REPORT

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9P07425-1B

Testing

Maine Energy Systems
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USA

Testing of a pellet boiler (non CBI report)

(13 appendices)

This is a non CBI report. This report is a revised version of the report dated 18/02/20 and revised 12/03/20. This revised version contains an appendix (12) with the email correspondence of a failed test with EPA.

The assignment

Testing the wood pellet fired hydronic heater, model Pellematic 56 in accordance with test method ASTM 2618-13, CSA B415.1-10 and ASTM 2515-11 for compliance with EPA 40 CFR Part 60, March 16, 2015.

Item for testing

The item tested was a hydronic heater– type Pellematic 56 with serial nr.: XUTO1478, year of production 2019 and manufactured by Maine Energy Systems, USA. The hydronic heater arrived at RISE on 21st November 2019. The hydronic heater had been pre-conditioned and was therefore in used condition.

The performance tests were conducted **9th to 12th of December 2019 and 21th January 2020.**

This test report relates only to the actual item tested.

Technical description

Pellets are charged either manually or via the suction system from the storage location into the hopper and from there via the backfire safety device to the drop stage. The burner auger transports the pellets to the burner plate where the heater rod heats them until they ignite. The ignition is monitored on the basis of the combustion chamber temperature and switches off once the pellets have ignited. The fuel and combustion air volume are automatically controlled by the combustion temperature and modulation level and the vacuum in the combustion chamber is controlled by means of the flue gas fan and burner fan. The heat exchanger is cleaned automatically with the cyclically activated cleaning spring in the heat exchanger. The ash is collected underneath the burner plate, and is transported by the ash auger into the ash bin.

The wood pellet fired hydronic heater Pellematic 56 is intended for indoor installation.

Informative material supplied

Two manuals were delivered from the manufacturer:

- Operating manual, Pellet heating with auger delivery or vacuum suction system for the end user. PE(S)(K)(B) 10 - 56. Version: FA_V2.03
- Installation manual – Pellet heating with vacuum suction system type AutoPellet PES 36-56, Version FA-V2.03

Test arrangement

The hydronic heater was connected to the test rig according to method ASTM E2618-13. The chimney was connected to a dilution tunnel (see appendix 11)**.**

The chimney diameter was 150 mm (5.9 in.), with a height of about 5 m (197 in.) above the upper surface of the scale. The dilution tunnel diameter was 160 mm (6.3 in.).

The manufacturer conducted a pre-test burning of 50 hours to condition the unit before testing. The wood pellet hydronic heater Pellematic 56 is a non-catalytic appliance.

Test procedure

Testing was carried out at/by RISE Department for Energy and Resources during December 2019 to January 2020 in accordance with EPA regulations 40 CFR Part 60 subpart QQQQ. Testing was performed according to ASTM 2618-13 and ASTM 2515-11.

The particulate matter from the probe assembly was handled according to the alternative method 126 dated March 6 2018 (broadly applicable) by rinsing the probe and probe assembly with acetone, drying down the rinse in beakers, desiccation followed by weighing (see appendix 10).

Calculation of the average overall thermal efficiency (η_{SLM}) was done in accordance with Canadian standard CSA B415.1-10, clause 13.7 except for 13.7.2 (e), (f), (g), and (h) where the following average fuel properties for oak were used: C = 50.0 %, H = 6.6 %, O = 43.2 %, Ash = 0.2 %. The higher heating value (HHV) 8600 Btu/lb (19.99 MJ/kg) and the lower heating value (LHV) 7988 Btu/lb (18.567 MJ/kg) were used when calculating the efficiencies.

CO, CO_2 and O_2 emissions were measured continuously in the chimney during the test period. Emissions of CO in g/min were calculated according to the Canadian standard CSA B415.1-10 clause 13.9 (using the spreadsheet in annex F, CSA B415.1-10).

The test fuel used was manufactured by Turmberger Pelletsproduktion GmbH and is classified as EN plus pellet and A1 according to ISO 17225-2. The fuel was delivered in 15 kg plastic bags.

Leakage checks of the particulate sampling trains were carried out before and after the tests (see appendix 4).

Instead of the thermopile on the load side of the heat exchanger one pair of PT-100 sensors were used to measure the temperatures. This was communicated with EPA by email (17/05/2016) and was approved. The PT-100 sensor has a higher accuracy and a higher sensitivity compared to the thermocouple.

The appliance was in operation at the specified draw rate two hours before the test started. The test period lasted for 4 hours at each heat output rate category according to method E2618-13 clause 12.3.3.

Representatives from the companies Maine Energy Systems, USA and Ökofen, Austria were present as observers during the tests.

Summary of test results (Hangtag information)

Table 1 shows a summary of the test results and a hangtag information for the hydronic heater Pellematic 56. For complete results see appendix 2.

Table 1. Additional (Hangtag) information.

MANUFACTURER:	**Maine Energy Systems 8 Airport Road P.O. Box 547 BETHEL, MAINE 04217 04217 USA**		
MODEL NUMBER:	**Pellematic 56**		
8-HOUR OUTPUT RATING	$Q_{out-8hr}$	**N.A**	Btu/hr
8-HOUR AVERAGE EFFICINCY	$\eta_{avg-8hr}$	**N.A**	(Using higher heating value)
		N.A	(Using lower heating value)
MAXIMUM OUTPUT RATING	Q_{max}	**191,000**	BTU/HR
ANNUAL EFFICIENCY RATING:	η_{avg}	**86.3**	(Using higher heating value)
		92.8	(Using lower heating value)
PARTICLE EMISSIONS:	E_{avg}	**0.904**	Grams/hr (Average)
		0.045	lbs/mmBtu Output
CO EMISSIONS	CO_{avg}	**0.027**	Grams/minute

N.A = Not Applicable because the hydronic heater is an automatic pellet fuelled appliance.

Comments and observations

The wood pellet hydronic heater Pellematic 56 manufactured by Maine Energy Systems, USA meets the step 2 requirement 2020 for PM emissions in EPA 40 CFR Part 60 of 0.10 lb/mmBtu heat output (average) and at each individual test rate.

A fault occurred with the boiler when performing test run 1 in category IV (test date 19/12/10). The boiler was restarted and then operated until the end of the test (see figure 2a in appendix 2). Because of the fault the test was repeated and a second test run was performed in category IV, dated 21/01/2020. The failed test in category IV is documented in table 4 appendix 2 and it has not been used in the calculated results in table 5 to 9. The failed test has also been communicated to EPA .

The boiler was not able to run in the lowest category I (shown in two attempts, see figure 2f and 2g in appendix 2) and was therefore tested two times in category II according to ASTM 2618-13 clause 12.2.12.

The model Pellematic 56 is safety tested by OMNI –Test Laboratories, Inc (report no. 0444PB0095).

The tested model has a rated output of 191,000 Btu/hr (56 kW).

This test report shall not be reproduced except in full, without the written approval of the test laboratory.

Quality assurance

RISE Research Institute of Sweden AB is accredited according to ISO/IEC 17025 as well as accredited by EPA as a test lab to perform tests according to EPA 40 CFR Part 60 subpart QQQQ.

RISE Research Institutes of Sweden AB
Built Environment - Energy and Resources

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Appendices

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Appendix 1

Identification

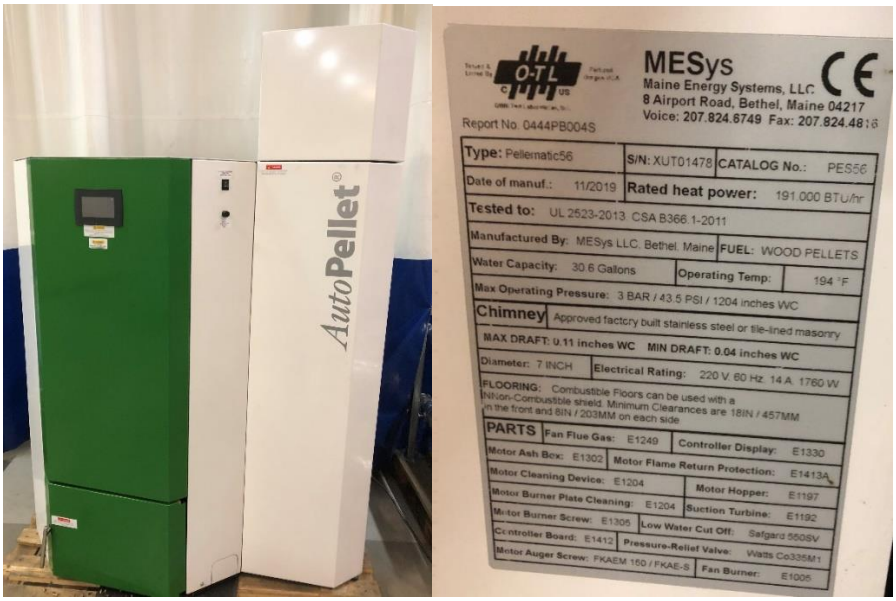


Figure 1a. Pellematic 56

Figure 1b Sealed boiler after testing

Technical data

A summary of the technical data is shown in table 2

Table 2. Technical data

Nominal output, Btu/h (kW)	191,000 (56)
Gross weight empty, lbs (kg)	1120 (508)
Water content, gal (l)	30.6 (116)
Dimensions, (height x depth x width), inch (mm)	61 x 39 x 51 (1555 x 990 x 1297)
Electrical connection	208 to 240 VAC, single phase, 60 Hz, 15 amp

Appendix 2

Results

Table 3 show the test results for the hydronic heater Pellematic 56. Further test results are presented in tables 5 to 9. Test run 1 in category IV failed and the test is documented in table 4. Stopped combustion in category I is shown in figure 2f and 2g.

Table 3. Test results from Category II to IV

	Unit	Category IV Run 2	Category III Run 1	Category II Run 1	Category II Run 2
Test date		21/01/2020	10/12/2020	11/12/2020	12/12/2020
Atmospheric pressure	mm Hg (mbar)	754 (1005)	745 (993)	736 (981)	732 (976)
Test duration	minute	240	240	240	240
Absolute average gas static pressure in dilution tunnel	mm Hg	755	746	737	733
Average velocity in dilution tunnel	m/s	8.6	8.6	8.6	8.6
Average gas tunnel temperature (at Pitot tube)	°F (°C)	93 (34)	79 (26)	73 (23)	73 (23)
Average temperature at PM filter, sampling train 1	°F (°C)	77 (25)	72 (22)	70 (21)	70 (21)
Average temperature at PM filter, sampling train 2	°F (°C)	75 (24)	70 (21)	70 (21)	70 (21)
Flue gas temp (chimney)	°F (°C)	268 (131)	203 (95)	165 (74)	163 (73)
Average temperature of the appliance and water at start of the test	°F (°C)	148 (64)	148 (65)	149 (65)	153 (67)
Average temperature of the appliance and water at the end of the test	°F (°C)	147 (64)	141 (61)	147 (64)	143 (62)
Average temperature of return water as it enters the appliance	°F (°C)	129 (54)	127 (53)	129 (54)	127 (53)
Average temperature of supply water as it leaves the appliance	°F (°C)	165 (74)	162 (72)	165 (74)	162 (72)
Average inlet temperature load side of the heat exchanger	°F (°C)	110 (43)	109 (43)	111 (44)	111 (44)
Average outlet temperature load side of the heat exchanger	°F (°C)	148 (65)	141 (60)	146 (63)	146 (63)
Test load as fired	lb (kg)	108.54 (49.23)	46.30 (21.00)	22.24 (10.09)	20.95 (9.50)
Fuel moisture content on dry basis	%	6.7	6.7	6.7	6.7
Diameter of pellet	mm	6	6	6	6
Water flow rate load side	gal/min (l/min)	10.02 (37.94)	5.39 (20.4)	2.22 (8.4)	2.21 (8.4)

Appendix 2

	Unit	Category IV Run 2	Category III Run 1	Category II Run 1	Category II Run 2
Heat output (load side)	Btu/hr (kW)	191,193 (56.0)	82,974 (24.3)	37,744 (11.1)	36,343 (10.6)
Efficiency delivered (HHV)	%	87.4[2]	88.9[2]	84.2	86.1
Efficiency delivered (LHV)	%	94.1	95.7	90.7	92.7
Stack loss efficiency (HHV)[1]	%	86.4[2]	86.8 [2]	87.7	87.8
CO (mean value)	ppm	78	19	42	44
CO (mean value)	%	0.0078	0.0019	0.0042	0.0044
CO2 (mean value)	%	16.5	11.8	10.4	10.1
O_2, (mean value)	%	3.9	8.8	10.1	10.6
CO, (mean) [3]	g/min	0.106	0.042	0.019	0.019
Room air blank filter	mg	0.0	0.1	0.1	0.1
Total amount of particulate matter collected in dilution tunnel, sampling train 1	g	4.12	2.03	3.90	3.98
Total amount of particulate matter collected in dilution tunnel, sampling train 2	g	5.34	2.79	3.64	4.44
Average gas flow rate in dilution tunnel	dscm/min	9.67	9.80	9.77	9.68
Absolute average dry gas meter temperature, sampling train 1	K	294	293	294	294
Absolute average dry gas meter temperature, sampling train 2	K	294	293	294	294
Volume of gas sample measured corrected to standard conditions, sampling train 1	dscm	1.3679	1.3112	1.2313	1.2522
Volume of gas sample measured corrected to standard conditions, sampling train 2	dscm	1.2515	1.2882	1.1334	1.3454
Volume of room air gas sample measured corrected to standard conditions	dscm	1.2145	1.2156	1.2854	1.1935
Difference of PM between the two sampling trains [4]	g/kg_{dry}	0.03	0.04	0.03	0.06

[1] Stack loss efficiency calculated according to CSA B415.1-10.

[2] The overall stack loss efficiency is lower than the delivered efficiency on the load side. One reason for this is that the stack loss method use the moisture content in the fuel on a wet base whilst the method ASTM 2618-13 (clause 13) uses the moisture content on a dry base, thus giving a lower heat input and therefore a higher efficiency.

[3] CO emission in g/min calculated according to B415.1-10.

[4] The requirement in ASTM 2515-11 for the difference between the two sampling trains are maximum 0.5 g/kg dry fuel

Table 4 below show the results from the failed test run 1 in category IV. The test run 1 failed because of a fault occurred (see comments and observations on page 3). The results in table 4 includes the time (about 10 minutes) when the boiler was stopped. The values in table 4 are not used in the calculations in tables 5 to 9.

