can fully vented.	✓
The boiler shall be so designed that under normal operation in accordance with the manufacturer's instructions no undue boiling noises occur.	✓
combustion chamber and the flue gas passages shall be designed in such a way that no dangerous accumulation of combustible gases is possible.	✓

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4.1.5.2 Cleaning of heating surfaces	
The heating surfaces shall be accessible from the flue gas side for inspection and cleaning with chemical agents and brushes.	✓
If special tools (e.g. special brushes) are required for cleaning and maintenance of the boiler these shall be supplied.	✓
4.1.5.3 Inspection of the flame	
A facility shall be provided which allows inspection of the flame of fire bed. If it consists of a door, hazard-free inspection shall be possible.	✓
4.1.5.4 Water tightness	
Holes for screws and similar components which are used or 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.	✓
4.1.5.5 Replacement parts	
Replacement and spare parts shall be designed, made or marked in such a way that their installation in accordance with the manufacturer's instructions shall be correct.	✓
4.1.5.6 Water side connection	
Adaptor nipples conform to ISO 7-1, ISO 7-2, ISO 228-1, ISO 228-2, flange connections conform to ISO 7005-1, ISO 7005-2, ISO 7005-3.	✓
There shall be sufficient space around the connection to allow the installation of the connecting pipes with the necessary tools.	✓
If connections are fitted with flanges, the mating flanges and seals shall also be supplied except standardized flanges are available.	✓
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:	
- G 1/2 for nominal heat outputs up to 70kW	✓
- G 3/4 for nominal heat outputs above 70kW	-----
4.1.5.7 Connections for control and indicating equipment and safety thermostat.	
Every boiler shall be equipped with at least one connection for an immersion pocket for temperature control, safety-temperature limiter and thermometer. Its minimum nominal diam. = G 1/2.	✓
Deviations are allowed, provided that the control devices are supplied with the boiler, and that they cannot be substituted by other components.	✓
The connections position shall be in such a way that the T° of the water is recorded with sufficient accuracy.	✓

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4.1.5.7 Where additional connections are provided, their size (especially for safety valve) is to be determined according to the output of the boiler.	✓
4.1.5.8 Thermal insulation All boilers shall be fitted with thermal insulation . This shall withstand normal thermal and mechanical stresses. It shall be made of non-combustible material and shall not give off fumes during normal running.	✓
4.1.5.9 Water side resistance of the boiler The water side resistance are to be determined for those flows which correspond to the nominal heat output with two temperature differences of 10K and of 20K between the flow and return connections of the boiler. Results stated in mbar for each boiler size shall correspond to the values indicated by the manufacturer.	✓
4.1.5.10 Leakage of the combustion system Boilers designed to operate with a positive pressure in the combustion chamber when tested according to 5.6 at a test-pressure of 1.2 times the gas side resistance, 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 filling chamber or fuel hopper filled to maximal capacity (see manufacturer specifications)	✓
4.1.5.1' Temperature control and limiting devices The control and safety devices described in the sections below and the appropriate installation options shall be provided for each boiler.	✓
The equipment required in each case shall be supplied by the manufacturer, unless specifications shall be given in the installation instructions (limit values and time constants for safety temperature limiter).	✓
4.1.5.11.1 Temperature control and limiting devices for open vented systems When used in physically protected heating installations the following equipment shall be provided: - a temperature controller	-----
- a safety temperature limiter with automatic reset.	✓
The safety temperature limiter is not necessary if the firing system is neither rapidly nor partly disconnectable.	-----

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4.1.5.11.2	Temperature control and limiting devices for closed vented system 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 exchanger or equivalent device.	
	a) The firing system is rapidly disconnectable; the necessary equipment consists of:	
	- a temperature controller	-----
	- a safety temperature limiter (manual reset)	✓
	b) the firing system is partly disconnectable; the necessary equipment consists of:	
	- a temperature controller	-----
	- a safety temperature limiter (manual reset)	-----
	- a reliable device for dissipating the residual heat output in accordance with 4.1.5.11.3	-----
	c) the firing system is not disconnectable and the nominal heat output < 100kW; the necessary equipment consists of :	
	- a temperature controller	-----
	- a reliable device (4.1.5.11.3) for dissipating the maximum heat output possible	-----
4.1.5.11.3	Devices for dissipating excess heat up to a maximum of 100kW 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.	-----
	Admissible heat exchangers include storage or circulatory water heaters, provided they are designed and laid out 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.	-----
	The following conditions shall also be met:	
	- the thermal sequence protection 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 case of malfunction or of partly disconnectable heating systems.	-----
	- if a storage water heater is used as the heat exchanger, it shall be designed so that it meets the above mentioned conditions at its maximum operating T°	-----
	- in case of safety heat exchangers used to dissipate heat in the event of malfunction the thermal sequence protection shall be fitted ahead of the heat exchanger in the cooling water inlet	-----
	Other solution are not excluded provided they comply with the protection objectives and safety standards .	

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4.1.5.11.3 All devices for dissipating excess heat are only admissible for:	
- boilers without disconnectable firing system with rated heat outputs of max 100kW	✓
- boilers with partly disconnectable firing system with residual heat outputs of up to 100kW	-----
4.1.5.12 Storage hopper	
The storage hopper shall be designed in such a way that the fuel moves freely and the duration of the combustion period is assured.	✓
4.1.5.13 Ash chamber	
The capacity of the ash chamber shall be adequate for a combustion period of at least 12h using the recommended fuel and at nominal heat output-taking into account the unobstructed flow of air under the grate.	✓
The above requirements shall be considered met if the system is designed with devices for automatic ash and clinker removal.	✓
4.1.5.14 Stoking devices	
4.1.5.14.1 Manual stoking	
Boiler with manual stoking shall be designed in such a way that, when the boilers are operated according to purpose, the operator does not run the risk of injury when opening the stoking door or the combustion chamber.	-----
4.1.5.14.2 Automatic stoking	
Automatic stoking systems shall be designed with a safety device to prevent back-burning into the feeder or metering device or creating a blow-back.	✓
4.1.5.15 Heating boiler accessories	
If the boiler is equipped with additional fittings, and if they need to be serviced to to ensure the correct operation and safety of the boiler, extensive dismantling work is not required.	-----
4.1.5.16 Electrical safety	
See EN 60335-1.	
1) General specifications:	
- type of boiler protection (EN 60529)	✓
- specifications concerning electrical components	✓
2) Certificate of conformity	
Certification is to be supplied by the equipment manufacturer for:	
- heating	✓
- operation of equipment with electrical heating elements under overload conditions	✓
- interference suppression	✓
- thermal endurance, resistance to creeping	✓

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4.2 Boiler performance requirements The nominal heat output and the heat output range may vary depending on the fuel. All measurement tolerances for efficiency and emissions have been taken into account in establishing the values in Fig. 1; no deviation when comparing test results may be claimed.	✓
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 have to be fulfilled.	✓
4.2.1 Boiler efficiency Tests according to 5.7, 5.8, 5.10: the efficiency shall not be less that the equation shown in Fig. 1 for the nominal heat output.	✓
4.2.2 Gas temperature For boilers which operate below 160K 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 sooting up of the chimney and condensation	✓
4.2.3 Draught The values in Fig. 2 apply as maximum values. They also serve as reference for chimney dimensioning.	✓
Where the maximum draught limits are exceeded a special reference shall be made in the technical instructions.	✓
4.2.4 Combustion period The combustion period for hand-stoked boilers at nominal heat output shall be stated by the manufacturer and shall be at least:	
- for biogenic fuels 2h	-----
- for fossil fuels 4h	-----
For automatic stoked boilers the combustion period shall be at least 6h.	✓
4.2.5 Minimum heat output The minimum heat output shall be not more than 30% of the nominal heat output. On heating boilers with manual stoking, the minimum heat output can be greater. If so the manufacturer shall specify in the technical documentation how the amount of the heat generated is to be dissipated.	✓
Heating boilers using several allowable fuels should have the tank size based on the fuel which requires the largest accumulator tank (this last one is not necessary when the required volume is less than 300l).	-----

