

**Report-no. K23332018T2**  
**Heating boilers for solid fuels**  
**Type testing**  
in accordance with DIN EN 303-5:2012  
**-test report C-**

Models:  
**Grande 37**  
**Titan**

Trademark:  
**ALFA PLAM**

Company:  
**ALFA PLAM A.D.**



Deutsche  
Akkreditierungsstelle  
D-PL-11120-04-00

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## Type testing

**Heating boilers for solid fuels acc. DIN EN 303-5: October 2012**

**Test of the heating requirements, test report C**

Applicant/contractor: **ALFA PLAM A.D.**  
Radnicka, 1  
17500, Vranje (Serbia)

Models designation: **Grande 37; Titan**

Type of construction: Heating boilers in accordance with DIN EN 303, part 5, for central heating installation.

Type of loading: automatic load

Type of fuel: wood pellets, Ø: 6 mm, maximum length: 30 mm,  
maximum humidity: 7,1%, Pfeifer.  
GCV (Gross Calorific Value): 18.663 KJ/kg.

No.	Model designation:	Nominal heat Output [kW]	Heat Input [kW]
1	Grande 37	10,9 – 37,0	11,8 – 40,0
2	Titan	10,9 – 37,0	11,8 – 40,0

### Test basis:

According to DIN EN 303-5:2012, 4.4 Heating requirements.

This examination has been carried out by the impartial test centre of TÜV Rheinland Energy GmbH in a test laboratory equipped in accordance with DIN EN 304, version 01/04.

For the constructional requirements see the test report B (K23332018T1).

**Remarks:** Both boilers share the same construction. The only difference is on the name written on the right upper front door.

### Test result:

The boilers are in conformity to the emission class 5, DIN EN 303-5:2012, 4.4.7 and the efficiency class 5, DIN EN 303-5:2012, 4.4.2.

The requirements of the above-mentioned standards are fulfilled. The local applicable installation conditions are to be observed.

Cologne, 2018-06-13  
432 / jd

Assessor:



B. Sc. J. Duschanek

Test Centre for Energy Appliances  
DIN- und DVGW-Laboratory

Report released after review:



Dipl.-Ing. A. Pump

## 1. Date of test

This examination has been carried out on 08<sup>th</sup> until 10<sup>th</sup> May 2018 by the impartial test centre of TÜV Rheinland Energy GmbH / CMC Centro Misura Compatibilità S.r.l. in a test laboratory equipped in accordance with DIN EN 304, version 01/04.

The factory production control was not a part of this assessment.

## 2. Brief description of the boilers

### 2.1 Technical boiler data

The present boilers **Grande 37** and **Titan** are steel constructed with the basic materials S235JR / P265GH and S235JRH for the pipes of the heat exchanger. The boiler body is covered with thermal insulation.

The boilers have got electrical equipment and are fitted with a flue gas motor. The combustion air is taken from the ambient and is controlled by an electronic device.

The appliances are also fitted with an automatic retort cleaning system.

Moreover the boilers are equipped with: a water safety temperature limiter (manual reset), a fuel hopper safety temperature limiter and two air pressure switches.

<b>Models designation:</b>		<b>Grande 37 / Titan</b>
Dimension: (height x width x depth)	mm	1400 x 954 x 830
Diameter of the flue outlet	mm	80
Practical testing	-	Yes
Water content	liters	72
Max. working temperature	°C	80
Max working pressure	bar	2
Rated Voltage	V/Hz	230/50
Rated electrical power (max)	W	310
Electrical consumption (at nominal heat output – acc. to EN 15456)	W	53
Electrical consumption (at minimum heat output – acc. to EN 15456)	W	37
Electrical consumption (stand-by – acc. IEC 62301)	W	3
Weight	kg	310

Additional information can be found in report K23332018T1.

### 3. Testing

The tests were carried out on 08<sup>th</sup> until 10<sup>th</sup> May 2018 in the laboratory of TÜV Rheinland Energy GmbH / CMC Centro Misura Compatibilità S.r.l. in Thiene (VI) – Italy.