Table 4. Failed test results from Category IV run 1

	Unit	Category IV Run 1
Test date		09/12/2020
Atmospheric pressure	mm Hg (mbar)	726 (968)
Test duration	minute	240
Absolute average gas static pressure in dilution tunnel	mm Hg	727
Average velocity in dilution tunnel	m/s	8.8
Average gas tunnel temperature (at Pitot tube)	°F (°C)	95 (35)
Average temperature at PM filter, sampling train 1	°F (°C)	79 (26)
Average temperature at PM filter, sampling train 2	°F (°C)	75 (24)
Flue gas temp (chimney)	°F (°C)	264 (129)
Average temperature of the appliance and water at start of the test	°F (°C)	144 (62)
Average temperature of the appliance and water at the end of the test	°F (°C)	144 (62)
Average temperature of return water as it enters the appliance	°F (°C)	129 (54)
Average temperature of supply water as it leaves the appliance	°F (°C)	162 (72)
Average inlet temperature load side of the heat exchanger	°F (°C)	109 (43)
Average outlet temperature load side of the heat exchanger	°F (°C)	(64)
Test load as fired	lb (kg)	104.91 (47.59)
Fuel moisture content on dry basis	%	6.7
Diameter of pellet	mm	6
Water flow rate on the load side	gal/min (l/min)	9.73 (36.83)
Heat output (load side)	Btu/hr (kW)	184,702 (54.1)
Efficiency delivered (HHV)	%	87.4[1]

Appendix 2

	Unit	Category IV Run 1
Efficiency delivered (LHV)	%	94.0
Stack loss efficiency (HHV)	%	86.2[1]
CO (mean value)	ppm	79
CO (mean value)	%	0.0079
CO2 (mean value)	%	15.4
O_2, (mean value)	%	5.1
CO, (mean) [3]	g/min	0.127
Room air blank filter	mg	0.04
Total amount of particulate matter collected in dilution tunnel, sampling train 1	g	3.36
Total amount of particulate matter collected in dilution tunnel, sampling train 2	g	4.25
Average gas flow rate in dilution tunnel	dscm/min	9.52
Absolute average dry gas meter temperature, sampling train 1	K	294
Absolute average dry gas meter temperature, sampling train 2	K	294
Volume of gas sample measured corrected to standard conditions, sampling train 1	dscm	1.28
Volume of gas sample measured corrected to standard conditions, sampling train 2	dscm	1.20
Volume of room air gas sample measured corrected to standard conditions	dscm	1.18
PM output, average of two sampling trains	lb/mmBtu out	0.011
First hour of emission	g/hr	1.27
Difference of PM between the two sampling trains [4]	g/kg_{dry}	0.02

[1] The overall stack loss efficiency is lower than the delivered efficiency on the load side. One reason for this is that the stack loss method use the moisture content in the fuel on a wet base whilst the method ASTM 2618-13 (clause 13) uses the moisture content on a dry base, thus given a lower heat input and therefore a higher efficiency.

Appendix 2

Tables 5 to 9 refer to the corresponding tables in ASTM E2618-13.

Table 5. Test condition summary

						Θ	W_{fuel}	MC_{ave}	Q_{in}	Q_{out}
Category	Run No	Load % Capacity	Target Load	Actual Load	Actual Load	Test Duration	Wood Weight as-fired	Wood Moisture	Heat Input	Heat Output
			Btu/hr	Btu/hr	% of max	hrs	lb	% DB	Btu	Btu
II[1]	1	16 - 24	30,560 - 45,840	37,744	19.8	4.0	22.24	6.7	179,282	150,975
II[1]	2	16 - 24	30,560 – 45,840	36,343	19.0	4.0	20.95	6.7	168,848	145,374
III	1	25 - 50	47,750 – 95,500	82,974	43.4	4.0	46.30	6.7	373,231	331,894
IV	2	100	191,000	191,203	100.1	4.0	108.54	6.7	874,955	764,810

[1] The boiler was not able to run in the lowest category I (shown in two stopped combustion, see figure 2f and 2g) and was therefore tested two times in category II according to ASTM 2618-13 clause 12.2.12.

Table 6. Test results summary

			T2 min	E_T	E	E	$E_{g/hr}$	$E_{g/kg}$	η_{del}	η_{SLM}
Category	Run No	Load % Capacity	Min return water temp	Total PM emissions	PM output based	PM output based	PM rate	PM factor	Delivered efficiency	Stack loss efficiency
			°F	g	lb/mmBtu out	g/MJ	g/hr	g/kg	%	%
II	1	16 - 24	124	3.77	0.055	0.024	0.946	0.400	84.2	87.7
II	2	16 - 24	123	4.21	0.064	0.027	1.057	0.475	86.1	87.8
III	1	25 - 50	126	2.41	0.016	0.007	0.609	0.124	88.9	86.8[1]
IV	2	100	127	4.73	0.014	0.006	1.204	0.104	87.4	86.4[1]

[1] The overall stack loss efficiency is lower than the delivered efficiency on the load side. One reason for this is that the stack loss method use the moisture content in the fuel on a wet base whilst the method ASTM 2618-13 (clause 13) uses the moisture content on a dry base, thus giving a lower heat input and therefore a higher efficiency.

Appendix 2

Table 7. Heating season weighting

Category	Weighting factor (F_i)	$\eta_{del,i}$ x F_i	$E_{g/MJ,i}$ x F_i	$E_{g/kg,i}$ x F_i	$E_{lb/mmBtu\ Out,i}$ x F_i	$E_{g/hr,i}$ x F_i	$CO_{g/min}$ x F_i
II	0.225[1]	18.95	0.0054	0.0900	0.0124	0.2129	0.0043
II	0.225[1]	19.37	0.0061	0.1069	0.0144	0.2378	0.0043
III	0.450	40.01	0.0032	0.0558	0.0072	0.2741	0.0149
IV	0.100	8.74	0.0006	0.0104	0.0014	0.1204	0.0106
Totals	**1.000**	**87.07**	**0.015**	**0.293**	**0.035**	**0.845**	**0.034**

[1] The weighting factor is calculated as the average of category I factor and category II factor according to ASTM 2618-13 clause 12.2.12.

Table 8. Year-Round use weighting

Category	Weighting factor (F_i)	$\eta_{del,i}$ x F_i	$E_{g/MJ,i}$ x F_i	$E_{g/kg,i}$ x F_i	$E_{lb/mmBtu\ Out,i}$ x F_i	$E_{g/hr,i}$ x F_i	$CO_{g/min}$ x F_i
II	0.3375[1]	28.42	0.0081	0.1350	0.0186	0.3193	0.0064
II	0.3375[1]	29.06	0.0091	0.1603	0.0216	0.3567	0.0064
III	0.275	24.45	0.0019	0.0341	0.0044	0.1675	0.0091
IV	0.050	4.37	0.0003	0.0052	0.0007	0.0602	0.0053
Totals	**1.000**	**86.30**	**0.019**	**0.335**	**0.045**	**0.904**	**0.027**

[1] The weighting factor is calculated as the average of category I factor and category II factor according to ASTM 2618-13 clause 12.2.12.

Table 9 show the PM emissions from the first hour of measurement measured by one of the two sampling trains (train 2 probe 2).

Table 9. First hour emissions

Category	1st hour emissions (g/hr)
II Run 1	0.99
II Run 2	0.99
III Run 1	1.56
IV Run 2	1.43

Appendix 2

Figures 2 a-e shows the heat output (load side) in Btu/hr during the tests.