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4.2.6 Emission limits Combustion shall be of low-emission. This requirement shall be satisfied if the emission values shown in tab. 7 are not exceeded when operating at nominal heat output, or in the case of boilers with heat output range, when operating at nominal heat output and minimum heat output in accordance with 5.7, 5.9, 5.10 Requirements for dust emission limits at minimum heat output shall be met when the requirements are fulfilled at nominal heat output.	✓
4.2.7 Surface temperatures The mean surface temperature of boiler doors and cleaning port covers on the operator side shall not exceed the room temperature by more than 100K when tested as in 5.12.	✓
The surface temperature on the outside of the boiler bottom shall not exceed the room temperature by more than 65K. 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:	
- 30K for metals and similar materials	-----
- 45K for porcelain and similar materials	-----
- 60K for plastics and similar materials	✓
7 DESIGNATION Each heating boiler shall have a data plate. It shall be written in the language of the boiler's country of destination and be affixed in an accessible spot.	✓
7,1 Information on the boiler plate The boiler plate shall contain at least the following :	
- name of the manufacturer and if available its symbol	✓
- trade mark, type	✓
- production number and year of construction	✓
- nominal heat output and heat output range in kW for each type of fuel	✓
- boiler class	✓
- maximal allowable operating pressure in bar	✓
- maximal allowable operating temperature in °C	✓
- water content in l.	✓
- electrical connection and watt in W	✓

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✓ =Carried out ----- = Not applicable x = Not done	
ESSENTIAL REQUIREMENTS OF EN 303-5:1999 - HEATING BOILERS - PART 5: HEATING BOILER FOR SOLID FUELS, HAND AND AUTOMATICALLY STOCKED, NOMINAL HEAT OUTPUT OF UP TO 300KW	
7.2 Data plate requirements	
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	✓
8 TECHNICAL DOCUMENTATION , SUPPLIED WITH BOILER	
For each boiler the documents listed below shall be available, preferably in the language of the boiler's country of destination; the documents specified under 8.1 and 8.2 shall be enclosed with every boiler.	✓
8.1 These documents shall contain at least the following indications:	
- necessary draught in mbar	✓
- water content in l;	✓
- exhaust gas temperature at nominal heat output and minimum heat output in °C	✓
- exhaust mass flow at nominal heat output and at minimum heat output in kg/s	✓
- flue pipe diameter in mm	✓
- water-side resistance in mbar	✓
- nominal heat output and heat output range for each type of fuel in KW	✓
- boiler class	✓
- combustion period in hours for each type of fuel at Q_N	✓
- setting range for the temperature controller in °C	✓
- minimal return temperature at boiler return tapping in °C	✓
- fuel type and water content as well as fuel size	✓
- filling chamber capacity in litres and cilling opening dimensions in mm	✓
- necessary accumulator storage in litre if $Q_{min} > 0.3Q_N$	✓
- auxiliary power requirement in W	✓
- cold water temperature and pressure for safety heat exchanger in bar	✓
- electrical connections incl. Appliance and main switch-off	✓
The installation instructions shall contain information concerning:	
- the on-site assembly of the boiler and the required water pressure test (5.4.2, 5.5.2.2)	✓
- the installation	✓
- the commissioning with information on the boiler output to be set in the output range	✓
- instructions on the location and fitting of the sensors for the control, display and safety equipment.	✓
In addition the documentation shall in general contain references to the standards and regulations to be observed on the safety equipment of the installation.	

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8.2 Operating instructions	
The operating instructions shall contain references to:	
- the operation of the boiler, stoking and opening doors without risk	✓
- cleaning and cleaning intervals, including the equipment required for cleaning	✓
- measures to be taken in the event of malfunction	✓
- the reasons for recommending a regular, competent maintenance service and the necessary maintenance intervals	✓
- the type of fuel and water content and the fuel size (with the direction of the layers in the case of wood chips)	✓
- the maximum filling height for fuel in the filling chamber	✓
- the combustion period for fuel types at nominal heat output	✓
Other documents shall not contain any information that is in contradiction with those of the operating instructions	✓
ANNEX A (INFORMATIVE) **A - DEVIATION**	-----
ANNEX C (NORMATIVE) **SPECIAL NATIONAL CONDITIONS**	-----

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ESSENTIAL REQUIREMENTS OF EN 303-5:1999 - HEATING BOILERS - PART 5: HEATING BOILER FOR SOLID FUELS, HAND AND AUTOMATICALLY STOCKED, NOMINAL HEAT OUTPUT OF UP TO 300KW	
ANNEX A (INFORMATIVE)	
A DEVIATION	
Requirements in 4.2.1 and 4.2.6 of this Standard do not fall under any Directive of EU.	✓
In the relevant CEN/CENELEC countries these A-deviations are valid instead of the provisions of the EN until they have been removed.	✓ ✓ ✓
A.1 Deviations for Austria	-----
Clause 4.2.1 - Fig. 1 Boiler Efficiency	-----
Clause 4.2.6 - Table 7 - Emission limits.	
A.1.1 Boiler efficiency for nominal heat output and minimum heat output	-----
a) Stoking by hand	
- up to 10 kW 73%	-----
- over 10 kW to 200kW (65.3+7.7 log Q_N)%	-----
- over 200kW 83%	-----
b) Stoking automatically	
- up to 10 kW 76%	-----
- over 10 kW to 200kW (68.3+7.7 log Q_N)%	-----
- over 200kW 86%	-----
A.1.2 Emission limits	
See table A.1.2	-----
A.2 Deviation for Germany	
Clause 4.2.6 - Table 7 - Emission limits	-----
The emission limits are regulated in the German Regulation Bundes-immissionsschutzgesetz . Therefore only class 3 of Table 7 is acceptable for Germany	
Heating boilers for solid fuels with a nominal heat output greater than 15kW have to be constructed and operated so that the emissions, depending on the fuel used, fulfil the following requirements:	
1) for bituminous and brown coal:	
- dust : 0.15g/m³ (in relation to a volume content of O_2 in the exit flue of 8%)	
2) for wood in natural state:	
- dust : 0.15g/m3 (in relation to a volume content of O2 in the exit flue of 13%)	
- carbon monoxide (in relation to a volume content of O2 in the exit flue of 13%)	

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ESSENTIAL REQUIREMENTS OF EN 303-5:1999 - HEATING BOILERS - PART 5: HEATING BOILER FOR SOLID FUELS, HAND AND AUTOMATICALLY STOCKED, NOMINAL HEAT OUTPUT OF UP TO 300KW

A.3 Deviations for United Kingdom
Clause 4.2.6 - Table 7 -----
The UK legislation in respect of clean air is consolidated in the Clean Air Act 1993 ----- which lays down legislative requirements regarding emissions from solid fuels and ----- solid fuel fired appliances in the UK which are more stringent than those in EN 303-5. ----- The UK therefore requires an A-deviation for 4.2.6 of this standard; this clause does ----- not require testing or lay down particulate measurements with maximum limits for ----- an appliance at low and intermediate output or under misuse conditions and ----- therefore compliance with UK legislation in respect of all possible continuously ----- operating conditions and outputs cannot be guaranteed for either domestic or ----- commercial /industrial boilers.