- P (pass)
- NA (not applicable)
- NT (not tested)
- F (fail)

Requirements	DIN EN 303-5	Result
<b>Boiler performance requirements</b>	<b>4.4</b>	
<b>General</b> The performance requirements are to be conducted with the test fuel	4.4.1	P
<b>Boiler efficiency</b> Class 5 Minimum required > 88,6	4.4.2	P
<b>Flue temperature</b> Nominal heat output: >160 K	4.4.3	P*
<b>Draught</b> Nominal heat output: 14,0 Pa Minimum heat output: 10,0 Pa	4.4.4	P
<b>Combustion period for hand-stoked boilers</b>	4.4.5	NA
<b>Minimum heat output</b> The minimum heat output shall be not more than 30% of the nominal heat output	4.4.6	P
<b>Emission limits (class 5)</b> CO < 500 mg/m <sup>3</sup>   OGC < 20 mg/m <sup>3</sup>   Dust < 40 mg/m <sup>3</sup>	4.4.7	P

\* Flue gas temperature below 160 K room temperature. See the recommendations regarding the flue installation in the manual.

### 3.1 Test results

#### 3.1.1 Nominal heat output

<b>Grande 37, Titan</b>		<b>required</b>	<b>achieved</b>
Type of fuel		<b>wood pellets</b>	
Nominal heat input	kW	40	40,0
Nominal heat output	kW	37	37,0
Duration of combustion	s	≥ 21600	21600
Mean flow temperature	°C	70 - 90	73,5
Boiler efficiency (direct method) Efficiency class	%	≥ 88,6 Class 5 acc. to DIN EN 303-5	92,5
Flue gas pressure	Pa	14,0	14,0
Flue gas temperature	°C	≥ 160 + room temperature	127,9 *
Room temperature	°C	15 - 30	27,0
O <sub>2</sub> -Concentration	Vol-%	-	8,3
CO-Emission (Referring to 10 Vol. % O <sub>2</sub> , dry) Emission class	mg/m <sup>3</sup>	≤ 500 Class 5 acc. to DIN EN 303-5	26
CO-Emission (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	19
NO <sub>x</sub> -Emission (Referring to 10 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	191
NO <sub>x</sub> -Emission (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	139
OGC-Emission (C <sub>x</sub> H <sub>y</sub> ) (Referring to 10 Vol. % O <sub>2</sub> , dry) Emission class	mg/m <sup>3</sup>	≤ 20 Class 5 acc. to DIN EN 303-5	6
OGC-Emission (C <sub>x</sub> H <sub>y</sub> ) (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	4
Dust-Emission (Referring to 10 Vol. % O <sub>2</sub> , dry) Emission class	mg/m <sup>3</sup>	≤ 40 Class 5 acc. to DIN EN 303-5	28
Dust-Emission (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	20

\* Flue gas temperature below 160 K room temperature. See the recommendations regarding the flue installation in the manual.

**3.1.2 Minimum heat output**

<b>Grande 37, Titan</b>		<b>required</b>	<b>achieved</b>
Type of fuel		<b>wood pellets</b>	
Nominal heat input	kW	11,8	11,8
Nominal heat output	kW	10,9	10,9
Duration of combustion	s	≥ 21600	21600
Mean flow temperature	°C	70 - 90	72,8
Boiler efficiency (direct method) Efficiency class	%	≥ 88 Class 5 acc. to DIN EN 303-5	92,2
Flue gas pressure	Pa	10,0	10,0
Flue gas temperature	°C	-	69,9
Room temperature	°C	15 - 30	26,8
O <sub>2</sub> -Concentration	Vol-%	-	12,6
CO-Emission (Referring to 10 Vol. % O <sub>2</sub> , dry) Emission class	mg/m <sup>3</sup>	≤ 500 Class 5 acc. to DIN EN 303-5	173
CO-Emission (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	125
NO <sub>x</sub> -Emission (Referring to 10 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	190
NO <sub>x</sub> -Emission (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	138
OGC-Emission (C <sub>x</sub> H <sub>y</sub> ) (Referring to 10 Vol. % O <sub>2</sub> , dry) Emission class	mg/m <sup>3</sup>	≤ 20 Class 5 acc. to DIN EN 303-5	5
OGC-Emission (C <sub>x</sub> H <sub>y</sub> ) (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	4
Dust-Emission (Referring to 10 Vol. % O <sub>2</sub> , dry) Emission class	mg/m <sup>3</sup>	-	17
Dust-Emission (Referring to 13 Vol. % O <sub>2</sub> , dry)	mg/m <sup>3</sup>	-	12

## **4. Test results, confirmation of conformity with test standard**

The boilers:

**Grande 37  
Titan**

of the company:

**ALFA PLAM A.D.**

fulfil and correspond to the requirements of the standard with DIN EN 303-5:2012  
The boilers are in conformity to the emission class 5, DIN EN 303-5:2012, 4.4.7 and the  
efficiency class 5, DIN EN 303-5:2012, 4.4.2.