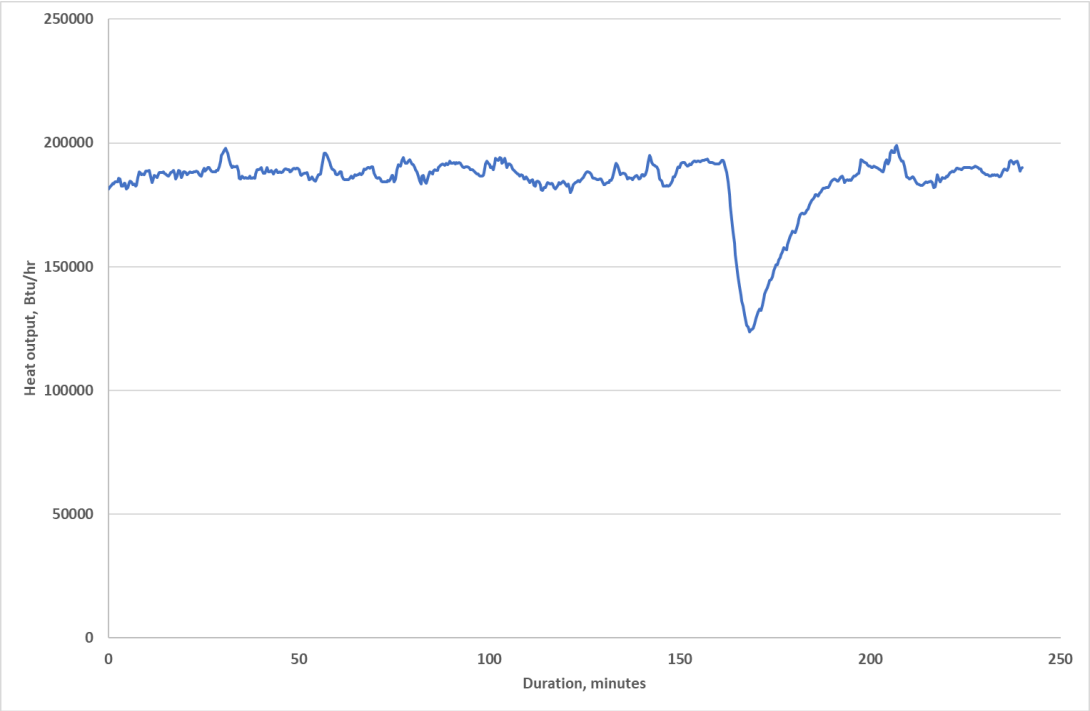


Figure 2 a. Heat output Category IV run 1

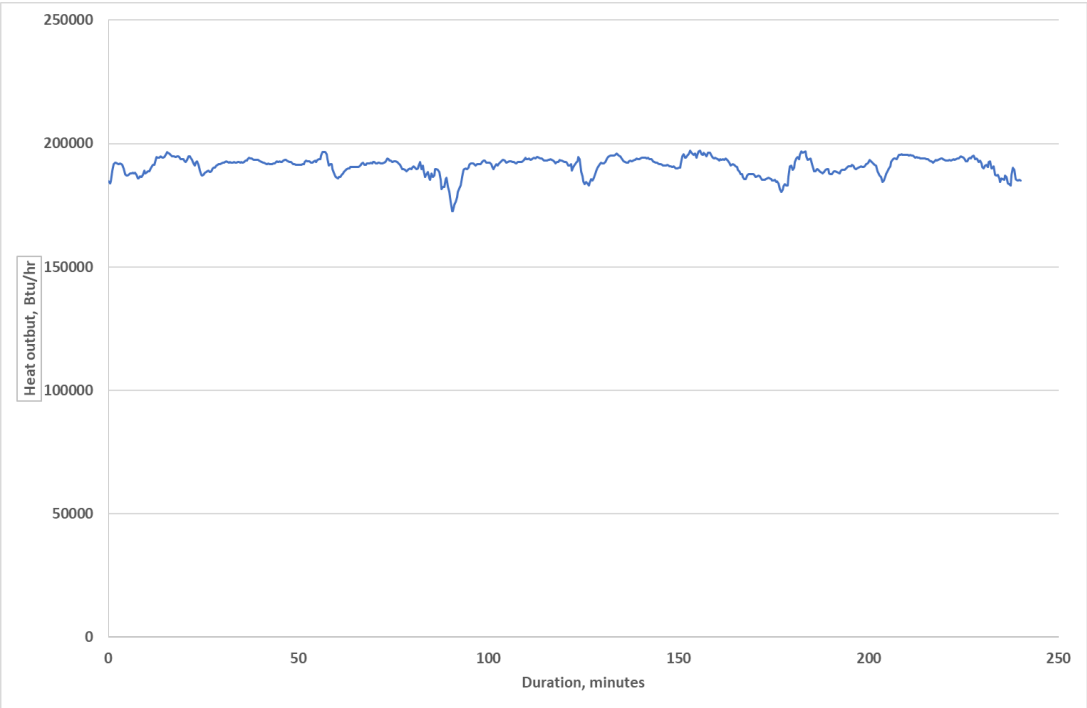


Figure 2 b. Heat output Category IV run 2

Appendix 2

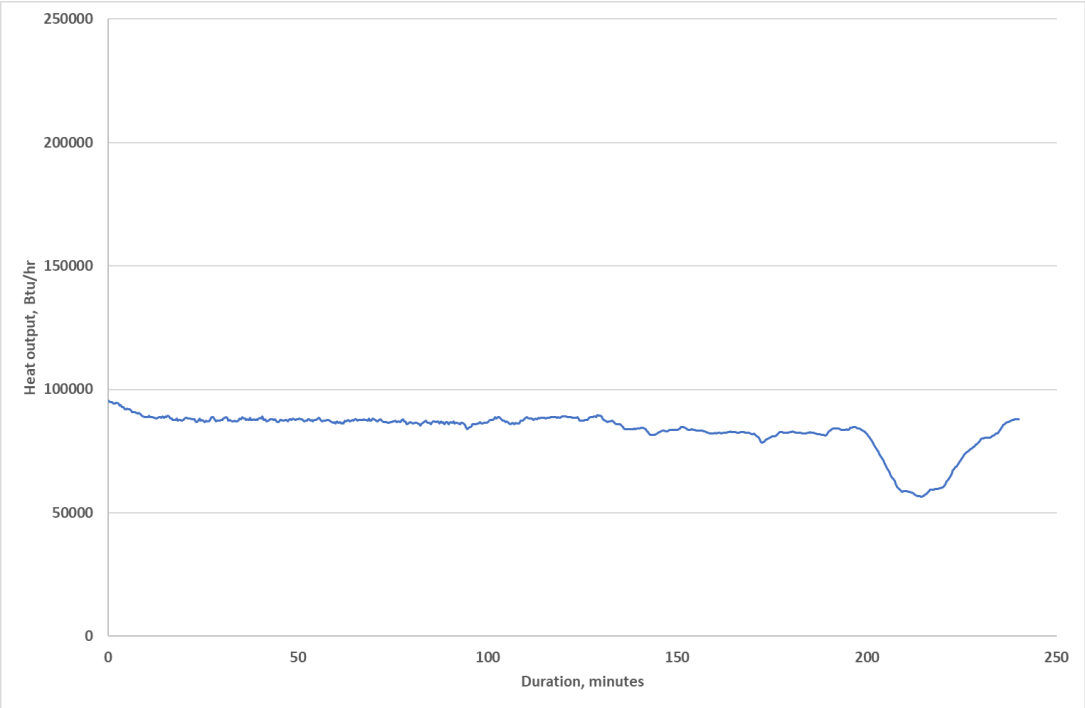


Figure 2 c. Heat output Category III run 1

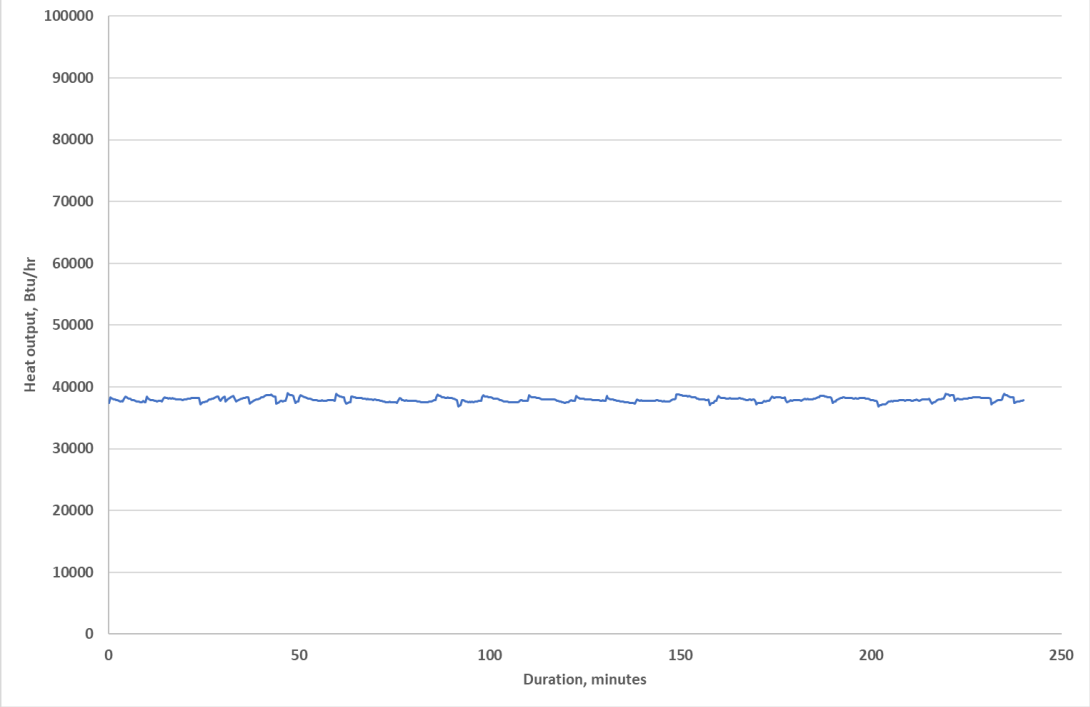


Figure 2 d. Heat output Category II run 1

Appendix 2

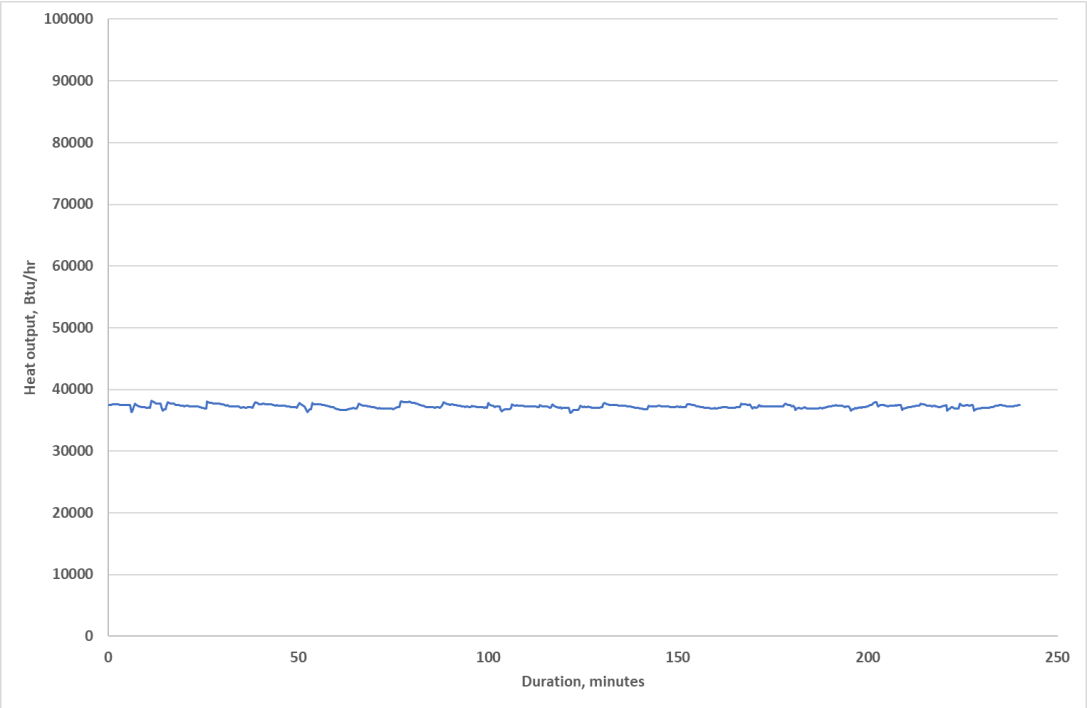


Figure 2 e. Heat output Category II run 2

Figure 2f and 2g shows the stopped combustion in category I.

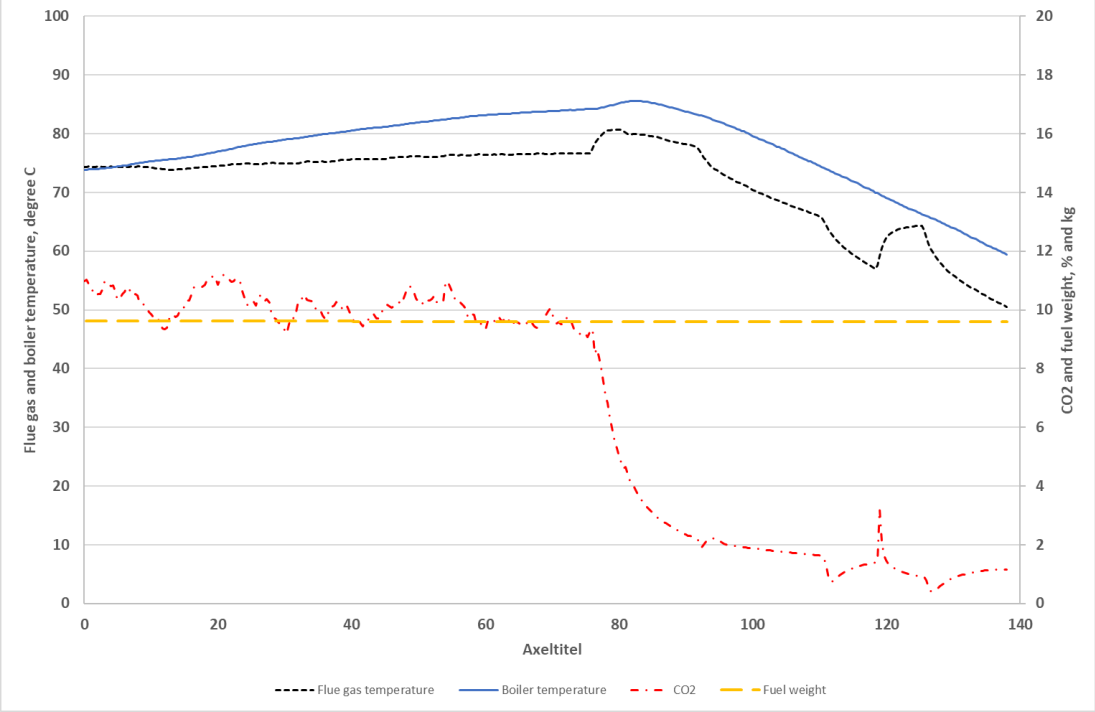


Figure 2 f. Heat output Category I run 1. Stopped combustion

Appendix 2

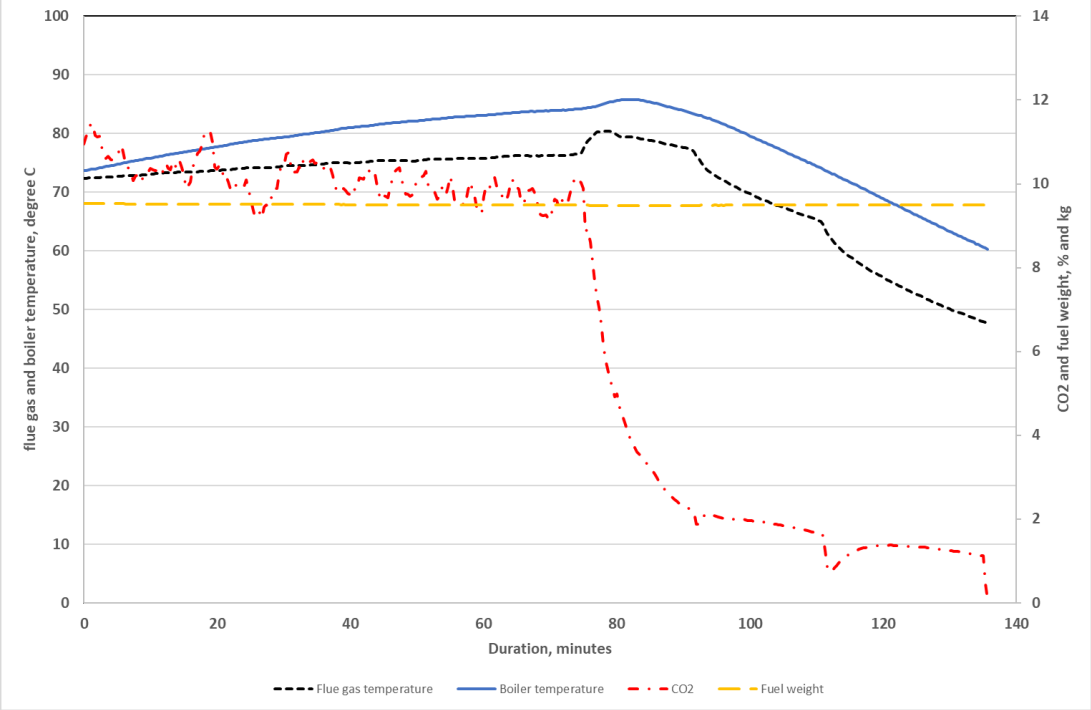


Figure 2 g. Heat output Category I run 2. Stopped combustion

Appendix 3

Dilution tunnel velocity traverse measurement

The dilution tunnel inside diameter was 160 mm (6.3 inch) and cross sectional area was 0.02 m^2 (0.22 ft^2).

Table 10. Dilution tunnel traverse

Traverse point	% of diameter (160 mm)	Temperature, °C (F)	Velocity, m/s
Y1	6.7	20.8	8.76
Y2	25.0	20.8	9.39
Centre	50.0	20.8	9.98
Y3	75.0	20.8	9.69
Y4	93.3	20.8	8.50
X1	6.7	20.8	8.66
X2	25.0	20.8	9.28
Centre	50.0	20.8	9.86
X3	75.0	20.8	9.52
X4	93.3	20.8	8.18
V_{strav}, average (Y + X)	-	-	9.00
V_{scent}, average (Centre)	-	-	9.92

$$F_p = \frac{Vstrav}{Vscent} = \frac{9.00}{9.92} = 0.907$$

The F_p factor has been included in the calculations of the particulate results.

Appendix 4

Sampling equipment leakage check

The leakage check of the sampling trains were performed at a vacuum of 380 mm Hg (0.5 bar). This vacuum was not exceeded during the test periods.

Table 11a. Category IV run 2

	Leakage rate m^3/min		**Requirement, 0.0003 m^3/min**
	Pre-test	Post-test	
Sampling train 1	0.0001	0.0001	OK
Sampling train 2	0.0002	0.0002	OK
Sampling train 3	0.0000	0.0000	OK
Ambient train	0.00025	0.00025	OK

Table 11b. Category III

	Leakage rate m^3/min		**Requirement, 0.0003 m^3/min**
	Pre-test	Post-test	
Sampling train 1	0.00015	0.00020	OK
Sampling train 2	0.00020	0.00005	OK
Sampling train 3	0.0001	0.0000	OK
Ambient train	0.0002	0.0002	OK

Table 11c. Category II run 1

	Leakage rate m^3/min		**Requirement, 0.0003 m^3/min**
	Pre-test	Post-test	
Sampling train 1	0.0001	0.0001	OK
Sampling train 2	0.00025	0.0002	OK
Sampling train 3	0.0002	<0.0001	OK
Ambient train	0.0002	0.0002	OK

Table 11d. Category II run 2

	Leakage rate m^3/min		**Requirement, 0.0003 m^3/min**
	Pre-test	Post-test	
Sampling train 1	0.00015	0.0002	OK
Sampling train 2	0.0001	0.00025	OK
Sampling train 3	0.0001	0.0000	OK
Ambient train	0.0002	0.0002	OK

Appendix 5

Table 12a to 12h shows the proportional rate variation of the sampling trains.

Table 12a. Category IV run 2 sampling train 1

PROBE 1 Cat IV run 2, 21-01-2020																						
		i 1	i 2	i 3	i 4	i 5	i 9	i 10	i 11	i 12	i 13	i 14	i 15	i 16	i 17	i 18	i 19	i 20	i 21	i22	i 23
Time total, minute	Θ	240,00	240,00	240,00	240,00	240,00	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,06	0,05	0,07	0,07	0,09	0,058	0,0575	0,074	0,04	0,0573	0,0567	0,057	0,0573	0,1417	0,0565	0,0565	0,113	0,0845	0,0565	0,0565
Average gas velocity in tunnel, m/s	V_s	9,39	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386
Absolute average dry gas meter temperature, K	T_m	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91	293,91
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	307,51	307,59	307,52	307,52	307,49	307,49	307,5	307,524	307,489	307,63	307,6	307,6	307,72	307,639	307,584	307,692	307,61	307,6	307,5	307,43
Volume of gas sample total, m^3	V_m	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36	1,36
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,37	9,39	9,39	9,39	9,39	9,3834	9,387	9,3814	9,3804	9,38	9,3841	9,3805	9,384	9,3868	9,386	9,381	9,3866	9,3861	9,3906	9,396
Absolute average gas temperature in tunnel (pitot), K	T_s	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,74	293,74	293,74	293,74	293,74	293,74	293,74	293,75	293,19	293,83	293,86	293,9	293,94	294	294,04	294,06	294,1	294,12	294,12	294,138
Actual time when reading, minute	Θ_i	11,00	9	12	12	16	10	10	13	7	10	10	10	10	25	10	10	20	15	10	10
Results		92	102	102	102	100	102	102	100	101	101	100	101	101	100	100	100	100	99	100	100
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110
Fail/ok		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Requirement 2		80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120

Table 12b. Category IV run 2 sampling train 2 and 3

PROBE 2 and 3 Cat IV run 2, 21-01-2020																						
		Probe 2	Probe 2	Probe 2	Probe 2	Probe 2	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3
		i 1	i 2	i 3	i 4	i 5	i 1	i 2	i 3	i 4	i 5	i 6	i 7	i 8	i 9	i 10	i 11	i 12	i 13	i 14	i 15	
Time total, minute	Θ	60,00	60,00	60,00	60,00	60,00	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	178,34	
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,07	0,06	0,07	0,06	0,08	0,05	0,051	0,0655	0,0373	0,053	0,0532	0,0528	0,0527	0,1315	0,053	0,052	0,1048	0,0782	0,052	0,0522	
Average gas velocity in tunnel, m/s	V_s	9,39	9,39	9,39	9,39	9,39	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	9,386	
Absolute average dry gas meter temperature, K	T_m	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	300,80	
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	307,51	307,59	307,52	307,52	307,49	307,49	307,5	307,524	307,489	307,63	307,6	307,6	307,72	307,639	307,584	307,692	307,61	307,6	307,5	307,43	
Volume of gas sample total, m^3	V_m	0,34	0,34	0,34	0,34	0,34	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	0,9392	
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,37	9,39	9,39	9,39	9,39	9,3834	9,387	9,3814	9,3804	9,38	9,3841	9,3805	9,384	9,3868	9,386	9,381	9,3866	9,3861	9,3906	9,396	
Absolute average gas temperature in tunnel (pitot), K	T_s	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	307,57	
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,42	293,52	293,56	291,59	293,63	293,68	293,7	293,74	293,76	293,79	293,81	293,85	293,87	293,89	293,91	293,92	293,91	293,92	293,92	293,93	
Actual time when reading, minute	Θ_i	11	9	12	12	16	10	10	13	7	10	10	10	10	25	10	10	20	15	10	10	
Results		110	112	102	97	96	97	99	98	104	103	103	103	103	102	103	101	102	101	101	101	
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	
Fail/ok		ok	fail	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	
Requirement 2		80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	80 - 120	81 - 120	82 - 120	83 - 120	84 - 120	80 - 120	
Fail 2/ok			ok																			