A.4 Deviation for Sweden -----
Clause 4.2.6 - Table 7
Basically this Standard is in conflict with the general provisions of the Swedish Ordinance for Pressure Equipments.
The allowable emission Sweden can accept class 3 with the following addition :
- for automatic stoking , the emission of CO must fulfil the requirements of BFS 1995:17 and BBR 94 Chapter 6:73. -----

A.5 Deviations for Switzerland
Clause 4.2.6 - Table 7 -----
The emission limits are regulated in the Swiss Ordinance on Air Pollution Control of 1985-12-16. Therefore for boilers with natural state wood only class 3 of Table 7 is acceptable.
The emission limits for boilers with fossil types of fuels are as follows:
- Heat input Q_N in kW ≤70 - CO in mg/m^3 at 7% Vol O_2 = 4000 - Dust = /
- Heat input Q_N in kW <70 Q_N ≤1000 - CO in mg/m^3 at 7% Vol O_2 = 1000 - Dust = 150mg/m^3

The use of coal, coal briquettes and coke with a sulfur content > 1% (mass) is not allowed

ANNEX C (NORMATIVE) - SPECIAL NATIONAL CONDITIONS

C.1. Special national conditions
National characteristics or practice that cannot be changed even over a long period, ----- e.g. climatic conditions. For the countries in which the relevant special national conditions apply these provisions are normative, for other countries they are informative.

C.2. Special national conditions for France -----
Clause 4.2.6 concerning emission limits is not applicable to the appliances referred to in the Scope of this standard which are placed on the market and/or put into service within the French Territory. This special national condition is applicable as from the date of publication of this standard, for a 5 year period.

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5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nominal heat input

Residential solid fuel burning appliances - Emission test methods
Annex A A.2 German particle test methods

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 24			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/13			-----
Power selection			5			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	64,7	32,3	32,4	-----
Test lenght		h	12,5	6,3	6,3	See 4.2.4
Mass of test fuel hourly	B	kg/h	5,2	5,2	5,2	See table 10
Remnants of combustion pre-test period		kg	-----			-----
Medium outlet pression		Pa	11,0	11,0	11,0	See 4.2.3
Room temperature	t_r	°C	22,7	22,6	22,7	15-30
Average temperature of the combustion products		°C	193,5	193,7	193,3	-----
		K	170,9	171,1	170,6	-----
Maximum temperature of the combustion products outlet appliance		°C	211,6	211,7	211,5	-----
Average temperature of the combustion products outlet appliance		°C	205,4	205,6	205,2	-----
		K	182,7	183,0	182,5	-----
Average content of O_2	O_2	%	9,3	9,3	9,3	-----
Average content of CO_2	CO_2	%	11,2	11,2	11,2	-----
Average content of CO	CO	ppm	115	116	115	-----
Average content of CO	CO	%	0,012	0,012	0,012	-----
Average content of CO to 10% O_2	CO	%	0,011	0,011	0,011	-----
Specific wet flue gas	G_w	Nm^3/kg	8,1	8,1	8,1	-----
Specif dry flue gas volume	G_D	Nm^3/kg	937,7	937,7	937,7	-----
Total hydrocarbon content (methane equivalents)	THC	mg	3	3,0	3,0	-----
Average content of OGC to 10% O2	OGC	mg/m^3	2,8	2,8	2,8	-----
Sampling period		min	30	30	30	15 (30)
Waste gas volume		l	270	270	270	135 (270)
Sampling system temperature		°C	70	70	70	70
Solids portion weight		mg	8	8	8	-----
Average content of DUSTS	DUSTS	mg/m^3	29	29	29	See 4.2.6
Average content of NO_2	NO_x	ppm	-----	-----	-----	-----
Conversion factor	f_{CO}		1,25			See 5.10.4
Conversion factor	f_{OGC}		1,64			See 5.10.4
Conversion factor	f_{NO2}		2,05			See 5.10.4
Average content of CO to 10% O_2	CO	mg/Nm^3	135	136	135	See 4.2.6
Average content of CO to 13% O_2	CO	mg/Nm^3	98	99	98	
Average content of CO to 0% O_2	CO	mg/MJ	60	60	60	
Average content of OGC to 10% O_2	OGC	mg/Nm^3	3	3	3	See 4.2.6
Average content of OGC to 13% O_2	OGC	mg/Nm^3	2	2	2	
Average content of OGC to 0% O_2	OGC	mg/MJ	1	1	1	
Average content of DUSTS to 10% O_2	DUSTS	mg/Nm^3	27	27	27	See 4.2.6
Average content of DUSTS to 13% O_2	DUSTS	mg/Nm^3	20	20	20	
Average content of DUSTS to 0% O_2	DUSTS	mg/MJ	12	12	12	
Average content of NO_2 to 10% O_2	NO_x	mg/Nm^3	-----	-----	-----	See 4.2.6
Average content of NO_2 to 13% O_2	NO_x	mg/Nm^3	-----	-----	-----	
Average content of NO_2 to 0% O_2	NO_x	mg/MJ	-----	-----	-----	
Boiler class (according to emission)			2			-----

Manufacturer **LAMINOX S.r.L.**

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A 4.6 Combustible heat losses in the residue
A.4.7 Nominal heat output
A.4.7 Efficency
A.4.7 Temperature of the combustion product

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 24			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/13			-----
Power selection			-----			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	64,7	32,3	32,4	-----
Test lenght		h	12,5	6,3	6,3	See 4.2.4
Mass of test fuel hourly	B	kg/h	5,2	5,2	5,2	See table 10
Room temperature	t_r	°C	22,7	22,6	22,7	15-30
Average temperature of the combustion products	ta	°C	193,5	193,7	193,3	
		K	170,9	171,1	170,6	
Carbon content of the residue	C_r	%		0,53	0,53	-----
Specific heat of the dry burnt gases	C_{pmd}	kJ/kgm3		1,36	1,36	-----
Specific heat of water vapour	C_{pmH2O}	kJ/kgm3		1,52	1,52	-----
Flue gas mass flow	m	g/s	13,942	13,947	13,937	-----
Leak of free heat	Qa	kJ/kg		1888,52	1883,15	-----
	qa	%		10,68	10,65	-----
Leak of latent heat	Qb	kJ/kg		10,85	10,77	-----
	qb	%		0,06	0,06	-----
Leak unburnt products	Qr	kJ/kg		176,90	176,90	-----
	qr	%		1	1	1
Heat input	P_{in}	kW	25,35	25,36	25,34	-----
Nominal heat output	P	kW	22,38	22,38	22,37	-----
Nominal heat output declared	P	kW	22,00			-----
Combustion efficiency	ŋ	%	88,28	88,26	88,29	-----
Combustion efficiency declared	ŋ	%	88,00			-----

5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nomina heat input

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Inlet water temperature	t_E	°C		61,4	61,4	-----
Outlet water temperature	t_{wA}	°C		78,2	78,2	-----
Average difference water temperature		°C		16,76	16,76	10-25
Average water temperature		°C		47,2	47,1	>40
Specific heat of water	c_{w2}	J/(kg K)		4,18	4,18	-----
Water flow rate	W_2	kg/h	935	935	935	-----
Loss a test bench	Q_V	kW	0			-----
Difference from the nominal heat output		%		0,0	0,0	-20 - +20
Difference from the nominal declared value		%		1,13	1,13	-8 - +8
Heat input	Q_B	kW	25,35			-----
Nominal heat output	P_u	kW	18,20	18,20	18,20	-----
Declared nominal heat output	P	kW	18,00			300
Efficency (indirect method)	ŋ	%	x			
Efficency (direct method)	ŋ	%	71,8			See 4.2.1
Boiler class (according to efficency)			2			-----
Boiler class			2			-----

IMQ primacontrol

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5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nominal heat input

Residential solid fuel burning appliances - Emission test methods
Annex A A.2 German particle test methods