The requirements of the above-mentioned standards are fulfilled. The local and applicable  
installation conditions are to be observed.

The test results presented in this report refer solely to the test object stated.

## **5. List of the documents**

Appendix 01 Fuel Data  
Appendix 02 Test results  
Appendix 03 Measurement Instruments

## Appendix 01

### Fuel data Grande 37, Titan

<b>Test at nominal load</b>														
<b>Verbrennungsrechnung aus der Elementaranalyse</b>														
nach DIN EN 304 Teil 2, Ausgabe 01/2004														
nach DIN 4702 Teil 2, Ausgabe 3/1990														
<b>Analysis from:</b>			<b>22/03/2018</b>			<b>Analysis No.</b>			<b>1802858-001</b>			<b>Fuel sampling date:</b>		
<b>Fuel:</b>			<b>wood pellets</b>									<b>14/03/2018</b>		
Bestandteil im Brennstoff	Stoffanteil	Sauerstoffbedarf		Abgasbestandteile aus Brennstoff in Nm <sup>3</sup> /kg Brennstoff										
		in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	CO <sub>2</sub>		SO <sub>2</sub>		H <sub>2</sub> O		N <sub>2</sub>				
	Gew. %		Sauerstoff-Bedarf	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	
c	46,00	1,860	0,856	1,850	0,8510	-	-	-	-	-	-	-	-	
s	0,03	0,700	0,000	-	-	0,680	0,0002	-	-	-	-	-	-	
h	6,02	5,550	0,334	-	-	-	-	11,100	0,6682	-	-	-	-	
n	0,10	-	-	-	-	-	-	-	-	-	0,80	0,0008	-	
o	40,20	-0,700	-0,281	-	-	-	-	-	-	-	-	-	-	
wasser	7,10	-	-	-	-	-	-	1,240	0,0880	-	-	-	-	
asche	0,55	-	-	-	-	-	-	-	-	-	-	-	-	
summe	100,000	O min=	0,908	V CO <sub>2</sub> =	0,8510	V SO <sub>2</sub> =	0,0002	V W =	0,7563	V N <sub>2</sub> =	0,0008			
Luftbedarf				L min =		4,3262 Nm <sup>3</sup> /kg Brennstoff								
trockene stöchiometrische Abgasmenge				V A tr min =		4,2688 Nm <sup>3</sup> /kg Brennstoff								
Max. Kohlenstoffdioxid-Anteil				CO <sub>2</sub> max =		19,9352 Vol.-%								
Wasserdampfmenge				V w =		0,7563 Nm <sup>3</sup> /kg Brennstoff								
Heizwert, wf				Hu =		18903 kJ/kg 5,251 kWh/kg								
<b>Berechnungen zum Versuchszeitpunkt</b>														
wasser	zum Versuchszeitpunkt		w =		7,100 Gew. %									
Heizwert, roh	zum Versuchszeitpunkt		Hu		17388 kJ/kg									