Appendix 5

Table 12 c. Category III, sampling train 1

PROBE 1 Cat III, 10-12-2019																						
		i 1	i 2	i 3	i 4	i 5	i 6	i 9	i 10	i 11	i 12	i 13	i 14	i 15	i 16	i 17	i 18	i 19	i 20	i 21	i 22
Time total, minute	Θ	240,00	240,00	240,00	240,00	240,00	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,05	0,08	0,06	0,06	0,05	0,07	0,055	0,0655	0,0553	0,0607	0,0545	0,0775	0,055	0,055	0,101	0,0935	0,066	0,06	0,0605	0,0823
Average gas velocity in tunnel, m/s	V_s	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43
Absolute average dry gas meter temperature, K	T_m	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	299,34	299,31	299,28	299,32	299,34	299,34	299,34	299,31	299,11	298,35	298,78	298,88	298,85	298,72	298,65	298,6	297,61	297,68	298,27	298,37
Volume of gas sample total, m^3	V_m	1,32	1,32	1,32	1,32	1,32	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186	1,3186
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,43	9,42	9,43	9,43	9,43	9,43	9,428	9,428	9,433	9,45	9,44	9,448	9,44	9,44	9,44	9,429	9,44	9,449	9,41	9,41
Absolute average gas temperature in tunnel (pitot), K	T_s	298,80	298,80	298,80	298,80	298,80	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,39	293,35	293,34	293,37	293,40	293,40	293,47	293,48	293,48	293,49	293,47	293,447	293,42	293,401	293,37	293,36	293,33	293,32	293,28	293,211
Actual time when reading, minute	Θ_i	10	15	10	10	10	12	10	12	10	11	10	14	10	10	19	17	12	11	11	15
Results		99	100	101	100	99	109	100	100	101	100	99	101	100	100	97	100	100	99	100	100
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	91-110	92-110	93-110	94-110	95-110
Fail/ok		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Requirement 2		80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	81-120	82-120	83-120	84-120	85-120

Table 12d. Category III, sampling trains 2 and 3

PROBE 2 Cat III, 10-12-2019																						
		Probe 2	Probe 2	Probe 2	Probe 2	Probe 2	Probe 2	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3
		i 1	i 2	i 3	i 4	i 5	i 6	i1	i 9	i 10	i 11	i 12	i 13	i 14	i 15	i 16	i 17	i 18	i 19	i 20	i 21	i22
Time total, minute	Θ	60,00	60,00	60,00	60,00	60,00	60,00	178	178	178	178	178	178	178	178	178	178	178	178	178	178	178
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,05	0,08	0,06	0,06	0,06	0,03	0,033	0,056	0,067	0,056	0,062	0,0555	0,079	0,0563	0,056	0,1062	0,0958	0,0672	0,0615	0,0615	0,0839
Average gas velocity in tunnel, m/s	V_s	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,43
Absolute average dry gas meter temperature, K	T_m	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42	293,42
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	299,34	299,31	299,28	299,32	299,34	299,36	299,33	299,34	299,31	299,11	298,35	298,78	298,88	298,85	298,72	298,65	298,6	297,61	297,68	298,27	298,27
Volume of gas sample total, m^3	V_m	0,33	0,33	0,33	0,33	0,33	0,33	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969	0,9969
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,43	9,42	9,43	9,43	9,43	9,426	9,4277	9,428	9,428	9,433	9,45	9,44	9,448	9,44	9,44	9,44	9,429	9,44	9,449	9,41	9,41
Absolute average gas temperature in tunnel (pitot), K	T_s	298,80	298,80	298,80	298,80	298,80	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8	298,8
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,46	293,50	293,56	293,63	293,71	293,76	293,78	293,814	293,88	293,95	294	294,039	294,063	294,08	294,08	294,07	294,051	294	293,98	293,93	293,93
Actual time when reading, minute	Θ_i	10	15	10	10	10	5	6	10	12	10	11	10	14	10	10	19	17	12	11	11	15
Results		91	99	103	103	103	106	98	100	100	100	100	99	100	100	100	99	100	99	99	100	100
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	91-110	92-110	93-110	94-110	95-110
Fail/ok		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Requirement 2		80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	81-120	82-120	83-120	84-120	

Appendix 5

Table 12e. Category II run 1, sampling train 1

PROBE 1 Cat II, run 1, 11-12-2019																							
		i 1	i 2	i 4	i 5	i 6	i 7	i 8	i 9	i 10	i 11	i 12	i 13	i 14	i 15	i 16	i 17	i 18	i 19	i 20	i 21	i 22
Time total, minute	Θ	240,00	240,00	240,00	240,00	240,00	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,05	0,05	0,09	0,07	0,05	0,06	0,05	0,05	0,08	0,05	0,05	0,06	0,06	0,06	0,08	0,05	0,05	0,05	0,05	0,06	0,06
Average gas velocity in tunnel, m/s	V_s	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42
Absolute average dry gas meter temperature, K	T_m	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	296,03	296,21	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58	296,58
Volume of gas sample total, m^3	V_m	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21	1,21
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,42	9,40	9,42	9,40	9,41	9,39	9,39	9,39	9,4	9,43	9,42	9,38	9,42	9,42	9,44	9,44	9,42	9,44	9,42	9,41	9,41
Absolute average gas temperature in tunnel (pitot), K	T_s	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,43	293,51	293,56	293,37	293,40	293,40	293,47	293,48	293,48	293,49	293,47	293,47	293,447	293,42	293,401	293,37	293,36	293,33	293,32	293,28	293,211
Actual time when reading, minute	Θ_i	11	10	19	15	10	11	10	10	14	10	11	11	11	11	15	10	10	10	10	10	11
Results		96	95	96	90	96	101	101	102	109	91	99	103	102	104	100	108	94	101	101	110	110
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	91-110	92-110	93-110	94-110	95-110
Fail/ok		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Requirement 2		80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	81-120	82-120	83-120	84-120	85-120
Fail 2/ok																						

Table 12f. Category II run 1, sampling trains 2 and 3

PROBE 2 and 3 Cat II, run 1, 11-12-2019																						
		Probe 2	Probe 2	Probe 2	Probe 2	Probe 2	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3
		i 1	i 2	i 3	i 4	i 5	i1	i2	i3	i4	i5	i6	i7	i8	i9	i10	i11	i12	i13	i14	i15	
Time total, minute	Θ	61,00	61,00	61,00	61,00	61,00	177	177	177	177	177	177	177	177	177	177	177	177	177	177	177	
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,06	0,05	0,09	0,07	0,03	0,0634	0,0485	0,049	0,0735	0,044	0,0525	0,108	0,055	0,0725	0,05	0,0473	0,0482	0,049	0,0485	0,0535	
Average gas velocity in tunnel, m/s	V_s	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	9,42	
Absolute average dry gas meter temperature, K	T_m	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	293,70	
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	296,03	296,03	296,03	296,03	296,03	296,03	296,43	296,03	296,03	296,23	296,03	296,03	296,03	296,03	296,03	296,03	296,03	296,03	296,03	296,03	
Volume of gas sample total, m^3	V_m	0,30	0,30	0,30	0,30	0,30	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	0,8629	
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,43	9,42	9,43	9,43	9,43	9,43	9,43	9,43	9,43	9,45	9,44	9,448	9,44	9,44	9,44	9,429	9,44	9,449	9,41	9,41	
Absolute average gas temperature in tunnel (pitot), K	T_s	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	296,08	
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,46	293,50	293,56	293,63	293,71	293,78	293,814	293,88	293,95	294	294,039	294,063	294,08	294,08	294,07	294,051	294	293,98	293,93	293,93	
Actual time when reading, minute	Θ_i	11	10	19	15	6	13	10	10	14	10	11	22	11	15	10	10	10	10	10	11	
Results		109	103	95	97	101	100	99	100	107	90	98	100	102	99	102	97	99	100	99	100	
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	
Fail/ok		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	
Requirement 2		80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	
Fail 2/ok																						

Appendix 5

Table 12g. Category II run 2, sampling train 1

PROBE 1 Cat II run 2, 12-12-2019																								
		i 1	i 2	i 3	i 4	i 5	i 6	i 1	1	i 3	i 4	i 5	i 6	i 7	i 8	i 9	i 10	i 11	i 12	i 13	i 15	i 16		
Time total, minute	Θ	240,00	240,00	240,00	240,00	240,00	240,00	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240		
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,05	0,05	0,07	0,05	0,05	0,06	0,06	0,05	0,09	0,08	0,05	0,09	0,05	0,05	0,05	0,06	0,08	0,05	0,05	0,05	0,06		
Average gas velocity in tunnel, m/s	V_s	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37		
Absolute average dry gas meter temperature, K	T_m	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64	293,64		
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	296,15	296,25	296,35	296,15	296,45	296,15	296,65	296,75	296,75	296,75	296,75	296,75	296,75	296,75	296,75	296,75	296,75	296,75	296,75	296,15	296,05		
Volume of gas sample total, m^3	V_m	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28	1,28		
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,39	9,39	9,40	9,39	9,39	9,40	9,38	9,39	9,4	9,39	9,36	9,35	9,34	9,33	9,34	9,35	9,35	9,35	9,34	9,34	9,37		
Absolute average gas temperature in tunnel (pitot), K	T_s	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14		
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,50	293,50	293,50	293,50	293,50	293,40	293,40	293,47	293,48	293,48	293,49	293,47	293,47	293,447	293,42	293,401	293,37	293,7	293,7	293,8	293,8		
Actual time when reading, minute	Θ_i	10	10	12	10	10	12	10	10	17	15	10	17	10	10	10	12	14	10	10	10	11		
Results		91	100	108	92	102	101	103	100	100	101	100	101	101	101	101	100	101	100	101	99	101		
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	91-110	92-110	94-110	95-110		
Fail/ok		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok		
Requirement 2		80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	81-120	82-120	84-120	85-120		
Fail 2/ok																								

Table 12h. Category II run 2, sampling trains 2 and 3

PROBE 2 and 3 Cat II, run 2, 12-12-2019																								
		Probe 2	Probe 2	Probe 2	Probe 2	Probe 2	Probe 2	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3	Probe 3
		i 1	i 2	i 3	i 4	i 5	i 6	i1	i2	i3	i4	i5	i6	i7	i8	i9	i10	i11	i12	i13	i14	i15	i16	
Time total, minute	Θ	60,00	60,00	60,00	60,00	60,00	60,00	178	178	178	178	178	178	178	178	178	178	178	178	178	178	178	178	
Gas meter volume of gas sample during 10 min interval, m^3	V_{mi}	0,05	0,06	0,07	0,06	0,06	0,05	0,0118	0,059	0,1	0,0883	0,059	0,0555	0,0992	0,059	0,0588	0,0582	0,07	0,082	0,058	0,058	0,058	0,064	
Average gas velocity in tunnel, m/s	V_s	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	9,37	
Absolute average dry gas meter temperature, K	T_m	293,42	293,42	293,42	293,42	293,42	293,42	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	294,04	
Absolute average gas temperature in tunnel during 10 minute interval, K (pitot)	T_{si}	299,34	299,31	299,28	299,32	299,34	299,36	299,33	299,34	299,31	299,11	298,35	298,78	298,88	298,85	298,72	298,65	298,6	297,61	297,68	298,27	298,27	298,27	
Volume of gas sample total, m^3	V_m	0,35	0,35	0,35	0,35	0,35	0,35	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	1,0428	
Average gas velocity in tunnel for 10 min interval, m/s	V_{si}	9,39	9,39	9,40	9,39	9,39	9,40	9,38	9,39	9,40	9,39	9,36	9,35	9,34	9,33	9,34	9,35	9,35	9,35	9,34	9,34	9,37	9,37	
Absolute average gas temperature in tunnel (pitot), K	T_s	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	296,14	
Absolute average dry gas meter temperature during 10 minute interval, K (probe i)	T_{mi}	293,46	293,50	293,56	293,63	293,71	293,76	293,78	293,814	293,88	293,95	294	294,039	294,063	294,08	294,08	294,07	294,051	294	293,98	293,93	293,93	293,93	
Actual time when reading, minute	Θ_i	10	10	12	10	10	8	2	10	17	15	10	10	17	10	10	10	12	14	10	10	10	11	
Results		93	102	103	102	102	102	102	102	101	101	102	96	101	102	102	100	101	101	100	100	100	100	
Requirement		90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	90-110	91-110	92-110	93-110	94-110	95-110	96-110	
Fail/ok		ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	
Requirement 2		80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	80-120	
Fail 2/ok																								

Appendix 6

Weight from filter, gasket and rinse

The tables below show the results from the filter, gasket and rinse weighting. The filters and gasket have been weighted in pairs. The underlined values have been used in the calculation.

Table 13 a: Filter weights.

Test Cat:	Filter nr. Probe nr.	Pre-weight 1 g (date, RH %)	Pre-weight 2 g (date, RH %)	Post-weight 1 g (date, RH %)	Post-weight 2 g (date, RH %)
IV Run 1	AF1 (filter)	0.08360 (06/12/19, 35)	0.08360 (09/12/19, 30)	0.08360 (10/12/19, 32)	0.08359 (11/12/19, 32)
IV Run 1	F1, probe 1 (front+back)	0.16515 (06/12/19, 35)	0.16513 (09/12/19, 30)	0.16428 (10/12/19, 32)	0.16426 (10/12/19, +6 h, 32)
IV Run 1	F2, probe 2 (front+back)	0.16670 (06/12/19, 35)	0.16669 (09/12/19, 31)	0.16621 (10/12/19, 30)	0.16626 (11/12/20, 32)
IV Run 1	F3, probe 3 (front+back)	0.16613 (06/12/19, 35)	0.16610 (09/12/19, 31)	0.16763 (10/12/19, 30)	0.16767 (11/12/19, 30)
IV Run 2	AF1 (filter)	0.08384 (20/01/20, 28	0.08384 (21/01/20, 32)	0.08383 (22/01/20, 26)	0.08386 (23/01/20, 22)
IV Run 2	F1, probe 1 (front+back)	0.16708 (20/01/20, 28)	0.16708 (21/01/20, 32)	0.16918 (22/01/20, 26)	0.16916 (23/01/20, 22)
IV Run 2	F2, probe 2 (front+back)	0.16698 (20/01/20, 28)	0.16698 (21/01/20, 32)	0.16745 (22/01/20, 26)	0.16745 (23/01/20, 22)
IV Run 2	F3, probe 3 (front+back)	0.16728 (20/01/20, 28)	0.16729 (21/01/20, 32)	0.16628 (22/01/20, 26)	0.16625 (23/01/20, 22)
III	AF2 (filter)	0.08250 (06/12/19, 35)	0.08248 (10/12/19, 22)	0.08250 (11/12/19, 30)	0.08248 (12/12/19, 27)
III	F4, probe 1 (front/back)	0.16600 (06/12/19, 35)	0.16599 (06/12/19, 22)	0.16669 (11/12/19, 30)	0.16667 (12/12/19,27)
III	F5, probe 2 (front/back)	0.16778 (06/12/19, 35)	0.16774 (06/12/19, 22)	0.16790 (11/12/19, 30)	0.16790 (12/12/19,27)
III	F6, probe 3 (front/back)	0.16981 (06/12/19, 35)	0.16981 (06/12/19, 22)	0.17028 (11/12/19, 30)	0.17028 (12/12/19,27)
II Run 1	AF3 (filter)	0.08741 (10/12/19, 24)	0.08742 (11/12/19, 25)	0.08745 (16/12/19, 31)	0.08744 (17/12/19 31)
II Run 1	F7, probe 1 (front/back)	0.17387 (10/12/19, 24)	0.17388 (11/12/19, 25)	0.17533 (16/12/19, 28)	0.17534 (17/12/19, 31)
II Run 1	F8, probe 2 (front/back)	0.17359 (10/12/19, 24)	0.17361 (11/12/19, 25)	0.17391 (17/12/19, 31)	0.17390 (23/12/19, 24)
II Run 1	F9, probe 3 (front/back)	0.17291 (10/12/19, 24)	0.17292 (11/12/19, 25)	0.17386 (16/12/19, 28)	0.17388 (17/12/19, 28)
II Run 2	AF4 (filter)	0.08622 (11/12/19, 27)	0.08623 (12/12/19, 29)	0.08627 (16/12/19, 28)	0.08627 (17/12/19, 31)
II Run 2	F10, probe 1 (front/back)	0.17227 (11/12/19, 27)	0.17227 (12/12/19, 29)	0.17419 (16/12/19, 27)	0.17421 (17/12/19, 31)
II Run 2	F11, probe 3 (front/back)	0.17203 (11/12/19, 27)	0.17208 (12/12/19, 29)	0.17245 (16/12/19, 27)	0.17246 (17/12/19, 31)
II Run 2	F12, probe 2 (front/back)	0.17219 (11/12/19, 27)	0.17221 (12/12/19, 29)	0.17386 (16/12/19, 27)	0.17387 (17/12/19, 31)