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 24			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/16			-----
Power selection			1			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	20,1	10,0	10,1	-----
Test lenght		h	12,2	6,1	6,1	See 4.2.4
Mass of test fuel hourly	B	kg/h	1,6	1,6	1,6	See table 10
Remnants of combustion pre-test period		kg	-----			-----
Medium outlet pression		Pa	11,0	11,0	11,0	See 4.2.3
Room temperature	t_r	°C	23,7	23,8	23,6	15-30
Average temperature of the combustion products		°C	101,9	101,9	101,9	-----
		K	78,2	78,1	78,3	-----
Maximum temperature of the combustion products outlet appliance		°C	126,5	126,8	126,3	-----
Average temperature of the combustion products outlet appliance		°C	111,0	111,1	111,0	-----
		K	87,3	87,2	87,4	-----
Average content of O_2	O_2	%	13,8	13,8	13,9	-----
Average content of CO_2	CO_2	%	6,6	6,6	6,6	-----
Average content of CO	CO	ppm	707	698	715	-----
Average content of CO	CO	%	0,071	0,070	0,072	-----
Average content of CO to 10% O_2	CO	%	0,109	0,107	0,110	-----
Specific wet flue gas	G_w	Nm^3/kg	13,2	13,2	13,2	-----
Specif dry flue gas volume	G_D	Nm^3/kg	553,46	555,0	551,9	-----
Total hydrocarbon content (methane equivalents)	THC	mg	30,4	30,4	30,4	-----
Average content of OGC to 10% O2	OGC	mg/Nm^3	46,6	46,5	46,7	-----
Sampling period		min	-----	-----	-----	15 (30)
Waste gas volume		l	-----	-----	-----	135 (270)
Sampling system temperature		°C	-----	-----	-----	70
Solids portion weight		mg	-----	-----	-----	-----
Average content of DUSTS	DUSTS	mg/m^3	-----	-----	-----	See 4.2.6
Average content of NO_2	NO_2	ppm	-----	-----	-----	-----
Conversion factor	f_{CO}		1,25			See 5.10.4
Conversion factor	f_{OGC}		1,64			See 5.10.4
Conversion factor	f_{NO2}		2,05			See 5.10.4
Average content of CO to 10% O_2	CO	mg/Nm^3	1356	1336	1375	See 4.2.6
Average content of CO to 13% O_2	CO	mg/Nm^3	986	972	1000	
Average content of CO to 0% O_2	CO	mg/MJ	603	594	611	
Average content of OGC to 10% O_2	OGC	mg/Nm^3	47	47	47	See 4.2.6
Average content of OGC to 13% O_2	OGC	mg/Nm^3	34	34	34	
Average content of OGC to 0% O_2	OGC	mg/MJ	21	21	21	
Average content of DUSTS to 10% O_2	DUSTS	mg/Nm^3	-----	-----	-----	See 4.2.6
Average content of DUSTS to 13% O_3	DUSTS	mg/Nm^3	-----	-----	-----	
Average content of DUSTS to 0% O_3	DUSTS	mg/MJ	-----	-----	-----	
Average content of NO_2 to 10% O_2	NO_x	mg/Nm^3	-----	-----	-----	See 4.2.6
Average content of NO_2 to 13% O_2	NO_x	mg/Nm^3	-----	-----	-----	
Average content of NO_2 to 0% O_2	NO_x	mg/MJ	-----	-----	-----	
Boiler class (according to emission)			2			-----

Manufacturer **LAMINOX S.r.L.**
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A 4.6 Combustible heat losses in the residue
A.4.7 Nominal heat output
A.4.7 Efficency
A.4.7 Temperature of the combustion product

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 24			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/16			-----
Power selection			1			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	20,1	10,0	10,1	-----
Test lenght		h	12,2	6,1	6,1	See 4.2.4
Mass of test fuel hourly	B	kg/h	1,6	1,6	1,6	See table 10
Room temperature	t_r	°C	23,7	23,8	23,6	15-30
Average temperature of the combustion products	ta	°C	101,9	101,9	101,9	
		K	78,2	78,1	78,3	
Carbon content of the residue	C_r	%		0,53	0,53	-----
Specific heat of the dry burnt gases	C_{pmd}	kJ/kgm3		1,33	1,33	-----
Specific heat of water vapour	C_{pmH2O}	kJ/kgm3		1,51	1,51	-----
Flue gas mass flow	m	g/s	7,601	7,573	7,629	-----
Leak of free heat	Qa	kJ/kg		1373,34	1383,51	-----
	qa	%		7,76	7,82	-----
Leak of latent heat	Qb	kJ/kg		110,45	113,87	-----
	qb	%		0,62	0,64	-----
Leak unburnt products	Qr	kJ/kg		176,90	176,90	-----
	qr	%		1	1	1
Heat input	P_{in}	kW	8,08	8,08	8,09	-----
Nominal heat output	P	kW	7,32	7,32	7,33	-----
Nominal heat output declared	P	kW	7,00			-----
Combustion efficiency	ŋ	%	90,57	90,61	90,54	-----
Combustion efficiency declared	ŋ	%	90,50			-----

5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nomina heat input

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Inlet water temperature	t_E	°C		61,1	61,2	-----
Outlet water temperature	t_{wA}	°C		75,1	75,0	-----
Average difference water temperature		°C		14,00	13,84	10-25
Average water temperature		°C		44,3	44,5	>40
Specific heat of water	c_{w2}	J/(kg K)		4,18	4,18	-----
Water flow rate	W_2	kg/h	337	337	337	-----
Loss a test bench	Q_V	kW	0			-----
Difference from the nominal heat output		%		0,0	0,0	-20 - +20
Difference from the nominal declared value		%		1,45	0,29	-8 - +8
Heat input	Q_B	kW	8,08			-----
Nominal heat output	P_u	kW	5,45	5,48	5,42	-----
Declared nominal heat output	P	kW	5,40			300
Efficency (indirect method)	ŋ	%	x			
Efficency (direct method)	ŋ	%	67,37			See 4.2.1
Boiler class (according to efficency)			2			-----
Boiler class			2			-----

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✓ =Carried out ----- = Not applicable x = Not done

5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nominal heat input

Residential solid fuel burning appliances - Emission test methods
Annex A A.2 German particle test methods

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 18			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/23			-----
Power selection			5			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	47,8	23,2	24,6	-----
Test lenght		h	12,5	6,1	6,4	See 4.2.4
Mass of test fuel hourly	B	kg/h	3,8	3,8	3,8	See table 10
Remnants of combustion pre-test period		kg	-----			-----
Medium outlet pression		Pa	11,0	11,0	11,0	See 4.2.3
Room temperature	t_r	°C	22,0	22,2	21,7	15-30
Average temperature of the combustion products		°C	154,4	153,5	155,2	-----
		K	132,4	131,3	133,5	-----
Maximum temperature of the combustion products outlet appliance		°C	173,0	173,5	172,6	-----
Average temperature of the combustion products outlet appliance		°C	166,9	166,0	167,7	-----
		K	144,9	143,8	146,0	-----
Average content of O_2	O_2	%	6,5	6,5	6,4	-----
Average content of CO_2	CO_2	%	14,1	14,1	14,1	-----
Average content of CO	CO	ppm	135	129	141	-----
Average content of CO	CO	%	0,014	0,013	0,014	-----
Average content of CO to 10% O_2	CO	%	0,010	0,010	0,011	-----
Specific wet flue gas	G_w	Nm^3/kg	6,6	6,6	6,5	-----
Specif dry flue gas volume	G_D	Nm^3/kg	1176,3	1173,7	1178,8	-----
Total hydrocarbon content (methane equivalents)	THC	mg	2	2,0	2,0	-----
Average content of OGC to 10% O2	OGC	mg/Nm^3	1,5	1,5	1,5	-----
Sampling period		min	30	30	30	15 (30)
Waste gas volume		l	270	270	270	135 (270)
Sampling system temperature		°C	70	70	70	70
Solids portion weight		mg	7	7	7	-----
Average content of DUSTS	DUSTS	mg/m^3	27	27	27	See 4.2.6
Average content of NO_2	NO_x	ppm	-----	-----	-----	-----
Conversion factor	f_{CO}		1,25			See 5.10.4
Conversion factor	f_{OGC}		1,64			See 5.10.4
Conversion factor	f_{NO2}		2,05			See 5.10.4
Average content of CO to 10% O_2	CO	mg/Nm^3	128	122	133	See 4.2.6
Average content of CO to 13% O_2	CO	mg/Nm^3	93	89	97	
Average content of CO to 0% O_2	CO	mg/MJ	57	54	59	
Average content of OGC to 10% O_2	OGC	mg/Nm^3	1	1	1	See 4.2.6
Average content of OGC to 13% O_2	OGC	mg/Nm^3	1	1	1	
Average content of OGC to 0% O_2	OGC	mg/MJ	1	1	1	
Average content of DUSTS to 10% O_2	DUSTS	mg/Nm^3	20	20	20	See 4.2.6
Average content of DUSTS to 13% O_2	DUSTS	mg/Nm^3	15	15	15	
Average content of DUSTS to 0% O_2	DUSTS	mg/MJ	9	9	9	
Average content of NO_2 to 10% O_2	NO_x	mg/Nm^3	-----	-----	-----	See 4.2.6
Average content of NO_2 to 13% O_2	NO_x	mg/Nm^3	-----	-----	-----	
Average content of NO_2 to 0% O_2	NO_x	mg/MJ	-----	-----	-----	
Boiler class (according to emission)			3			-----