<b>Test at reduced load</b>														
<b>Verbrennungsrechnung aus der Elementaranalyse</b>														
nach DIN EN 304 Teil 2, Ausgabe 01/2004														
nach DIN 4702 Teil 2, Ausgabe 3/1990														
<b>Analysis from:</b>			<b>22/03/2018</b>			<b>Analysis No.</b>			<b>1802858-001</b>			<b>Fuel sampling date:</b>		
<b>Fuel:</b>			<b>wood pellets</b>									<b>14/03/2018</b>		
Bestandteil im Brennstoff	Stoffanteil	Sauerstoffbedarf		Abgasbestandteile aus Brennstoff in Nm <sup>3</sup> /kg Brennstoff										
		in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	CO <sub>2</sub>		SO <sub>2</sub>		H <sub>2</sub> O		N <sub>2</sub>				
	Gew. %		Sauerstoff-Bedarf	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	in Nm <sup>3</sup> je kg Bestandteil	in Nm <sup>3</sup> je kg Brennstoff	
c	46,00	1,860	0,856	1,850	0,8510	-	-	-	-	-	-	-	-	
s	0,03	0,700	0,000	-	-	0,680	0,0002	-	-	-	-	-	-	
h	6,02	5,550	0,334	-	-	-	-	11,100	0,6682	-	-	-	-	
n	0,10	-	-	-	-	-	-	-	-	-	0,80	0,0008	-	
o	40,20	-0,700	-0,281	-	-	-	-	-	-	-	-	-	-	
wasser	7,10	-	-	-	-	-	-	1,240	0,0880	-	-	-	-	
asche	0,55	-	-	-	-	-	-	-	-	-	-	-	-	
summe	100,000	O min=	0,908	V CO <sub>2</sub> =	0,8510	V SO <sub>2</sub> =	0,0002	V W =	0,7563	V N <sub>2</sub> =	0,0008			
Luftbedarf				L min =		4,3262 Nm <sup>3</sup> /kg Brennstoff								
trockene stöchiometrische Abgasmenge				V A tr min =		4,2688 Nm <sup>3</sup> /kg Brennstoff								
Max. Kohlenstoffdioxid-Anteil				CO <sub>2</sub> max =		19,9352 Vol.-%								
Wasserdampfmenge				V w =		0,7563 Nm <sup>3</sup> /kg Brennstoff								
Heizwert, wf				Hu =		18903 kJ/kg 5,251 kWh/kg								
<b>Berechnungen zum Versuchszeitpunkt</b>														
wasser	zum Versuchszeitpunkt		w =		7,100 Gew. %									
Heizwert, roh	zum Versuchszeitpunkt		Hu		17388 kJ/kg									



## Appendix 02

### Test results

<b>Report- No.</b>		<b>K23332018T2</b>		
<b>TÜV- order- No.</b>		<b>21243221</b>		
<b>Manufacturer</b>		<b>ALFA PLAM A.D.</b>		
<b>Construction type</b>		<b>Pellet boiler</b>		
<b>max. working temperature</b>	°C	<b>80</b>		
<b>max. working pressure</b>	bar	<b>2,0</b>		
<b>Type of fuel charging</b>		<b>automatic load</b>		
<b>Special properties / Remarks</b>		<b>-</b>		
<b>Burner Type</b>		<b>-</b>		
<b>Model designation:</b>		<b>Grande 37</b>		
Test place		<b>Thiene</b>		
Standard		<b>EN 303-5:2012</b>		
Type of test		<b>Test at nominal load</b>		
<b>Heat input from manufacturer</b>	<b>kW</b>	<b>40,0</b>		
<b>Heat output from manufacturer</b>	<b>kW</b>	<b>37,0</b>		
		<b>1. test</b>	<b>2. test</b>	<b>Average</b>
Test date		08/05/2018		
Time		11:30-17:30	not tested	
<b>Ambient:</b>				
Ambient pressure, measurement	mbar	1008		1008
Air temperature (combustion air), measurement	°C	27,01		27,0
Humidity of combustion air, measurement	%	48		48
Ambient temperature, measurement	°C	27,01		27,0
<b>Type of Fuel</b>		wood pellets		
Properties of Fuel		Ø 6 mm, Lmax 30 mm, max humidity 7,1% Pfeifer		
Number of fuel tasks		1		
Weight of the stove, start, measurement	kg	523,2		
Weight of the stove, end, measurement	kg	473,6		
Fuel consumption, calculated of the difference	kg	49,6		
Test duration, measurement	sec	21600		
Fuel consumption "B"	kg/h	8,27		8,27
Combustible constituents in material passing through the grate "b", analyse	Gew . %	15,0		15,0
Residue passing through the grate, measurement	kg	0,400		0,400
Residue passing through the grate "R"	Gew . %	0,8		0,8
Carbon content of the residue passing through the grate "Cr" depending of 1kg fuel	Gew . %	0,12		0,12
<b>Water side, measurement</b>				
Flow , measurement	°C	73,5		73,5
Return, measurement	°C	50,3		50,3
Delta T	K	23,3		23,3
Cold water flow , measurement	kg/h	1366,3		1366,3
Additional energy of the pump	kW	0,000		0,000
<b>Flue, average</b>				
Flue gas temperature, measurement	°C	127,9		127,9
Flue draught, measurement	Pa	14,0		14,0
O <sub>2</sub> - concentration, measurement	Vol.-%	8,3		8,3
CO <sub>2</sub> - concentration, calculated	Vol.-%	12,0		12,0
lambda figure	-	1,650		1,650