	Blank filter	0.24935	0.24935	0.24932	0.24931

Table 13 b: Gasket weights

Test Cat.	Gasket nr. Probe nr.	Pre-weight 1 g (date)	Pre-weight 2 g (date)	Post-weight 1 g (date)	Post-weight 2 g (date)
IV Run 1	AG1 (gasket)	2.50072 (06/12/19)	2.50069 (09/12/19)	2.50070 (10/12/19)	2.50074 (11/12/19)
IV Run 1	G1, probe 1 (front/back)	4.89165 (06/12/19)	4.89166 (09/12/19)	4.89447 (10/12/19)	4.89446 (10/12/19, +6 h)
IV Run 1	G2, probe 2 (front/back)	4.36238 (06/12/19)	4.36237 (06/12/19)	4.36327 (10/12/19)	4.36319 (11/12/19)
IV Run 1	G3, probe 3 (front/back)	4.99757 (06/12/19)	4.99761 (06/12/19)	4.99766 (10/12/19)	4.99768 (11/12/19)
IV Run 2	AG1 (gasket)	2.50072 (20/01/20)	2.50073 (21/01/20)	2.50073 (22/01/20)	2.50070 (23/01/20)
IV Run 2	G1, probe 1 (front/back)	4.99754 (20/01/20)	4.99759 (21/01/20)	4.99766 (22/01/20)	4.99761 (23/01/20)
IV Run 2	G2, probe 2 (front/back)	4.89159 (20/01/20)	4.89163 (21/01/20)	4.89169 (22/01/20)	4.89165 (23/01/20)
IV Run 2	G3, probe 3 (front/back)	4.36254 (20/01/20)	4.36254 (21/01/20)	4.36524 (22/01/20)	4.36517 (23/01/20)
III	AG2 (gasket)	2.44549 (06/12/19)	2.44545 (10/12/19)	2.44554 (11/12/19)	2.44558 (12/12/19)
III	G4, probe 1 (front/back)	5.02661 (06/12/19)	5.02650 (10/12/19)	5.02668 (11/12/19)	5.02674 (12/12/19)
III	G5, probe 2 (front/back)	4.95004 (06/12/19)	4.94995 (10/12/19)	4.95012 (11/12/19)	4.95018 (12/12/19)
III	G6, probe 3 (front/back)	5.01204 (06/12/19)	5.01195 (10/12/19)	5.01217 (11/12/19)	5.01223 (12/12/19)
II Run 1	AG3 (gasket)	2.44606 (06/12/19)	2.44605 (10/12/19)	2.44613 (12/12/19)	2.44608 (16/12/19)
II Run 1	G7, probe 1 (front/back)	4.31856 (06/12/19)	4.31859 (11/12/19)	4.31879 (16/12/19)	4.31881 (17/12/19)
II Run 1	G8, probe 2 (front/back)	4.91052 (06/12/19)	4.91057 (11/12/19)	4.91063 (17/12/19)	4.91062 (23/12/19)
II Run 1	G9, probe 3 (front/back)	4.91444 (06/12/19)	4.91449 (11/12/19)	4.91469 (16/12/19)	4.91468 (17/12/19)
II Run 2	AG4 (gasket)	2.48800 (11/12/19)	2.48799 (12/12/19)	2.48803 (16/12/19)	2.48803 (17/12/19)
II Run 2	G10, probe 1 (front/back)	4.89164 (11/12/19)	4.89164 (12/12/19)	4.89167 (16/12/19)	4.89168 (17/12/19)
II Run 2	G11, probe 3 (front/back)	4.99763 (11/12/19)	4.99764 (12/12/19)	4.99764 (16/12/19)	4.99765 (17/12/19)
II Run 2	G12, probe 2 (front/back)	4.36227 (11/12/19)	4.36224 (12/12/19)	4.36266 (16/12/19)	4.36266 (17/12/19)

Appendix 6

	Blank gasket	5.02663	5.02669	5.02668	5.02669

Table 13 c: Probe rinse weights.

Test Cat.	Rinse nr. container Probe nr.	Pre-weight 1 container, g (date)	Pre-weight 2 container, g (date)	Post-weight 1 (cont.+rinse), g (date)	Post-weight 2 (cont.+rinse), g (date)
IV Run 1	R1 Probe 1	45.07827 (06/12/19)	45.07845 (09/12/19)	45.07840 (10/12/19)	45.07830 (11/12/19)
IV Run 1	R2 Probe 2	48.85328 (06/12/19)	48.85333 (09/12/19)	48.85358 (10/12/19)	48.85365 (11/12/19)
IV Run 1	R3 Probe 3	41.92178 (06/12/19)	41.92195 (09/12/19)	41.92152 (10/12/19)	41.92164 (16/12/19)
IV Run 2	R1 Probe 1	45.07837 (20/01/20)	45.07885 (21/01/20)	45.07909 (24/01/20)	45.07918 (24/01/20, +6h)
IV Run 2	R2 Probe 2	48.85345 (20/01/20)	48.85378 (21/01/20)	48.85416 (24/01/20)	48.85410 (24/01/20, +6h)
IV Run 2	R3 Probe 3	41.92155 (20/01/20)	41.92189 (21/01/20)	41.92247 (24/01/20)	41.92246 (24/01/20, +6h)
III	R4 Probe 1	41.59285 (06/12/19)	41.59265 (10/12/19)	41.59311 (11/12/19)	41.59300 (16/12/19)
III	R5 Probe 2	39.70438 (06/12/19)	39.70420 (10/12/19)	39.70458 (11/12/19)	39.70468 (17/12/18)
III	R6 Probe 3	46.30949 (06/12/19)	46.30948 (10/12/19)	46.30952 (11/12/19)	46.30954 (17/12/19)
II Run 1	R7 Probe 1	46.84380 (06/12/19)	46.84390 (11/12/19)	46.84414 (17/12/19)	48.84425 (23/12/19)
II Run 1	R8 Probe 2	47.94170 (06/12/19)	47.94171 (11/12/19)	47.94188 (17/12/19)	47.94188 (23/12/19)
II Run 1	R9 Probe 3	46.94288 (06/12/19)	46.94311 (11/12/19)	46.94321 (17/12/19)	46.94327 (23/12/19)
II Run 2	R10 Probe 1	45.24907 (11/12/19)	45.24916 (12/12/19)	45.24943 (16/12/19)	45.24941 (17/12/19)
II Run 2	R11 Probe 2	46.06572 (11/12/19)	46.06581 (12/12/19)	46.06588 (17/12/19)	46.06602 (23/12/19)
II Run 2	R12 Probe 3	45.07869 (11/12/19)	45.07878 (12/12/19)	45.07850 (17/12/19)	45.07869 (23/12/19)
	Aceton blank	16.07834	16.07839	16.07841	16.07838

Appendix 7

Technician notes

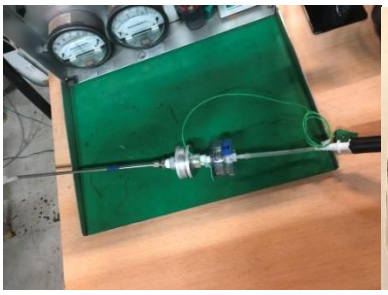
Logg Pellematic 56, 2019/2020

-Calibrated weight (20 kg) put on the scale including boiler: 975,7 kg + 20 kg = 995,7 kg

-Dilution tunnel induced static pressure at the boiler: 10 m/s = 0,9 Pa

- Moisture content in pellets on dry fuel base: (928-369) - (893-369)/ (893-369)*100=**6.68 %**

- Sampling trains adjusted to a sample flow below 0,007 m^3/min



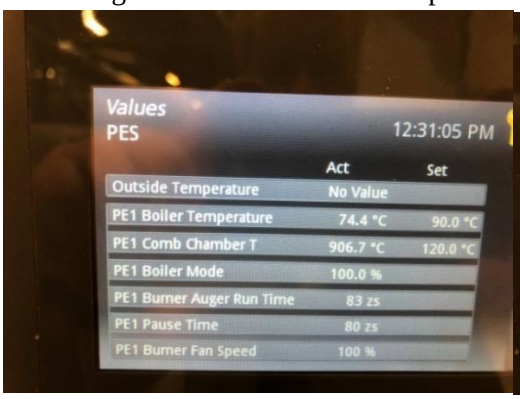
Probe

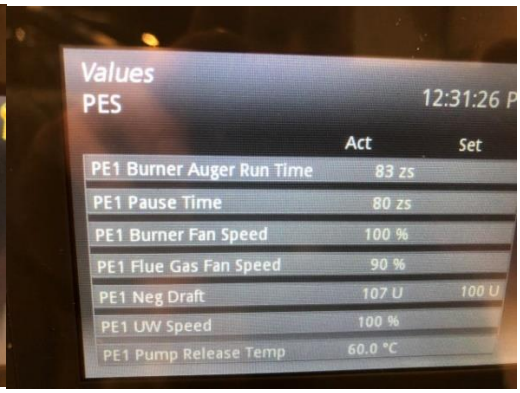
Filters

Boiler

Test day 1,Cat IV run 1, 2019-12-09

- Air velocity around the appliance: 0 - 0.05 m/s
- Boiler was electrical connected to 220 V and 60 Hz
- Static pressure induced by the draught = 0,9 Pa (at 10 m/s in the dilution tunnel)
- Settings on the boiler: boiler temperature = 72 °C





- Pstat in tunnel = 107.6 Pa

Test	Time, computer	Weight (scale), kg	Probe 2 (gas meter 202743)	Probe 1 (gas meter 901070)	Probe 3 (gas meter 202743)	Ambient	barometer/ humidity/ temp.	Comments
Start pre-burn test	10,00 130,00						968mbar/RH 45 %/19 C	Test category IV run 1
Start test 1 (probe 1+2)	130,17		F2, G2	F1,G1		AF1,AG1		Stop Probe 2 (1 hour)=190,17

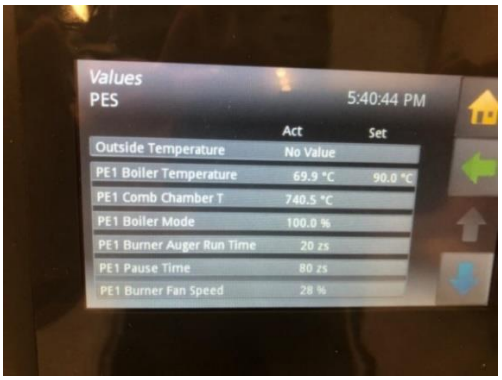
Appendix 7

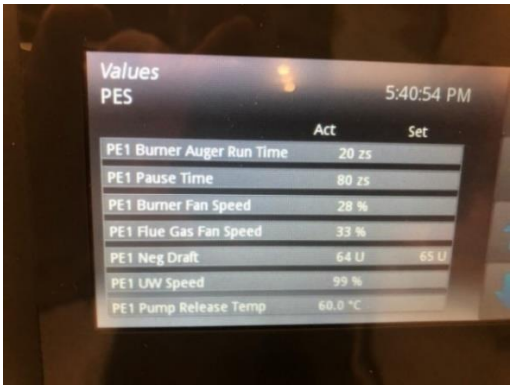
								Gas volume=0,3235 m^3
Start test probe 3	192,17				F3,G3			
End test	370,17	929,26					965/45 %/20	
Fault occurred	292-300							The boiler stopped suddenly. The boiler was re-started and the test was then completed.

Test day 2 2019-12-10

Cat III run 1

- Air velocity around the appliance: 0-0.05 m/s
- Static pressure in the chimney induced by the draught = 1.0 Pa
- Settings on the boiler: boiler temperature at 72 C.





- Pstat in tunnel = 107.6 Pa

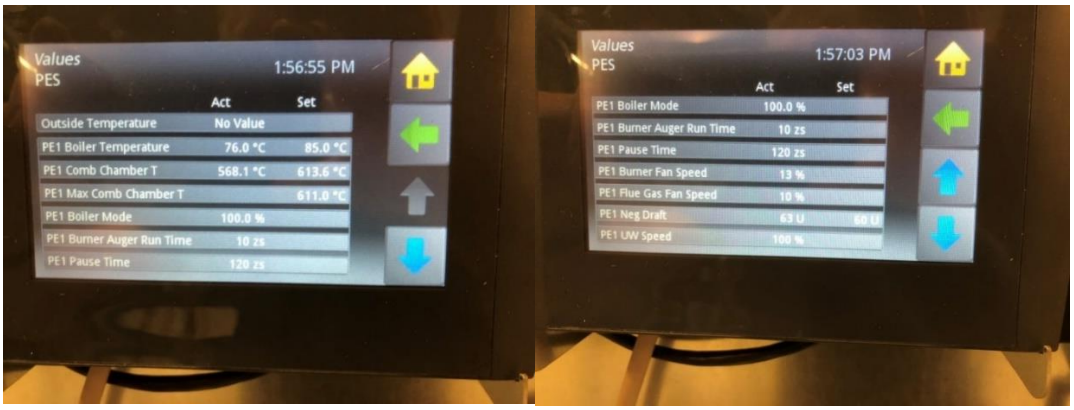
Test	Time, computer	Weight (scale), kg	Probe 2 (gas meter 202743)	Probe 1 (gas meter 901070)	Probe 3 (gas meter 202743)	Ambient	barometer/ humidity/ temp.	Comments
Start pre-burn test	3,17						993/38%/20	Test category III run 1
Start test 1 (probe 1+2)	123,17	977,26	F5,G5	F4,G4		AF2, AG2		Stop Probe 3 (1 hour)=183,17
Start test probe 3	185,17				F6,G6			
End test	363,17	956,26					990/38%/20	

Test day 3 2019-12-11

Cat II run 1

- Air velocity around the appliance: 0-0.05 m/s
- Static induced by the draught = 1.0 Pa
- Settings on the boiler: boiler temperature at 72 C.

Appendix 7



- Pstat in tunnel = 108,8 Pa

Test	Time computer	Weight (scale), kg	Probe 2 (gas meter 202743)	Probe 1 (gas meter 901070)	Probe 3 (gas meter 202743)	(200721) Ambient	barometer/ humidity/ temp.	Comments
Start pre-burn test 1	0,00	948,48					981 mbar/46 %/21 C	Test category II run 1
Start test 1 (probe 2+3)	120,17	973,56	F8, G8	F7,G7		AG3, AF3		Stop Probe 2 (1 hour) =181,17
Start test probe 3	183,17				F9,G9			
End test 1	360,17							

Test day 3 2019-12-11

Cat I run 1

- Air velocity around the appliance: 0 - 0.05 m/s
- Static induced by the draught = 1.0 Pa
- Settings on the boiler: boiler temperature at 72 C.
- Pstat in tunnel = 108,8 Pa

Test	Time, computer	Weight (scale), kg	Probe 1 (gas meter 202743)	Probe 2 (gas meter 901070)	Probe 3 (gas meter 901070)	Ambient	barometer/ humidity/ temp.	Comments
Start pre-burn test 1	0,00						991 mbar/42 %	Test category I run 1
Stopped combustion	78,17	959,16 kg						The boiler reached the switch off temperature (84 C) at minute 78,17 (computer time).
Still switched off	138,17	960.98 kg					991 mbar/42 %	The boiler did not switch on after one hour of switch off.