Manufacturer **LAMINOX S.r.L.**

Type **HIDRA 24; HIDRA 18** Date 2010/02/02

Test report N° **CS-09-095** Technician Dino Grotto

✓ =Carried out ----- = Not applicable x = Not done

A 4.6 Combustible heat losses in the residue
A.4.7 Nominal heat output
A.4.7 Efficency
A.4.7 Temperature of the combustion product

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 18			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/23			-----
Power selection			5			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	47,8	23,2	24,6	-----
Test lenght		h	12,5	6,1	6,4	See 4.2.4
Mass of test fuel hourly	B	kg/h	3,8	3,8	3,8	See table 10
Room temperature	t_r	°C	22,0	22,2	21,7	15-30
Average temperature of the combustion products	ta	°C	154,4	153,5	155,2	
		K	132,4	131,3	133,5	
Carbon content of the residue	C_r	%		0,53	0,53	-----
Specific heat of the dry burnt gases	C_{pmd}	kJ/kgm3		1,37	1,37	-----
Specific heat of water vapour	C_{pmH2O}	kJ/kgm3		1,51	1,51	-----
Flue gas mass flow	m	g/s	8,288	8,295	8,281	-----
Leak of free heat	Qa	kJ/kg		1187,93	1203,97	-----
	qa	%		6,72	6,81	-----
Leak of latent heat	Qb	kJ/kg		9,66	10,51	-----
	qb	%		0,05	0,06	-----
Leak unburnt products	Qr	kJ/kg		176,90	176,90	-----
	qr	%		1	1	1
Heat input	P_{in}	kW	18,76	18,74	18,79	-----
Nominal heat output	P	kW	17,30	17,28	17,31	-----
Nominal heat output declared	P	kW	17,00			-----
Combustion efficiency	ŋ	%	92,18	92,23	92,13	-----
Combustion efficiency declared	ŋ	%	92,00			-----

5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nomina heat input

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Inlet water temperature	t_E	°C		61,2	61,2	-----
Outlet water temperature	t_{wA}	°C		77,1	77,2	-----
Average difference water temperature		°C		15,96	15,98	10-25
Average water temperature		°C		46,9	47,5	>40
Specific heat of water	c_{w2}	J/(kg K)		4,18	4,18	-----
Water flow rate	W_2	kg/h	768	767	768	-----
Loss a test bench	Q_V	kW	0			-----
Difference from the nominal heat output		%		0,0	0,0	-20 - +20
Difference from the nominal declared value		%		1,59	1,82	-8 - +8
Heat input	Q_B	kW	18,76			-----
Nominal heat output	P_u	kW	14,24	14,22	14,25	-----
Declared nominal heat output	P	kW	14,00			300
Efficency (indirect method)	ŋ	%	x			
Efficency (direct method)	ŋ	%	75,9			See 4.2.1
Boiler class (according to efficency)			3			-----
Boiler class			3			-----

IMQ primacontrol

Manufacturer **LAMINOX S.r.L.**

Type **HIDRA 24; HIDRA 18** Date 2010/02/02

Test report N° **CS-09-095** Technician Dino Grotto

✓ =Carried out ----- = Not applicable x = Not done

5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nominal heat input

Residential solid fuel burning appliances - Emission test methods
Annex A A.2 German particle test methods

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 18			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/24			-----
Power selection			1			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	15,1	7,4	7,7	-----
Test lenght		h	12,3	6,0	6,3	See 4.2.4
Mass of test fuel hourly	B	kg/h	1,2	1,2	1,2	See table 10
Remnants of combustion pre-test period		kg	-----			-----
Medium outlet pression		Pa	11,0	11,0	11,0	See 4.2.3
Room temperature	t_r	°C	23,6	23,6	23,5	15-30
Average temperature of the combustion products		°C	80,4	80,5	80,3	-----
		K	56,8	56,9	56,8	-----
Maximum temperature of the combustion products outlet appliance		°C	109,4	109,4	109,4	-----
Average temperature of the combustion products outlet appliance		°C	89,2	89,3	89,1	-----
		K	65,6	65,7	65,5	-----
Average content of O_2	O_2	%	13,3	13,3	13,3	-----
Average content of CO_2	CO_2	%	7,1	7,1	7,1	-----
Average content of CO	CO	ppm	184	184	184	-----
Average content of CO	CO	%	0,018	0,018	0,018	-----
Average content of CO to 10% O_2	CO	%	0,026	0,026	0,026	-----
Specific wet flue gas	G_w	Nm^3/kg	12,4	12,4	12,4	-----
Specif dry flue gas volume	G_D	Nm^3/kg	590,77	589,9	591,6	-----
Total hydrocarbon content (methane equivalents)	THC	mg	27,4	27,4	27,4	-----
Average content of OGC to 10% O2	OGC	mg/Nm^3	39,3	39,4	39,2	-----
Sampling period		min	-----	-----	-----	15 (30)
Waste gas volume		l	-----	-----	-----	135 (270)
Sampling system temperature		°C	-----	-----	-----	70
Solids portion weight		mg	-----	-----	-----	-----
Average content of DUSTS	DUSTS	mg/m^3	-----	-----	-----	See 4.2.6
Average content of NO_2	NO_2	ppm	-----	-----	-----	-----
Conversion factor	f_{CO}		1,25			See 5.10.4
Conversion factor	f_{OGC}		1,64			See 5.10.4
Conversion factor	f_{NO2}		2,05			See 5.10.4
Average content of CO to 10% O_2	CO	mg/Nm^3	329	330	329	See 4.2.6
Average content of CO to 13% O_2	CO	mg/Nm^3	240	240	239	
Average content of CO to 0% O_2	CO	mg/MJ	146	147	146	
Average content of OGC to 10% O_2	OGC	mg/m^3	39	39	39	See 4.2.6
Average content of OGC to 13% O_2	OGC	mg/Nm^3	29	29	28	
Average content of OGC to 0% O_2	OGC	mg/MJ	17	18	17	
Average content of DUSTS to 10% O_2	DUSTS	mg/Nm^3	-----	-----	-----	See 4.2.6
Average content of DUSTS to 13% O_3	DUSTS	mg/Nm^3	-----	-----	-----	
Average content of DUSTS to 0% O_3	DUSTS	mg/MJ	-----	-----	-----	
Average content of NO_2 to 10% O_2	NO_x	mg/Nm^3	-----	-----	-----	See 4.2.6
Average content of NO_2 to 13% O_2	NO_x	mg/Nm^3	-----	-----	-----	
Average content of NO_2 to 0% O_2	NO_x	mg/MJ	-----	-----	-----	
Boiler class (according to emission)			3			-----