CO - concentration, measurement	ppm	24		24
CO - concentration, measurement	Vol.-%	0,002		0,002
CO - concentration, measurement	mg/m³	29		29
CO - concentr. (at 10% - O2)	Vol.-%	0,002		0,002
CO - concentr. (at 10% - O2)	mg/m³	26		26
CO - concentration	mg/kWh	43		43
CO - concentration	mg/MJ	12		12
NOx - concentration, measurement	ppm	107		107
NOx - concentration, measurement	mg/m³	219		219
NOx - concentr. (at 10% - O2)	mg/m³	191		191
NOx - concentration	mg/kWh	322		322
NOx - concentration	mg/MJ	89		89
CnHm concentration, measurement	ppm	4		4
CnHm concentration, measurement	mg/m³	7		7
CnHm concentr. (at 10% - O2)	mg/m³	6		6
CnHm - concentration (total C)	mg/kWh	10		10
CnHm - concentration (total C)	mg/MJ	3		3
Dust, measurement*	mg	10		10
Dust, measurement*	mg/m³	32		32
Dust (at 10% - O2)*	mg/m³	28		28
Dust*	mg/kWh	46		46
Dust*	mg/MJ	13		13
PME concentration (at 13% - O2)*	mg/m³	22		22
<b>Electrical consumption</b>				
Rated electrical power (max)	W		310	
Electrical consumption (at nominal heat output) - acc. EN 15456	W		53	
Electrical consumption (at minimum heat output) - acc. EN 15456	W		37	
PSTBY (during stand-by) - acc. IEC 62301	W		3	
<b>Calculation</b>				
"Qa" loss free heating flue gas	kJ/kg	1150,4		1150,4
"qa" loss flue gas	%	6,6		6,6
"Qb" loss fix heating in flue gas	kJ/kg	2,1		2,1
"qb" loss fix heating in flue gas	%	0,01		0,01
"Qr" losses due to combustible constituents in the residue passing through the grate	kJ/kg	40,5		40,5
"qr" losses due to combustible constituents in the residue passing through the grate	%	0,23		0,23
"m" flue gas mass flow	g/s	23,1		23,1
cpm, acc. DIN 4702-2, version 03.90 for dry flue gas	kJ/(m³K)	1,35		1,35
"eta" Efficiency (direct), to consider only water heating output Pw	%	92,5		92,5
"eta" Efficiency (indirect)	%	91,1		91,1
Heating input	kW	40,0		<b>40,0</b>
"Pw" water heating output	kW	37,0		<b>37,0</b>
<b>Adjustments</b>				
Flue gas motor	rpm	2450		
Fuel motor	rpm	2100		
Combustion air fan	Volts	130		
Cleaning time	s / min	40 /60		
Firedoor	-	closed		

<b>Report- No.</b>		<b>K23332018T2</b>
<b>TÜV- order- No.</b>		<b>21243221</b>
<b>Manufacturer</b>		<b>ALFA PLAM A.D.</b>
<b>Construction type</b>		<b>Pellet boiler</b>
<b>max. working temperature</b>	°C	<b>80</b>
<b>max. working pressure</b>	bar	<b>2,0</b>
<b>Type of fuel charging</b>		<b>automatic load</b>
<b>Special properties / Remarks</b>		-
<b>Burner Type</b>		-
<b>Model designation:</b>		<b>Grande 37</b>
Test place		<b>Thiene</b>
Standard		<b>EN 303-5:2012</b>
Type of test		<b>Test at reduced load</b>
<b>Heat input from manufacturer</b>	<b>kW</b>	<b>11,8</b>
<b>Heat output from manufacturer</b>	<b>kW</b>	<b>10,9</b>
		<b>1. test</b>
Test date		09/05/2018
Time		10:45-16:45
<b>Ambient:</b>		
Ambient pressure, measurement	mbar	1010
Air temperature (combustion air), measurement	°C	26,8
Humidity of combustion air, measurement	%	54
Ambient temperature, measurement	°C	26,8
<b>Type of Fuel</b>		<b>w ood pellets</b>
Properties of Fuel		Ø 6 mm, Lmax 30 mm, max humidity 7,1% Pfeifer
Number of fuel tasks		1
Weight of the stove, start, measurement	kg	514,2
Weight of the stove, end, measurement	kg	499,5
Fuel consumption, calculated of the difference	kg	14,7
Test duration, measurement	sec	21600
Fuel consumption "B"	kg/h	2,45
Combustible constituents in material passing through the grate "b", analyse	Gew . %	15,0
Residue passing through the grate, measurement	kg	0,220
Residue passing through the grate "R"	Gew . %	1,5
Carbon content of the residue passing through the grate "Cr" depending of 1kg fuel	Gew . %	0,22
<b>Water side, measurement</b>		
Flow , measurement	°C	72,8
Return, measurement	°C	58,9
Delta T	K	13,9
Cold w ater flow , measurement	kg/h	675,1
Additional energy of the pump	kW	0,000
<b>Flue, average</b>		
Flue gas temperature, measurement	°C	69,9
Flue draught, measurement	Pa	10,0
O <sub>2</sub> - concentration, measurement	Vol.-%	12,6
CO <sub>2</sub> - concentration, calculated	Vol.-%	7,9
lambda figure	-	2,492