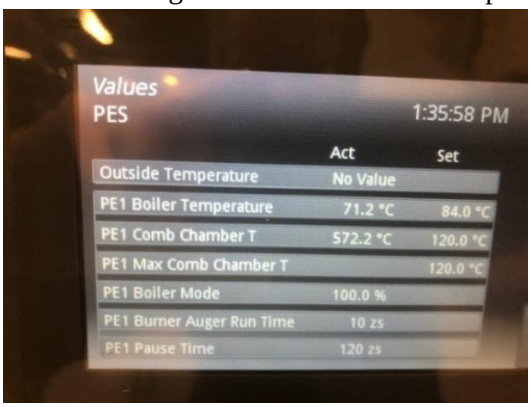
The boiler was not able to run at category I (equal or less than 15 % of rated output). The boiler has a temperature limiter switch off at 84 C (183 F). The scale was increasing due to the temperature decrease in the boiler.

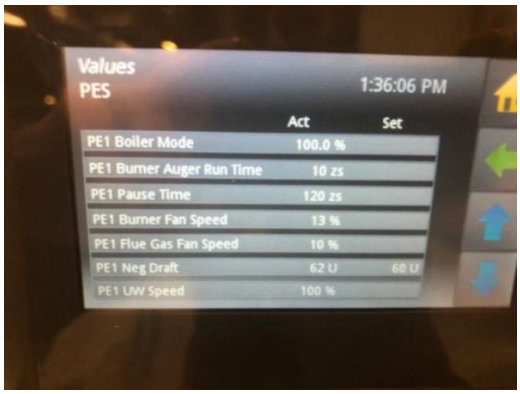
Appendix 7

Test day 4 2019-12-12

Cat II run 2

- Air velocity around the appliance: 0- 0.05 m/s
- Static induced by the draught = 0.9 Pa
- Settings on the boiler: boiler temperature at 72 C.





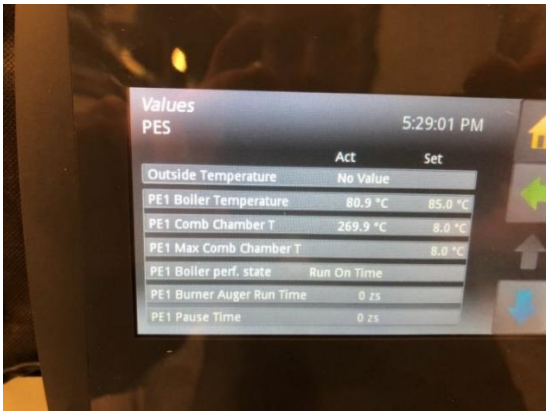
- Pstat in tunnel = 108.4 Pa

Test	Time, computer	Weight (scale), kg	Probe 2 gas meter 202743	Probe 1 gas meter 901070	Probe 3 gas meter 202743	Ambient 200721	barometer/ humidity/ temp.	Comments
Start pre-burn test 1	0,00	968.48				AF4, AG4	976 mbar/46 %/19 C	Test category II run 2
Start test 1 (probe 1+2)	120,17	962.97	F11, G11	F10,G10				Stop Probe 2 (1 hour)=180,17
Start test probe 3	182,17				F12,G12			
End test 1	360,17	953,47					978 mbar/45 %/19 C	

Test day 4 2019-12-12

Cat I run 2

- Air velocity around the appliance: 0 - 0.05 m/s
- Static induced by the draught = 1.0 Pa
- Settings on the boiler: boiler temperature at 72 C.



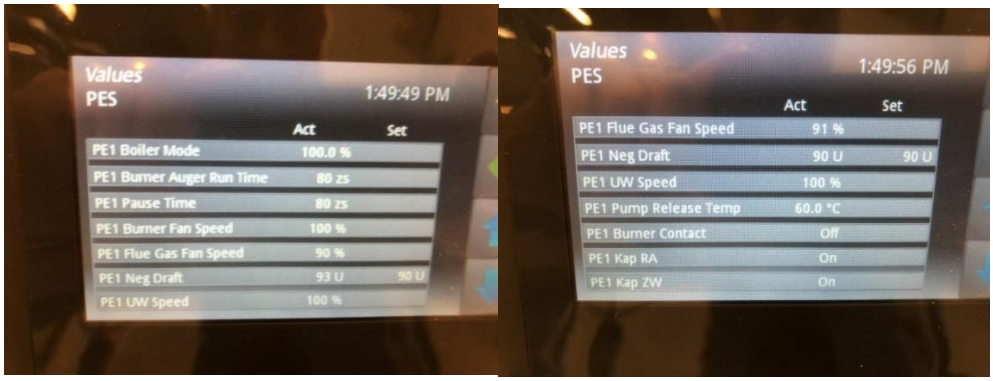
- Pstat in tunnel = 108,8 Pa

Test	Time computer	Weight (scale), kg	Probe 1 (gas meter 202743)	Probe 2 (gas meter 901070)	Probe 3 (gas meter 901070)	Ambient	barometer/ humidity/ temp.	Comments
Start pre-burn test 1	0,00						991 mbar/42 %	Test category I run 1
Stopped combustion	74.83	948.76 kg						The boiler reached the switch off temperature (84 C) at minute 74.50 (computer time).
Still switched off	134.83	950.25 kg					991 mbar/42 %	The boiler did not switch on after one hour of switch off mode.

The boiler was not able to run at category I (equal or less than 15 % of rated output). The boiler has a temperature limiter switch off at 84 C (183 F). The scale increased weight is due to the temperature decrease in the boiler.

Test day 5,Cat IV run 2, 2020-01-21

- The boiler was retested at category IV because of the failed test in test day 1, 09/12/2020)
- Air velocity around the appliance: 0-0.05 m/s
- Static pressure induced by the draught = 0,9 Pa (at 10 m/s in the dilution tunnel)
- Settings on the boiler: boiler temperature = 72 C



- Pstat in tunnel = 109.4 Pa

Appendix 7

Test	Time computer time	Weight (scale), kg	Probe 2 (gas meter 202743)	Probe 1 (gas meter 901070)	Probe 3 (gas meter 202743)	Ambient	barometer/ humidity/ temp.	Comments
Start pre-burn test	0,00	966,97					1005mbar/RH 43 %/20 C	Test category IV run 2
Start test 1 (probe 1+2)	120,17	997,48	F2, G2	F1,G1		AF1,AG1		Stop Probe 2 (1 hour)=180,17 Gas volume=0,3368 m^3
Start test probe 3					F3,G3			
End test	360,17	948.25					1003mbar/RH 43 %/20 C	

Appendix 8

Instrumentation and uncertainty

Measuring instruments

The designations listed below refer to RISE quality system

Resistance thermometer, PT-100	ETf-QD Db 2
Thermocouple, type K	ETf-QD-Db 3
Water flow meter Valmet 9V-MP150 (load side)	Inv.no. 200 783
Water flow meter Valmet 9V-MP150 (supply side)	Inv.no. 201 655
Data logging system	Inv. no. 202 561
Atmospheric pressure	Inv.no. 701 275
Scale Mettler (filter weighing)	Inv.no. BX7 2435
Particulate sampling equipment (Train 1)	Inv.no. 901 070
Particulate sampling equipment (Train 2, probe 2 and 3)	Inv.no. 202 743
Particulate sampling equipment (ambient)	Inv.no. 200 721
Differential pressure gauge Furness FCO 14 (static pressure)	Inv.no. 200 628
Differential pressure gauge Furness FCO 12 (Dynamic pressure tunnel)	Inv.no. 202 638
CO/CO_2- analyser XStream (CO 0-2000 ppm)	Inv.no. 901 073
O_2-analyser PMA 10	Inv.no. 202 589

Calibration gases

The calibration gases for calibrating the gas analyser were accredited and delivered by Air Liquide. Oxygen calibration was performed at zero and span (21 %) points.

Table 14. Calibration gases

	Concentration	Uncertainty	Id. No.
CO	1742 mol-ppm	1.0 % rel.	NoK9E36
CO_2	15.89 mol-%	1.0 % rel.	NoK9E36

Appendix 8

Uncertainty of measurement

Table 15. Uncertainty of measurments

	Uncertainty
Temperature difference, load side	± 0.05 °C
Flue gas temperature	± 1 °C
Ambient temperature	± 1 °C
Static pressure in chimney	± 10 %
Liquide flow, load side	± 1 %-of flow
Fuel quantity	± 0.01 kg
PM filter weight	± 0.1 mg
CO-concentration	± 49 ppm
CO_2-concentration	± 0.4 %-points
Boiler efficiency[1]	± 2 %-points

[1] Does not include losses in the test rig.

The uncertainty has been calculated according to EA-4/16 with coverage factor

factor k=2

Appendix 9

Test setup

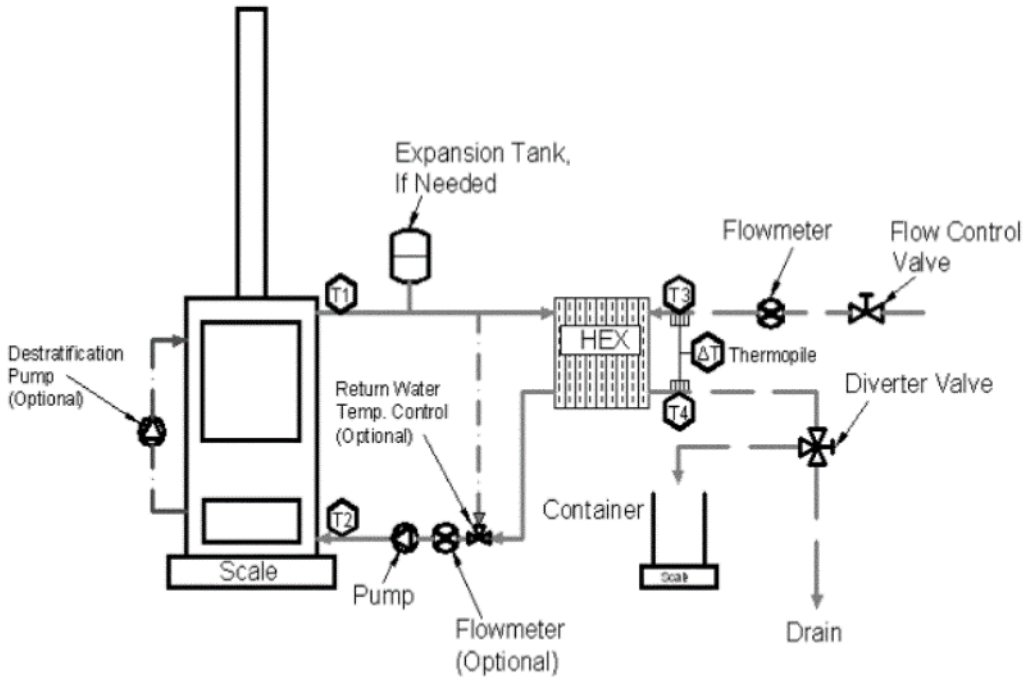


Figure 3a. Test rig

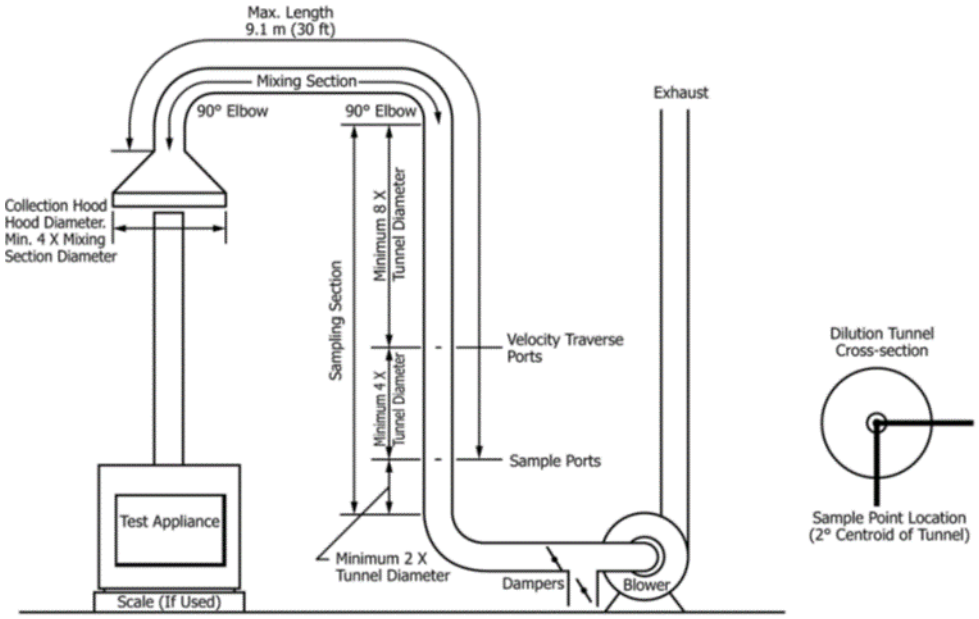


Figure 3b. Dilution tunnel

Appendix 10

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAR 0 6 2018

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Ms. Kelli O'Brien
Lab Manager
ClearStak
99 Canal Street
Putnam, CT 06260

Dear Ms. O'Brien,

I am writing in response to your letter dated March 4, 2018, regarding certification testing of the Nova model wood stove, a prototype single burn rate wood stove manufactured by MF Fire. You are requesting to use alternative test procedures for recovery and preparation of the particulate matter (PM) samples from the front half filter and probe assembly. In particular, you propose use of the acetone probe rinse and filter sample recovery and preparation procedures described in sections 8.7 and 11.0 of Method 5, Determination of Particulate Matter Emissions from Stationary Sources (40 CFR 60, Appendix A), in lieu of the procedures in section 10.2.2 of ASTM E2515-11, Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel which is required under 40 CFR 60, Subparts AAA and QQQQ.

The difference between the sample recovery and preparation procedures of Method 5 and ASTM E2515-11 is that Method 5 determines PM in the probe and filter assembly by (1) collecting PM in the probe through acetone rinses of the probe, drying down the rinse in beakers, dessication, followed by weighing and (2) removal of the filter, dessicating, and then weighing, as opposed to ASTM E2515-11 where the entire 100+ gram probe assembly is weighed before and after a test run. We understand that ClearStak typically performs gravimetric analysis of their PM samples (acetone rinses and filters) at an offsite location and not in the wood heater emission testing laboratory to ensure quality low mass (e.g., milligram) measurements uninfluenced by ground vibrations caused by daily operations of testing facilities.

You state that through past experience, you have found that probe PM collected through acetone rinses which are then transported in sample jars offer far less possible sample contamination than handling the front half probe and filter assembly. You propose to collect the acetone rinses after testing according to section 8.7 of Method 5, transport them to your laboratory, then transfer the rinses from the jars to clean and desiccated pre-weighed 100 mL beakers where they are dried down and desiccated according to section 11.2.2 of Method 5, and finally weighed according ASTM E2515-11 in 6-hour intervals until two consecutive weights are achieved within 0.2mg. Likewise, the filters (which were pre-weighed before testing as required in section 8.1.3 of Method 5) are recovered according to section 8.7 of Method 5, transported to the laboratory, dessicated according to section 11.2.1 of Method 5, and weighed according ASTM E2515-11.