Manufacturer **LAMINOX S.r.L.**
Type **HIDRA 24; HIDRA 18** Date 2010/02/02
Test report N° **CS-09-095** Technician Dino Grotto

✓ =Carried out ----- = Not applicable x = Not done

A 4.6 Combustible heat losses in the residue
A.4.7 Nominal heat output
A.4.7 Efficency
A.4.7 Temperature of the combustion product

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Model			HIDRA 18			-----
Fuel type			Wood pellet			-----
Date of test			2009/11/24			-----
Power selection			1			-----
Primary air			-----			-----
Secondary air			-----			-----
Bottomgrate position			-----			-----
Number of fuel charges		n°	2	1	1	2
Total charged fuel		kg	15,1	7,4	7,7	-----
Test lenght		h	12,3	6,0	6,3	See 4.2.4
Mass of test fuel hourly	B	kg/h	1,2	1,2	1,2	See table 10
Room temperature	t_r	°C	23,6	23,6	23,5	15-30
Average temperature of the combustion products	ta	°C	80,4	80,5	80,3	
		K	56,8	56,9	56,8	
Carbon content of the residue	C_r	%		0,53	0,53	-----
Specific heat of the dry burnt gases	C_{pmd}	kJ/kgm3		1,33	1,33	-----
Specific heat of water vapour	C_{pmH2O}	kJ/kgm3		1,50	1,50	-----
Flue gas mass flow	m	g/s	5,341	5,389	5,293	-----
Leak of free heat	Qa	kJ/kg		944,59	939,62	-----
	qa	%		5,34	5,31	-----
Leak of latent heat	Qb	kJ/kg		27,35	27,39	-----
	qb	%		0,15	0,15	-----
Leak unburnt products	Qr	kJ/kg		176,90	176,90	-----
	qr	%		1	1	1
Heat input	P_{in}	kW	6,01	6,06	5,97	-----
Nominal heat output	P	kW	5,62	5,67	5,58	-----
Nominal heat output declared	P	kW	5,50			-----
Combustion efficiency	ŋ	%	93,52	93,51	93,53	-----
Combustion efficiency declared	ŋ	%	93,50			-----

5.8 Determination of the heat output and the efficiency of the boiler
5.8.1 Method for the measurement of the heat output
5.8.2 Determining the nominal heat input
5.8.4 Determination of the boiler efficiency
5.9 Determination of the emission values
5.9.1 Determination of the emission at nomina heat input

Definition	Notation	Unit	Mean value	I combustion period	II combustion period	Allowed (EN standard)
Inlet water temperature	t_E	°C		60,5	60,5	-----
Outlet water temperature	t_{wA}	°C		76,7	76,7	-----
Average difference water temperature		°C		16,19	16,21	10-25
Average water temperature		°C		45,0	45,1	>40
Specific heat of water	c_{w2}	J/(kg K)		4,18	4,18	-----
Water flow rate	W_2	kg/h	227	227	227	-----
Loss a test bench	Q_V	kW	0			-----
Difference from the nominal heat output		%		0,0	0,0	-20 - +20
Difference from the nominal declared value		%		1,45	1,55	-8 - +8
Heat input	Q_B	kW	6,01			-----
Nominal heat output	P_u	kW	4,26	4,26	4,26	-----
Declared nominal heat output	P	kW	4,20			300
Efficency (indirect method)	ŋ	%	x			
Efficency (direct method)	ŋ	%	70,89			See 4.2.1
Boiler class (according to efficency)			3			-----
Boiler class			3			-----

Manufacturer **LAMINOX S.r.L.**
Type **HIDRA 24; HIDRA 18** Date 2010/02/02
Test report N° **CS-09-095** Technician Dino Grotto

✓ =Carried out ----- = Not applicable x = Not done

5.13 Function check of the temperature controller and safety temperature limiter

Definition	Notation	Unit				
Model			HIDRA 24	HIDRA 18	-----	Allowed (EN standard)
Testing fuel			Wood pellet	Wood pellet	-----	-----
Date of test			2009/11/18	26/112009	-----	-----
Room temperature	t_r	°C	23,0	22,7	-----	-----
Outlet water temp.at the beginning of the test	t_{wA}	°C	61,0	60,0	-----	<=75
Primary air		cm^2	-----	-----	-----	-----
Secondary air		cm^2	-----	-----	-----	-----
Bottomgrate position			-----	-----	-----	-----
Mass of test fuel hourly	B	kg/h	-----	-----	-----	See table 10
Medium outlet pression		Pa	-----	-----	-----	See 4.2.3
Water flow rate		kg/h	-----	-----	-----	
Nominal heat output	P_u	kW	-----	-----	-----	-----
Minimum dissepated output heat allowed		kW	-----	-----	-----	0,35 x Pu
Maximum dissepated output heat allowed		kW	-----	-----	-----	0,45 x Pu
Dissipated output heat		kW	x	x	-----	See 5.13
Temperature on the monitor temperature (temp. controller is operating normally)		°C	85,0	85,0	-----	<=100
Temperature on the monitor temperature (temp. controller out of function)		°C	88,0	88,6	-----	<=110

5.14 Function test on the device for dissipating excess heat

Definition	Notation	Unit				
Model			-----	-----	-----	Allowed (EN standard)
Testing fuel			-----	-----	-----	-----
Date of test			-----	-----	-----	-----
Room temperature	t_r	°C	-----	-----	-----	-----
Primary air		cm^2	-----	-----	-----	-----
Secondary air		cm^2	-----	-----	-----	-----
Bottomgrate position			-----	-----	-----	-----
Mass of test fuel hourly	B	kg/h	-----	-----	-----	See table 10
Medium outlet pression		Pa	-----	-----	-----	See 6.4
Nominal heat output	P_u	kW	-----	-----	-----	-----
Dissipating water temperature		°C	-----	-----	-----	10 - 15
Dissipating water pressure		bar	-----	-----	-----	2
Maximum boiler water temperature		°C	-----	-----	-----	< 110

Manufacturer **LAMINOX S.r.L.**
Type **HIDRA 24; HIDRA 18** Date 2010/02/02
Test report N° **CS-09-095** Technician Dino Grotto

✓ =Carried out ----- = Not applicable x = Not done

5.11 Determination of the waterside resistance

Definition	Notation	Unit				
Model			HIDRA 24	HIDRA 18	-----	Allowed (EN standard)
Date of test			2009/11/26	2009/11/25	-----	-----
Room temperature	t_r	°C	21,7	22,5	-----	-----
Water flow rate for Δt=10 K	W_1	kg/h	1566	1225	-----	-----
Water side resistance for W_1		mbar	340	218	-----	See 4.1.5.9
Water flow rate for Δt=20 K	W_2	kg/h	783	612	-----	-----
Water side resistance for W_3		mbar	105	76	-----	See 4.1.5.9