CO - concentration, measurement	ppm	105
CO - concentration, measurement	Vol.-%	0,010
CO - concentration, measurement	mg/m³	131
CO - concentr. (at 10% - O2)	Vol.-%	0,014
CO - concentr. (at 10% - O2)	mg/m³	173
CO - concentration	mg/kWh	291
CO - concentration	mg/MJ	81
NOx - concentration, measurement	ppm	71
NOx - concentration, measurement	mg/m³	145
NOx - concentr. (at 10% - O2)	mg/m³	190
NOx - concentration	mg/kWh	321
NOx - concentration	mg/MJ	89
CnHm concentration, measurement	ppm	2
CnHm concentration, measurement	mg/m³	4
CnHm concentr. (at 10% - O2)	mg/m³	5
CnHm - concentration (total C)	mg/kWh	8
CnHm - concentration (total C)	mg/MJ	2
Dust, measurement*	mg	4
Dust, measurement*	mg/m³	13
Dust (at 10% - O2)*	mg/m³	17
Dust*	mg/kWh	28
Dust*	mg/MJ	8
PME concentration (at 13% - O2)*	mg/m³	13
<b>Electrical consumption</b>		
Rated electrical power (max)	W	310
Electrical consumption (at nominal heat output) - acc. EN 15456	W	53
Electrical consumption (at minimum heat output) - acc. EN 15456	W	37
PSTBY (during stand-by) - acc. IEC 62301	W	3
<b>Calculation</b>		
"Qa" loss free heating flue gas	kJ/kg	692,6
"qa" loss flue gas	%	3,98
"Qb" loss fix heating in flue gas	kJ/kg	14,3
"qb" loss fix heating in flue gas	%	0,08
"Qr" losses due to combustible constituents in the residue passing through the grate	kJ/kg	75,3
"qr" losses due to combustible constituents in the residue passing through the grate	%	0,43
"m" flue gas mass flow	g/s	10,0
cpm, acc. DIN 4702-2, version 03.90 for dry flue gas	kJ/(m³K)	1,33
"eta" Efficiency (direct), to consider only water heating output Pw	%	92,2
"eta" Efficiency (indirect)	%	91,1
Heating input	kW	<b>11,8</b>
"Pw" water heating output	kW	<b>10,9</b>
<b>Adjustments</b>		
Flue gas motor	rpm	1050
Fuel motor	rpm	680
Combustion air fan	Volts	110
Cleaning time	s / min	40 / 360
Firedoor	-	closed

### Appendix 03

The requirements of the measuring instruments are fulfilled. Before each qualified measuring analysers were calibrated with zero gas and calibration gas