We understand ClearStak is requesting to use these alternative procedures for PM recovery, dry down, and desiccation of the front half probe and filter assembly samples for ASTM E2515-11 testing of MF Fire's prototype single burn rate stove, Nova, and for all future ASTM E2515-11 emissions testing of residential wood heaters, hydronic heaters, and forced-air furnaces per 40 CFR Part 60 Subparts AAA and QQQQ.

Appendix 10

With this letter, we are approving your alternative test procedures detailed above in conjunction with ASTM E2515-11 for certification testing of the MF Fire's prototype single burn rate stove, Nova, as well as all wood heaters, hydronic heaters, and forced-air furnaces subject to 40 CFR Part 60 Subpart AAA and QQQQ. A copy of this letter must be included in each certification test report where this alternative test method is utilized.

It is reasonable that this alternative test method approval be broadly applicable to certification testing of all wood heaters, hydronic heaters, and forced-air furnaces subject to the requirements of 40 CFR part 60, Subparts AAA and QQQQ. For this reason, we will post this letter as ALT-126 on our website at *http://www3.epa.gov/ttn/emc/approalt.html* for use by other interested parties. This alternative method approval is valid until such time that Subparts AAA and QQQQ are revised or replaced to require a different certification method, and at such time, this alternative will be reconsidered and possibly withdrawn.

If you have additional questions regarding this approval, please contact Michael Toney of my staff at 919-541-5247 or toney.mike@epa.gov.

Sincerely,

Steffan M. Johnson, Group Leader
Measurement Technology Group

cc: Amanda Aldridge, EPA/OAQPS/OID
Adam Baumgart-Getz, EPA/OAQPS/OID
Rafael Sanchez, EPA/OECA
Michael Toney, EPA/OAQPS/AQAD

Appendix 11

Calibrations

Calibration of manometer for dynamic pressure in dilution tunnel

KALIBRERINGSBEVIS

Datum 2019-05-07
Beteckning ETk9P00564-K02

Sida 2 (3)

Tabell 1. *Kalibreringsresultat Mätområde 0- 200 Pa.*

Referens	Objekt		
Verkligt tryck	Avläst tryck	Korrektion	Mätosäkerhet
[Pa]	[Pa]	[Pa]	[Pa]
0,0	0,0	0,0	±0,31
2,0	2,0	0,0	±0,31
6,0	6,0	0,0	±0,31
10,1	10,0	0,1	±0,31
20,3	20,0	0,3	±0,31
30,2	30,0	0,2	±0,31
40,3	40,0	0,3	±0,31
50,3	50,0	0,3	±0,31
100,5	100,0	0,5	±0,31
150,9	150,0	0,9	±0,31
200,3	199,0	1,3	±0,41
0,0	0,0	0,0	±0,31
200,3	199,0	1,3	±0,41
0,0	0,0	0,0	±0,31
200,3	199,0	1,3	±0,41
0,0	0,0	0,0	±0,31

Calibration of manometer for static pressure in chimney

KALIBRERINGSBEVIS

Datum 2019-09-24
Beteckning ETk9P00564-K13

Sida 2 (3)

Tabell 1.
Kalibreringsresultat 0-200 Pa.

Referens	Objekt		
Verkligt tryck	Avläst tryck	Korrektion	Mätosäkerhet
[Pa]	[Pa]	[Pa]	[Pa]
0,0	0,0	0,0	±0,31
2,0	2,0	0,0	±0,31
5,9	6,0	-0,1	±0,31
10,0	10,0	0,0	±0,31
20,0	20,0	0,0	±0,31
30,1	30,0	0,1	±0,31
40,1	40,0	0,1	±0,31
50,1	50,0	0,1	±0,31
100,3	100,0	0,3	±0,31
150,7	150,0	0,7	±0,31
199,9	199,0	0,9	±0,41
0,0	0,1	-0,1	±0,31
199,9	199,0	0,9	±0,41
0,0	0,1	-0,1	±0,31
200,0	199,0	1,0	±0,41
0,0	0,1	-0,1	±0,31

Appendix 11

Calibration of gas meter in sampling train 1

KALIBRERINGSBEVIS

Datum 2019-06-18
Beteckning ETk9P00564-K07

Sida 2 (2)

Tabell 1. *Kalibreringsresultat.*

Referens	Objekt betingelser		Objekt				
Verkligt flöde	Temperatur	Gasdensitet	Avläst volym	Avläst tid	Beräknat flöde	Korrektion	Mätosäkerhet
[m³/h]	[°C]	[kg/m³]	[l]	[s]	[m³/h]	[%]	[%]
0.200	24.0	1.166	20.0	362.8	0.198	1.0	± 1.1
0.490	24.0	1.166	40.0	299.4	0.481	1.8	± 0.98
0.985	24.0	1.166	80.0	297.9	0.967	1.9	± 0.93
1.77	24.0	1.166	160.0	333.0	1.73	2.4	± 0.92
2.85	24.0	1.166	200.0	259.9	2.77	2.8	± 0.92

Kalibreringsgas: Luft

Angivna gasflöden avser volymflöden in i objektet vid aktuella kalibreringsbetingelser

$$\dot{V}_{Beräknat} = \frac{V_{Avläst}}{t}$$

$$\dot{V}_{Verkligt} = \dot{V}_{Beräknat} \cdot \left(1 + \frac{\dot{V}_{Korrektion}}{100}\right)$$

där

$V_{Avläst}$	Avläst gasvolym
t	Avläst mättid
$\dot{V}_{Beräknat}$	Beräknat volymflöde
$\dot{V}_{Korrektion}$	Korrektion vid beräknat volymflöde
$\dot{V}_{Verkligt}$	Verkligt volymflöde

RISE Research Institutes of Sweden AB
Energi och cirkulär ekonomi - Hållbara energisystem

Utfört av: Harriet Standar, Signed by: Harriet Standar, I am the author of this document, 2019-06-18 11:21:23 +02:00

Granskat av: Fredrik Niklasson, Signed by: Fredrik Niklasson, I have reviewed this document, 2019-06-18 13:24:18 +02:00

Harriet Standar

Fredrik Niklasson

Calibration of gas meter in sampling trains 2 and 3

KALIBRERINGSBEVIS

Datum 2019-06-18
Beteckning ETk9P00564-K06

Sida 2 (2)

Tabell 1. *Kalibreringsresultat.*

Referens	Objekt betingelser		Objekt				
Verkligt flöde	Temperatur	Gasdensitet	Avläst volym	Avläst tid	Beräknat flöde	Korrektion	Mätosäkerhet
[m³/h]	[°C]	[kg/m³]	[l]	[s]	[m³/h]	[%]	[%]
0.201	23.8	1.167	20.0	351.3	0.205	-1.9	± 1.1
0.494	23.8	1.167	40.0	286.8	0.502	-1.6	± 0.98
0.978	23.7	1.167	80.0	290.8	0.991	-1.2	± 0.93
1.68	23.7	1.167	140.0	297.8	1.69	-0.7	± 0.92
2.85	23.7	1.167	200.0	253.5	2.84	0.2	± 0.92

Kalibreringsgas: Luft

Angivna gasflöden avser volymflöden in i objektet vid aktuella kalibreringsbetingelser

$$\dot{V}_{Beräknat} = \frac{V_{Avläst}}{t}$$

$$\dot{V}_{Verkligt} = \dot{V}_{Beräknat} \cdot \left(1 + \frac{\dot{V}_{Korrektion}}{100}\right)$$

där

$V_{Avläst}$	Avläst gasvolym
t	Avläst mättid
$\dot{V}_{Beräknat}$	Beräknat volymflöde
$\dot{V}_{Korrektion}$	Korrektion vid beräknat volymflöde
$\dot{V}_{Verkligt}$	Verkligt volymflöde

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Utfört av: Harriet Standar, Signed by: Harriet Standar, I am the author of this document, 2019-06-18 11:21:22 +02:00

Granskat av: Fredrik Niklasson, Signed by: Fredrik Niklasson, I have reviewed this document, 2019-06-18 13:24:15 +02:00

Appendix 11

Calibration of gas meter for blank probe (ambient)

KALIBRERINGSBEVIS

Datum 2019-09-20

Beteckning ETk9P00564-K11

Sida 2 (2)

Tabell 1. *Kalibreringsresultat.*

Referens	Objekt betingelser		Objekt				
Verkligt flöde	Temperatur	Gasdensitet	Avläst volym	Avläst tid	Beräknat flöde	Korrektion	Mätosäkerhet
[l/min]	[°C]	[kg/m³]	[l]	[s]	[l/min]	[%]	[%]
0,640	22,2	1,182	6,0	608,5	0,592	8,1	± 2,2
1,27	22,2	1,182	8,0	392,6	1,22	4,0	± 1,8
2,60	22,3	1,181	12,0	283,4	2,54	2,3	± 1,4
5,11	22,4	1,181	20,0	239,9	5,00	2,2	± 1,1
7,56	22,4	1,181	40,0	326,7	7,35	2,9	± 0,98
10,1	22,4	1,181	60,0	367,7	9,79	3,5	± 0,94

Kalibreringsgas: Luft

Angivna gasflöden avser volymflöden in i objektet vid aktuella kalibreringsbetingelser

$$V_{Beräknat} = \frac{V_{Avläst}}{t}$$

$$V_{Verkligt} = V_{Beräknat} \cdot \left(1 + \frac{V_{Korrektion}}{100}\right)$$

där

$V_{Avläst}$	Avläst gasvolym
t	Avläst mättid
$V_{Beräknat}$	Beräknat volymflöde
$V_{Korrektion}$	Korrektion vid beräknat volymflöde
$V_{Verkligt}$	Verkligt volymflöde

RISE Research Institutes of Sweden AB
Energi och cirkulär ekonomi - Hållbara energisystem

Utfört av

Signed by: Harald Stenlöv
I am the author of this document
2019-09-20 13:11:27 +02:00

Granskat av

Signed by: Fredrik Nilsson
I have reviewed this document
2019-09-20 15:33:27 +02:00

Calibration of scale

KALIBRERINGSBEVIS

Datum 2018-06-12

Beteckning KVj1718 062

Sida 2 (2)

Resultat
(Resultaten avser endast de föremål som är specificerade i detta dokument)

Före varje belastning har vågen nollställts

Efter intrimning med vågens inbyggda vikt

Belastning, g	Avläst på våg, g	Mätosäkerhet, ±g
5	5,00001	0,00001
20	20,00002	0,00003
40	40,00000	0,00005
60	60,00001	0,00006
80	80,00005	0,00007
150	150,0001	0,0002
200	200,0001	0,0002

Samtliga avlästa värden är angivna som medelvärde baserat på tre mätningar.

Excentriskt placerad last

Belastningspunkt	Belastning, g	Avläst på våg, g
1	100	99,9996
2	100	100,0000
3	100	99,9995
4	100	99,9995
5	100	100,0002

Mätosäkerhet

Den angivna utvidgade mätosäkerheten är produkten av standardmätosäkerhet och täckningsfaktorn k = 2, vilket för en normalfördelning svarar mot en täckningssannolikhet av ungefär 95 %. Standardmätosäkerheten har bestämts i enlighet med EAL:s publikation EA-4/02.

RISE Research Institutes of Sweden AB
Kalibrering och Verifiering

Utfört av

Signed by: Niklas Sund
I am the author of this document
2018-06-21 07:40:56 +02:00

Niklas Sund

Appendix 11

Calibration of flow meter on load side

FLÖDESMÄTARE:	Valmet 9V MP115	Inv.nr.	200 783				DATUM:	2019-08-15			SIGN.:	MJ
		Normal: Flödeskalibrator Inv.nr. 200 083										
TEMP.	PULSER	TID	MASSA	DENSITET	VOLYM	VERKL. FLÖDE	NOM. MÄTAR-KONSTANT	UPPMÄTT FLÖDE	KORREKTION	KORREKTION	MÄT-OSÄKERHET	NOTERINGAR
℃	st	s	kg	kg/m3	dm3	m3/h	pulser/dm3	m3/h	%	m3/h	%	
51,6	290763	601,8	50,14	987,3	50,84	0,304	5760	0,302	0,71	0,0022	0,22	Flygande start
50,5	292219	608,5	50,41	987,8	51,08	0,302	5760	0,300	0,69	0,0021	0,22	
50,3	291289	607,6	50,25	987,9	50,92	0,302	5760	0,300	0,68	0,0020	0,22	
						0,303		0,301	0,69	0,0021		
50,3	581910	633,9	100,51	987,9	101,85	0,578	5760	0,574	0,81	0,0047	0,22	Flygande start
50,3	582258	634,2	100,57	987,9	101,91	0,578	5760	0,574	0,82	0,0047	0,22	
50,3	583168	635,4	100,72	987,9	102,06	0,578	5760	0,574	0,81	0,0046	0,22	
						0,578		0,574	0,81	0,0047		
50,1	588252	360,3	101,60	988,0	102,95	1,029	5760	1,020	0,80	0,0082	0,28	Flygande start
50,3	586293	358,9	101,21	987,9	102,56	1,029	5760	1,021	0,76	0,0077	0,22	
50,4	587286	359,6	101,32	987,9	102,68	1,028	5760	1,021	0,71	0,0072	0,24	
						1,028		1,021	0,76	0,0077		
50,4	591876	249,3	102,14	987,9	103,51	1,495	5760	1,484	0,73	0,0109	0,24	Flygande start
50,5	595864	250,9	102,79	987,8	104,17	1,494	5760	1,484	0,70	0,0103	0,26	
50,6	591792	249,5	102,06	987,8	103,43	1,493	5760	1,483	0,67	0,0100	0,23	
						1,494		1,483	0,70	0,0104		
50,6	601561	187,7	103,80	987,8	105,20	2,017	5760	2,003	0,73	0,0145	0,25	Flygande start
50,7	597746	186,7	103,09	987,7	104,48	2,014	5760	2,001	0,68	0,0137	0,28	
50,8	598177	186,9	103,23	987,7	104,64	2,016	5760	2,000	0,76	0,0151	0,23	
						2,016		2,001	0,72	0,0144		
50,8	605361	133,1	104,34	987,7	105,75	2,859	5760	2,842	0,62	0,0177	0,22	Flygande start
50,8	601273	132,8	103,66	987,7	105,07	2,848	5760	2,829	0,66	0,0185	0,22	
50,9	605178	133,7	104,31	987,7	105,72	2,846	5760	2,828	0,63	0,0177	0,22	
						2,851		2,833	0,64	0,0180		

Mätosäkerhet för normalen ±0,3% vid normala tillämpningar. Se ETL-QD annex DB1.