5.12 Surface temperature

Definition	Notation	Unit				
Model			HIDRA 24	-----	-----	Allowed (EN standard)
Testing fuel			Wood pellet	-----	-----	-----
Date of test			2099/11/18	-----	-----	-----
Primary air		cm^2	-----	-----	-----	-----
Secondary air		cm^2	-----	-----	-----	-----
Bottomgrate position		cm^2	-----	-----	-----	-----
Mass of test fuel hourly	B	kg/h	5,16	-----	-----	See table 10
Medium inlet pression		Pa	11,0	-----	-----	See 6.4
Room temperature	t_r	°C	22,5	-----	-----	15-30
Nominal heat output	P_u	kW	18,20	-----	-----	-----
The boiler is to be installed on a non combustible base			No	-----	-----	-----
Surface			Top	-----	-----	-----
I point surface temperature		°C	43,0	-----	-----	-----
II point surface temperature		°C	39,0	-----	-----	-----
III point surface temperature		°C	38,6	-----	-----	-----
IV point surface temperature		°C	38,6	-----	-----	-----
V point surface temperature		°C	37,5	-----	-----	-----
Mean surface temperature		K	16,8	-----	-----	< 65
Surface			Front	-----	-----	-----
I point surface temperature		°C	67,2	-----	-----	-----
II point surface temperature		°C	65,2	-----	-----	-----
III point surface temperature		°C	64,4	-----	-----	-----
IV point surface temperature		°C	62,6	-----	-----	-----
V point surface temperature		°C	62,0	-----	-----	-----
Mean surface temperature		K	41,8	-----	-----	< 100
Surface			Left	-----	-----	-----
I point surface temperature		°C	49,0	-----	-----	-----
II point surface temperature		°C	46,2	-----	-----	-----
III point surface temperature		°C	45,9	-----	-----	-----
IV point surface temperature		°C	45,0	-----	-----	-----
V point surface temperature		°C	43,1	-----	-----	-----
Mean surface temperature		K	23,3	-----	-----	< 100
Critical surface					-----	
- Cleaning port covers - plastic		K	29	-----	-----	<100
- Display - plastics		K	15	-----	-----	See 4.2.7
- Storage container door - plastic		K	14	-----	-----	See 4.2.7
- -----		K	-----	-----	-----	See 4.2.7
- -----		K	-----	-----	-----	See 4.2.7

IMQ primacontrol

Manufacturer **LAMINOX S.r.L.**
Type **HIDRA 24; HIDRA 18** Date 2010/02/02
Test report N° **CS-09-095** Technician Dino Grotto

✓ =Carried out ----- = Not applicable

Type test: Nominal heat results

Model	✓ = teste ----- = not tested	Water heat declared - kW	Water heat output (*) - kW	Ratio betweenn water heat declared of the preceding tested model	Mass of test fuel hourly - kg/h	Nominal heat input - kW	Water efficiency - %	Combustion efficiency declared - %	Combustion efficiency - %	Average temp. of the combustion products - °C	Average content of CO to 10% O2 - mg/Nm³	Average content of OGC to 10% O2 - mg/Nm³	Average content of DUSTS to 10% O2 - mg/Nm³	Average content of NO_x	Boiler class
HIDRA 24	✓	18,0	18,2	-----	5,2	25,35	71,82	88,0	88,3	205	135	3	27	-----	2
HIDRA 18	✓	14,0	14,2	0,8	3,8	18,76	75,88	92,0	92,2	167	128	1	20	-----	3
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Linear interpolation results for not-tested type: Nominal heat results

Model	✓ = teste - = not tested	Water heat declared - kW	Water heat output (*) - kW	Ratio betweenn water heat declared of the preceding tested model	Mass of test fuel hourly - kg/h	Nominal heat input - kW	Water efficiency - %	Combustion efficiency declared - %	Combustion efficiency - %	Average temp. of the combustion products - °C	Average content of CO to 10% O2 - mg/Nm³	Average content of OGC to 10% O2 - mg/Nm³	Average content of DUSTS to 10% O2 - mg/Nm³	Average content of NO_x	Boiler class
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

(*) For the models not tested, the nominal heat output is the value declared from the manufacturer, according to the standard

The results of not-tested boilers are determinated by linear interpolation based on the nomial heat output between the smallest and the largest boiler of the model inside the ratio that not exceed the value of 2, according to the standard
For some models the ratio of the nominal heat output is more than 2 : 1. In according to the analogy of the construction, function and design, the variance of this values have not been considered important.

IMQ primacontrol

Manufacturer	**LAMINOX S.r.L.**		
Type	**HIDRA 24; HIDRA 18**	Date	2010/02/02
Test report N°	**CS-09-095**	Technician	Dino Grotto

✓ =Carried out ----- = Not applicable

Type test: Reduced heat results

Model ✓ = teste ----- = not tested		Water heat declared - kW	Water heat output (*) - kW	Ratio betweenn water heat declared of the preceding tested model	Mass of test fuel hourly - kg/h	Nominal heat input - kW	Water efficiency - %	Combustion efficiency declared - %	Combustion efficiency - %	Average temp. of the combustion products - °C	Average content of CO to 10% O2 - mg/Nm³	Average content of OGC to 10% O2 - mg/Nm³	Average content of DUSTS to 10% O2 - mg/Nm³	Average content of NO_x	Boiler class
HIDRA 24	✓	5,4	5,4	-----	1,6	8,08	67,37	90,5	90,6	111	1356	47	-----	-----	2
HIDRA 18	✓	4,2	4,3	0,8	1,2	6,01	70,89	93,5	93,5	89	329	39	-----	-----	3
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Linear interpolation results for not-tested type: Reduced heat results

Model ✓ = teste - = not tested		Water heat declared - kW	Water heat output (*) - kW	Ratio betweenn water heat declared of the preceding tested model	Mass of test fuel hourly - kg/h	Nominal heat input - kW	Water efficiency - %	Combustion efficiency declared - %	Combustion efficiency - %	Average temp. of the combustion products - °C	Average content of CO to 10% O2 - mg/Nm³	Average content of OGC to 10% O2 - mg/Nm³	Average content of DUSTS to 10% O2 - mg/Nm³	Average content of NO_x	Boiler class
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(*) For the models not tested, the nominal heat output is the value declared from the manufacturer, according to the standard

The results of not-tested boilers are determinated by linear interpolation based on the nomial heat output between the smallest and the largest boiler of the model inside the ratio that not exceed the value of 2, according to the standard
For some models the ratio of the nominal heat output is more than 2 : 1. In according to the analogy of the construction, function and design, the variance of this values have not been considered important.

IMQ primacontrol

Richiedente
Applicant **LAMINOX S.r.L.**
Modello
Model **HIDRA 24; HIDRA 18**

Test report n° **CS-09-095**

Enclosure n° **1**

LISTA DEGLI STRUMENTI E DELLE ATTREZZATURE UTILIZZATI PER LE PROVE
List of instruments and equipments used for the tests

Codice *Code*	**Descrizione** *Description*	**Campo di taratura** *Calibration field*	
Strumenti Instruments			
02.09	**Analizzatore automatico di idrocarburi** *Automatic hydrocarbons analyzer*	0 - 1000	mg/m3
02.10	**Campionatore digitale a portata costante** *Digital constant sampler*	3 - 20	l/min
02.11	**Analizzatore combustione (CO) ABB** *Combustion analyzer (CO) ABB*	100 - 20000	ppm
02.11	**Analizzatore combustione (CO_2) ABB** *Combustion analyzer (CO_2) ABB*	0,5 - 19	%
02.11	**Analizzatore combustione (O_2) ABB** *Combustion analyzer (O_2) ABB*	5 - 20	%
04.04	**Bilancia 1500 kg** *Balance 1500 kg*	55000 - 700000	g
04.05	**Bilancia 65 g** *Balance 65 g*	35 - 140	mg
04.05	**Bilancia 65 g** *Balance 65 g*	2 - 35	mg
05.04.10	**Sonda a contatto a gomito** *Contact elbow probe*	15 - 150	°C
06.10	**Acquisitore pressione e velocità TESTO 400 …..** *Pressure and air speed recorder TESTO 400 …..*	----	
06.10.01	**….. con sonda manometrica** ….. with *manometric probe*	0 - 1	mbar
06.10.02	**….. con sonda anemometrica** ….. with *anemometric probe*	0,1 - 0,5	m/s
06.10.02	**….. con sonda anemometrica** ….. with *anemometric probe*	0,5 - 1,0	m/s
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	1 - 5	V
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	5 - 50	V
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	50 - 600	V
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	0,2 - 5	A
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	5 - 50	A
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	50 - 100	A
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	45 - 230	W
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	230 - 4600	W
14.01.01	**Multimetro VIP SYSTEM** *Multimeter VIP SYSTEM*	4600 - 16000	W
001-100	**Termocoppie tipo J 220°C** *Type J thermocouples 220°C*	0 - 220	°C
111-130	**Termocoppie tipo J 500°C** *Type J thermocouples 500°C*	0 - 500	°C
AMB01	**Termocoppia tipo J ambiente combustibili solidi** *Solid fuel ambient type J thermocouple*	15 - 25	°C
L1	**Triedro combustibili solidi** *Solid fuel test corner*	25 - 90	°C
L1FB29	**Modulo acquisizione temperature triedro comb. solidi** *Temperature recorder solid fuel test corner*	0 - 500	°C