Index	Measure	Principle	Company	Range	Instrument specification	Reference
B030	Water pressure	Manometer	Cewal DN 150	0 – 25 bar	± 0,6%	Reference manometer
B062	Temperature	PT 100 K-type thermocouples	Agilent 34970 A	0 – 300 °C	Up to 0,5 °C	Reference thermometer
B066	Gas pressure	Manometer	Testo 510	0 – 100 hPa	± 3% related to final value	Reference manometer
B068	Temperature	IR emission	Fluke Ti20	-10 – 350 °C	---	---
B070	Fuel consumption	Gravimetric	Dini Angeo DFWK	0 – 600 kg	± 10 g	Reference load
B079	Water flow	Magnetic	ABB Copa-XE DE43FI	0 – 2000 kg/h	± 1% related to the range	Balance
B084	Temperature	PT 100 K-type thermocouples	Agilent 34970 A	0 – 300 °C	Up to 0,5 °C	Reference thermometer
B090	Dust content	Gravimetric	Sartorius CPA 224 S	0,1 mg – 220 g	± 0,1 mg	Reference load
B092	Fuel consumption	Gravimetric	Dini Angeo DFWK	0 – 1200 kg	± 10 g	Reference load
B094	CO <sub>2</sub>	Infrared-absorption	Siemens Ultramat 6E	0 – 3 % 0 – 30 %	± 1% related to the range	Reference gas: 19,99 %
	CO	Infrared-absorption	Siemens Ultramat 6E	0 – 300 ppm 0 – 3000 ppm	± 1% related to the range	Reference gas: 2002 ppm
B095	CO	Infrared-absorption	Siemens Ultramat 23	0 – 1 % 0 – 5 %	± 1% related to the range	Reference gas: 4,925 %
B096 + B123	CO <sub>2</sub>	Infrared-absorption	Siemens Ultramat 23	0 – 5 % 0 – 25 %	± 1% related to the range	Reference gas: 19,99 %
	CO	Infrared-absorption	Siemens Ultramat 23	0 – 1000 ppm 0 – 5000 ppm	± 1% related to the range	Reference gas: 2002 ppm
	NO <sub>x</sub>	Infrared-absorption	Siemens Ultramat 23 + Bühler Bünox MV	0 – 1000 ppm 0 – 5000 ppm	± 1% related to the range	Reference gas: 191,4 ppm
B097	OGC	FID	Siemens Fidamat 6	0 – 3,33 ppm C3 0 – 33,3 ppm C3 0 – 333 ppm C3 0 – 3333 ppm C3	± 1% related to the range	Reference gas: 29,82 ppm propane
B098	Temperature	K-type thermocouple	Testo 925	0 – 200 °C	± 2 °C	Reference thermometer
B116	Air flow	Mass flow measurement	Bronkhorst F-11AC-50K-AAD-33-V	0 – 50 l/min	± (0,5 % Rd + 0,1 % FS)	External calibration
B118	Gas volume	Diaphragm	CMC	0,016 – 2,5 m <sup>3</sup> /h	± 5 %	Air flow
B121	OGC	FID	Siemens Fidamat 6	0 – 3,33 ppm C3 0 – 33,3 ppm C3 0 – 333 ppm C3 0 – 3333 ppm C3	± 1% related to the range	Reference gas: 29,82 ppm propane
B122	CO <sub>2</sub>	Infrared-absorption	Siemens Ultramat 23	0 – 5 % 0 – 25 %	± 1% related to the range	Reference gas: 19,99 %
	CO	Infrared-absorption	Siemens Ultramat 23	0 – 1000 ppm 0 – 5000 ppm	± 1% related to the range	Reference gas: 2002 ppm
	NO	Infrared-absorption	Siemens Ultramat 23	0 – 1000 ppm 0 – 5000 ppm	± 1% related to the range	Reference gas: 191,4 ppm
B129	Water flow	Magnetic	ASA AF6-2600/1/B/1/AC	0 – 1500 kg/h	Accuracy: ± 0,5% r.v.	Balance
B140	Gas pressure	Inclined liquid column manometer	Kimo HP series	0 – 15 Pa	± 10% related to final value	Reference manometer



<b>Index</b>	<b>Measure</b>	<b>Principle</b>	<b>Company</b>	<b>Range</b>	<b>Instrument specification</b>	<b>Reference</b>
B141	Gas pressure	Inclined liquid column manometer	Kimo HP series	0 – 15 Pa	± 10% related to final value	Reference manometer
B149	Mass	Gravimetric	Kern FKB 15K0.5A	0 – 15 kg	± 0,5 g (reproducibility)	Reference load
B154	Gas volume	Diaphragm	Elster BK-G4M	---	Class 1,5	Air flow
B169	Electrical power	---	Yokogawa WT310E	0 – 2000 W	± 0,5 %	External calibration

The values are continuously recorded. The scan interval is 10s. All related certificates are stored.