Caratteristiche pellet
Pellet features

Contenuto di carbonio nel combustibile di prova [C] *Carbon in test fuel [C]*	

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Codice *Code*	**Descrizione** *Description*	**Campo di taratura** *Calibration field*
Quantità d'acqua presente nel combustibile di prova [W] *Water in test fuel [W]*		
Quantità di idrogeno presente nel combustibile di prova [H] *Hydrogen in test fuel [H]*		
Potere calorifico del combustibile di prova secco [H_i] *Dry net calorific value in test fuel [H_u]*		
Quantità di carbonio nelle ceneri [C_r] *Carbon in the ashes [C_r]*		

Composizione strumenti
Instruments composition

	Campo di misura *Measuring field*
Temperature con sonda a contatto *Temperature with contact probe*	
Temperatura ambiente combustibili solidi *Solid fuel ambient temperature*	
Temperature componenti combustibili solidi *Solid fuel components temperature*	
Temperature triedro di prova combustibili solidi *Solid fuel test corner temperature*	
Analisi combustione apparecchi a combustibile solido (CO%) *Combustion analyze solid fuel appliences (CO%)*	(0-0,1)%
Analisi combustione apparecchi a combustibile solido (CO%) *Combustion analyze solid fuel appliences (CO%)*	(0,1-0,4)%
Analisi combustione apparecchi a combustibile solido (CO%) *Combustion analyze solid fuel appliences (CO%)*	(0,4-1,3)%
Analisi combustione apparecchi a combustibile solido (CO%) *Combustion analyze solid fuel appliences (CO%)*	(1,3-3,0)%
Potenza combustibili solidi *Input rate solid fuels*	(0-7) kW
Potenza combustibili solidi *Input rate solid fuels*	(7-15) kW
Rendimento combustibili solidi (legna) *Efficiency of solid fuel (wood) appliances*	(50-60) %
Rendimento combustibili solidi (legna) *Efficiency of solid fuel (wood) appliances*	(60-90) %

Attrezzature
Equipments

A.02.01.01	**Camino prove combustibili solidi Ø 100 mm** *Solid fuel test chimney Φ 100 mm*
A.02.01.03	**Curva per adattatore Ø 100 mm** *Curve for adapter Φ 100 mm*
A.02.05.01	**Adattatore Ø 80 mm** *Adapter Φ 80 mm*
A.03.05.01	**Sonda prelievo temperatura gas di scarico** *Temperature probe for combustion gas*
A.03.05.02	**Sonda prelievo temperatura rendimento** *Temperature probe for efficiency*
A.03.05.03	**Sonda prelievo gas combusti** *Combustion product sampling probe*
A.03.05.04	**Sonda prelievo depressione al camino** *Pressure sampling probe*
A.08.02	**Cilindro sonda ambiente con termocoppia cod. AMB.02** *Ambient probe cylinder with thermocouple cod. AMB.02*
A.35.03	**Banco stufe** *Stove bench*

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Modello
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INCERTEZZE DI MISURA
Measurement uncertainties

Parameter	Range	Relative uncertainty (*)
Voltage	< 1000 V (50/60 Hz)	1,5 %
	≥ 1000 V (50/60 Hz)	3 %
Current	< 5 A (50/60 Hz)	1,5 %
	≥ 5 A (50/60 Hz)	2,5 %
Leakage current	< 30 mA (50/60 Hz)	3,5 %
	≥ 30 mA (50/60 Hz)	5 %
Power	< 1 W (50/60 Hz)	20 mW (expanded)
	1 W ÷ 3 kW	3 %
	≥ 3 kW	5 %
Power Factor	0 ± 1 (50/60 Hz)	0,05 %
Frequency	50/60 Hz	0,2 %
Resistance	1 mΩ ÷ 100 mΩ and ≥ 1 MΩ	5 %
	≥ 1 TΩ	10 %
	for all other cases	3 %
Temperature	< 100 °C	2° C (expanded)
	100 °C ÷ 500 °C	3 %
Time	≥ 1 s	1 %
Linear dimensions	< 1 mm	0,05 mm (expanded)
	1 mm ÷ 25 mm	0,1 mm (expanded)
	≥ 25 mm	0,5 %
Mass	10 g ÷ 100 g	1 %
	100 g ÷ 5 kg	2 %
	≥ 5 kg	5 %
Force	for all values	6 %
Mechanical energy	for all values	10 %
Torque	for all values	10 %
Angle	0 ° ÷ 30 °	0,5 ° (expanded)
Relative humidity	30 % ÷ 99 % RH	6 %
Barometric air pressure	for all values	0,01 MPa (expanded)
Gas & fluid pressure	for static measurement	5 %
Temperature for gas efficiency	---	0,1 °C (expanded)
Ignition delay time	---	1,7 s (expanded)
Gas burner efficiency	0 % ÷ 95 %	1 % (expanded)
Gas boiler efficiency	0 % ÷ 96 %	1,8 % (expanded)
Solid fuel efficiency (wood)	50 % ÷ 90 %	1,5 % (expanded)
Solid fuel efficiency (lignite)	50 % ÷ 90 %	2,5 % (expanded)
Gas heat input	< 1 kW	0,02 kW (expanded)
	1 kW ÷ 3 kW	0,04 kW (expanded)
	3 kW ÷ 5 kW	0,06 kW (expanded)
	5 kW ÷ 10 kW	0,1 kW (expanded)
	10 kW ÷ 30 kW	0,4 kW (expanded)
	30 kW ÷ 50 kW	0,6 kW (expanded)
	50 kW ÷ 70 kW	0,8 kW (expanded)
Solid fuel heat input	< 7 kW	0,3 kW (expanded)
	7 kW ÷ 15 kW	1,5 kW (expanded)
Gas combustion (CO)	0 % ÷ 0,15 %	0,02 % (expanded)
Solid fuel combustion (CO)	< 0,1 %	0,02 % (expanded)
	0,1 % ÷ 0,4 %	0,04 % (expanded)
	0,4 % ÷ 1,3 %	0,06 % (expanded)
	1,3 % ÷ 3 %	0,15 % (expanded)
Specific load EN 625	0 l/min ÷ 18 l/min	0,3 l/min (expanded)

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INCERTEZZE DI MISURA
Measurement uncertainties

Parameter	Range	Relative uncertainty (*)
Mass flow rate of the flue gas	< 10 g/s	0,6 g/s (expanded)
	10 g/s ÷ 20 g/s	1,1 g/s (expanded)
Leakage of gas circuit	< 15 cm^3/h	1 cm^3/h (expanded)
	15 cm^3/h ÷ 70 cm^3/h	5 cm^3/h (expanded)
	70 cm^3/h ÷ 140 cm^3/h	10 cm^3/h (expanded)
Gas calorific value	---	1 %
Gas density	---	0,5 %

(*)
Le incertezze di misura dichiarate in questo documento sono espresse come due volte l'incertezza composta (corrispondente, nel caso di distribuzione normale, a un livello di confidenza di circa 95%) e sono comprensive dell'errore massimo riscontrato nel campo di misura, come specificato nei documenti operativi applicabili.
The measurement uncertainties reported in this document are estimated at the level of twice composed uncertainty (corresponding, in the case of normal distribution, to a confidence level of about 95%) and are comprensive of the maximum error found in the measuring field, as specified in the relevant operating documents.