Flöde	Korrektion	Flöde	Korrektion
	20℃		20 ℃
0,301	0,69	0,301	0,0021
0,574	0,81	0,574	0,0047
1,021	0,76	1,021	0,0077
1,483	0,70	1,483	0,0104
2,001	0,72	2,001	0,0144
2,833	0,64	2,833	0,0180

Calibration of temperature sensors on load side (PT-100)

Tempgivare
1 = Givare 4T1 Kanal A Sprit
2 = Givare 4T2 Kanal B Vatten
401 = Givare 0401 Kanal A Sprit
402 = Givare 0402 Kanal B Vatten

Kalibrering av temperaturgivare/instrument

Instruktion ETvvs 002

Referens			**Kalibreringsobjekt**		
Kalibreringsbad Heto + Systemteknik S1220			PT01-VV1		
Kalibrerad 2019-08-16			Datorvagn TIGER kanal 1102		
Inv. nr 200 437+200 076+202 108			**Inv. nr**		
Visad temp ℃	**Korrektion ℃**	**Verklig temp ℃**	**Visad temp ℃**	**Korrektion ℃**	**Mätosäkerhet ℃**
2	29,900	0,092	29,992	30,16	-0,17	±0,07
2	39,918	0,106	40,024	40,21	-0,19	±0,07
2	49,873	0,117	49,990	50,19	-0,20	±0,07
2	59,858	0,128	59,986	60,20	-0,22	±0,07
2	69,850	0,145	69,995	70,23	-0,24	±0,07
2	79,845	0,163	80,008	80,26	-0,26	±0,07

Verklig temp = Visad temp + Korrektion	
Datum:	190909
Signatur:	HP

Appendix 11

Tempgivare	Kalibrering av temperaturgivare/instrument					
1 = Givare 4T1 Kanal A Sprit						
2 = Givare 4T2 Kanal B Vatten	Instruktion ETvvs 002					
401 = Givare 0401 Kanal A Sprit						
402 = Givare 0402 Kanal B Vatten	**Referens**			**Kalibreringsobjekt**		
	Kalibreringsbad Heto + Systemteknik S1220			PT04-VV3		
	Kalibrerad 2019-08-16			Datorvagn TIGER kanal 1103		
	Inv. nr 200 437+200 076+202 108			**Inv. nr**		
	Visad temp °C	**Korrektion °C**	**Verklig temp °C**	**Visad temp °C**	**Korrektion °C**	**Mätosäkerhet °C**
2	29,900	0,092	29,992	29,83	0,16	±0,07
2	39,918	0,106	40,024	39,86	0,16	±0,07
2	49,873	0,117	49,990	49,82	0,17	±0,07
2	59,858	0,128	59,986	59,82	0,17	±0,07
2	69,850	0,145	69,995	69,83	0,17	±0,07
2	79,845	0,163	80,008	79,85	0,16	±0,07
	Verklig temp = Visad temp + Korrektion					
	Datum:	190909				
	Signatur:	HP				

Appendix 12

Correspondence with EPA

Hi Henrik,

Thank you for your December 9, 2019 email to the EPA regarding the MES 56kW pellet boiler. I have consulted with the Office of Air Quality Planning and Standards (OAQPS) regarding your below question. Based on the information provided, your proposal would not be consistent with the 2015 Wood Heater rule definition of a valid certification test. A valid certification test means a test that meets the following criteria:

> (4) The test was conducted in
>
> accordance with the test methods and
>
> procedures specified in § 60.5476. (see 60.5473).

To that end, RISE should do another test and not use any data from the "stopped" test in determining compliance with the rule. Please keep in mind that any suspended test run should be included in the test report. If you need further discussion, we can set up a call a week from now.

Rafael Sanchez, Ph.D.

Wood Heater Program Lead

Air Branch

Monitoring, Assistance, and Media Programs Division

Office of Compliance

U.S. Environmental Protection Agency (EPA)

Room 7149-D

1200 Pennsylvania Ave., NW

MS:2227A

Washington, DC 20460

202-564-7028

202-564-0050 fax

Teleworking on Mondays and Fridays.

You can reach me at 571-732-2018

The Excel MS EPA Certified Wood Heater List has been retired. The Agency has now developed a new fully searchable EPA Certified Wood Heater Database or https://www.epa.gov/compliance/epa-certified-wood-heater-database. Please try it and let us know!

Appendix 12

From: Henrik Persson <henrik.persson@ri.se>
Sent: Monday, December 9, 2019 12:41 PM
To: Toney, Mike <Toney.Mike@epa.gov>; Sanchez, Rafael <Sanchez.Rafael@epa.gov>
Subject: Ongoing test

Hello Mike and Rafael,

As you may be aware RISE is testing the Maine energy Systems 56 kW pellet boiler for the 2020 standard at the moment. Unfortunately we have now had a problem with the boiler which have stopped for approximately 5 minutes with 80 minutes left of the test and I need advice if we can use this test or not. My proposal is to use the emissions data as it is, including the brief interruption. I would like to use 80 minutes of the pre-test run data for calculation the heat output only. Would that be ok for you?

With best regards

Henrik Persson

Research Institutes of Sweden

Built Environment – Energy and circular economy

Engineer

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Appendix 13

Operating and installation manuals

Please read carefully prior
to installing and servicing.

SAVE THESE INSTRUCTIONS

Operating Manual

Pellet heating with auger delivery or vacuum suction system for the end-user

AutoPellet®
PE(S)(K)(B) 10 — 56

FA_V2.03

AutoPellet TOUCH

USA

Title:	Operating Manual AutoPellet® PE(S)(K)(B) 10 — 56
Article number:	PE 568 USA 1.1
Version valid from:	04/2015
Approved:	Wohlinger Christian

Author & Manufacturer

MAINE ENERGY SYSTEMS LLC
8 Airport Road — P.O. Box 547 Bethel
Maine 04217

E-Mail: info@maineenergysystems.com
www.maineenergysystems.com

1 Dear Customer

Maine Energy Systems specializes in wood pellet heating, our company enjoys an exclusive license from ÖkoFEN to manufacture AutoPellet boilers here in the USA. We represent expertise, innovation and quality. We are delighted that you have decided to purchase our product.

- This instruction manual is intended to help you operate the product safely, properly and economically.
- Please read this instruction manual completely and take note of the safety warnings.
- Keep all documentation supplied with this unit in a safe place for future reference.
  Please pass on the documentation to the new user if you decide to part with the unit at a later date.
- Installation and first start up must be carried out by an installer certified by Maine Energy Systems.
- Please contact your authorised dealer if you have any questions.

We place great importance on the development of new products. Our R&D department continues to question accepted solutions and works continually on new improvements. That is how we maintain our technological lead. We have already received several awards for our products in Austria and abroad. Our products fulfil European and USA requirements regarding quality, efficiency and emissions.

Tested & Listed By O-T L Portland Oregon USA
C US
OMNI-Test Laboratories, Inc.
Report No. 0444PB004S

2 Use only for the purpose intended

The pellet boiler is designed to heat water for central or other indirect heating systems and hot water supply for buildings. It is not permissible to use the pellet boiler for any other purpose. Reasonable foreseeable inadvertent uses for the pellet boiler are not known.

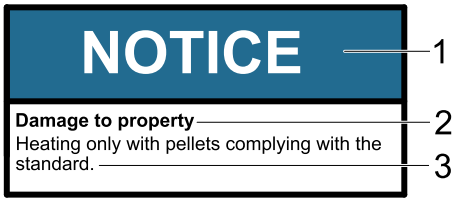
The boiler fulfils the requirements of UL 2523-2013 and CSA B366.1–2011.

3 Types of safety warning sign

The warning signs use the following symbols and texts.

Types of safety warning sign

1. Risk of injury
2. Consequences of risk
3. Avoiding risk



1. Risk of injury:

Danger - indicates a situation that could lead to death or life-threatening injury.

Warning - indicates a situation that could lead life-threatening or serious injury.

Caution - indicates a situation that could lead to injury.

Note - indicates a situation that could lead to property damage.

2. Consequences of risk

Effects and consequences resulting from incorrect operation.

3. Avoiding risk

Observing safety instructions ensures that the heating system is operated safely

4 Warnings and safety instructions

Observing safety instructions ensures that the heating system is operated safely.

4.1 Basic safety instructions

- Never get yourself into danger; give your own safety the utmost priority.
- Keep children away from the boiler room and storage room.
- Observe all safety warnings on the boiler and in this user manual.
- Observe all instructions relating to maintenance, servicing and cleaning.
- The pellet heating system may only be installed and started up for the first time by an authorised installer. Professional installation and start up is the prerequisite for safe and economical operation.
- Never make any changes to the heating system or flue gas system.
- Never close or remove safety valves.

4.2 Warning signs

DANGER

Risk of poisoning
Make sure that the pellet boiler is supplied with sufficient combustion air.
The openings in the combustion air inlet must never be partially or completely closed.
Ventilation systems, central vacuum cleaning systems, extractor fans, air conditioning systems, flue gas blowers, dryers, fuel storage ventilation fans or similar equipment must never be allowed to draw air from the boiler room and cause a drop in pressure.
The boiler must be connected tight to the chimney using a flue gas tube.
Clean the chimney and the flue gas tube at regular intervals.
The boiler room and pellet storage room must be sufficiently supplied with air and ventilated.
Before entering the storage room it must be ventilated with sufficient air and the heating system switched off

DANGER

Risk of electric shock
Only an authorised installer may connect the pellet boiler to the power supply.
Always disconnect / de-energize the power supply before working on the boiler.

DANGER

Risk of explosion
DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, ENGINE OIL, OR OTHER INAPPROPRIATE MATERIALS.
DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.
Switch off the heating system before filling the storage room.

DANGER

Risk of fire
Do not store any flammable materials in the boiler room.
Do not hang out any washing in the boiler room.
Do not operate with fuel loading or ash removal doors open.

WARNING

Risk of burns
Do not touch the flue gas connector or flue gas pipe.
Do not reach into the ash chamber.
Use gloves to empty ash box if boiler not equipped with automatic ash compression
Do not clean the boiler until it has been allowed to cool down.

CAUTION

HOT SURFACES
Keep children away.
Do not touch during operation.
Do not operate if maximum draft as listed on boiler nameplate is exceeded.
Doing so can allow non-controlled combustion.

CAUTION

Risk of cut injuries due to sharp edges.
Use gloves for performing all work on the boiler.

NOTICE

Damage to property
The pellet boiler is suitable only for pellets which comply with PFI premium or EnPlus -A1 pellets specifications.
The use of any other fuel voids your warranty and can cause damage to the pellet boiler and chimney.

NOTICE

Damage to property
Do not use the heating system if it, or any of its components, come into contact with water.
If water damage occurs, check the heating system by an authorized service technician and replace damaged parts.

WARNING

All cover plates, enclosures, and guards must be maintained in place at all times, except during maintenance and servicing.

4.3 What to do in an emergency

DANGER

Risk to life
Never get yourself into danger; give your own safety the utmost priority.

What to do in the event of a fire

- Switch off the heating system.
- Call your local fire department and or 911.
- Use approved fire extinguishers (fire protection class ABC).

What to do if you smell smoke

- Switch off the heating system.
- Close the doors leading to living areas.
- Ventilate the central heating room.

5 Prerequisites for installing a pellet boiler

You must fulfill the following conditions before operating a fully automatic pellet boiler.

5.1 Guidelines and standards for installing a pellet boiler

Overview of standards and guidelines applying to the installation of a pellet boiler.

Check whether you need to obtain planning permission or approval from the authorities for installing a new heating system or changing your existing system. Legislation in your country must be observed.

Flue gas system	EN 13384–1	Legislation in your country must be observed.
Building and fire prevention regulations		Legislation in your country must be observed.
Type of installation	FC 42x	Fireplace with a flue gas fan for connection to an air exhaust system. The combustion air line from air shaft and the connecting piece to the chimney are part of the fireplace.
	FC 52x	Fireplace with a flue gas for connection to a chimney. The combustion air line from outside and the connecting piece to the chimney are part of the fireplace.
Sound insulation	DIN 4109	Please note the building-unique demands on sound insulation.

5.2 Boiler room

The pellet boiler is installed in the boiler room.

1. **Safety instructions for the boiler room**

DANGER

Risk of fire
Do not store flammable materials or liquids in the vicinity of the pellet boiler.
Do not permit unauthorised persons to enter the boiler room - Keep children away.
Do not operate with fuel loading or ash removal doors open.

2. **Air supply and ventilation of boiler room**

   The boiler room must be fitted with air supply and ventilation openings (at least 31 inch²/200cm²).In any case you must comply with the state and local regulations

3. **Combustion air supply**

   The pellet boiler needs a supply of combustion air. The supply of combustion air can:

   a. take place using one or more air supply and ventilation openings in total min. 31 inch².

   b. or through a special air supply line directly from outside, where the diameter of the air supply line must be at least 4 inch/ 100mm in for type PE(S) 12 – PE(S) 32. Ambient air independent operation of PES 36-56 types is also available on request. In any case, properly sized room ventilation is still required to allow your barometric draft controller to function properly.

   Never operate the pellet boiler if the air intake openings are partially or completely closed.

   Contaminated combustion air can cause damage to the pellet boiler. Never store of use cleaning detergents containing chlorine, nitrobenzene or halogen in the room where the heating system is installed, if combustion air is drawn directly from the room. It is recommended that no washing or drying of laundry is done in the boiler room or where the boiler may draw air from.

   Do not hang out washing in the boiler room.

Prevent dust from collecting at the combustion air intake to the pellet boiler.

4. **Damage due to frost and humid air**

   The boiler room must be frost-proof to ensure trouble-free operation of the heating system. The temperature of the boiler room must not fall below 37°F and must not exceed 90°F. The air humidity in the boiler room must not exceed 70%.

5. **Danger for animals**

   Make sure that household pets and other small animals cannot enter the boiler room. Fit mesh over any openings.

6. **Flooding**

   If there is a risk of flooding, switch off the pellet boiler and disconnect from the power supply before water enters the boiler room. You must have all components that come into contact with water replaced, before you start up the pellet boiler again.

5.3 Flue gas system

The flue gas system consists of a chimney and a flue gas tube. The flue gas tube connects the pellet heating system to the chimney. The chimney leads the flue gas from the pellet heating system out into the open.

1. **Design of the chimney**

   The dimensions and design of the chimney is very important. The chimney must be able to ensure sufficient draft to safely draw away the flue gas regardless of the status of the boiler. Low flue gas temperatures can cause sooting and moisture damage on chimneys that are not insulated. For this reason **moisture-resistant chimneys** (stainless steel or ceramic) should be used. An existing chimney that is not damp-resistant needs to be rennovated before use. Follow guidelines below:

Boiler size		**PE(S) 12 – 20**	**PE(S) 25 – 32**	**PE(S) 36 – 56**
Flue gas tube diameter (at boiler)	inch/mm	5/130 or 6/150	6/150	7/180
Flue gas temp. / rated power	°F	320	320	360
Flue gas temp. / partial load	°F	212	212	230
Min. draft – full load/part load	in/wc	-0.04 / -0.02		

Chimney size	**Min. Height**
6in x 6in	17ft
7in x 7in	16ft
8in x 8in	16ft
6in round	19ft
7in round	17ft

NOTICE

Person(s) operating a hydronic heater is/are responsible for operation in a manner that does not create a public or private nuisance condition. The manufacturer's distance and stack height recommendations and the requirements in any applicable laws or other requirements may not always be adequate to prevent nuisance conditions due to terrain or other factors.

Recommended and UL-103HT approved chimney materials are:

a. Selkirk sure temp

b. Supervent (JSC)

c. Security chimneys (secure temp ASHT)

Use flue gas pipe from chimney to boiler as required by your local code.

CAUTION

Unregulated combustion
Please observe that combustion air openings and flue pipes are not reduced in size or closed. Make end user aware of these guidelines and their potential danger.
Clean the chimney and the flue gas tube at regular intervals.
Check if the draft inducer is clean and in a good condition.

2. **Flue gas temperature**

The flue gas temperatures are approximately the same for all Autopellet boilers covered in this manual.

The dewpoint of flue gas with wood pellets (max. 10% water content) is approx. 120°F.

It is possible to increase the flue gas temperature to prevent condensation inside the chimney and avoid damage due to damp. Only authorised installers may increase the flue gas temperature.

Note:
The increase in flue gas temperature results in reduced efficiency and thus increases fuel consumption.

3. **Negative pressure of the chimney**

The boiler must be connected to a chimney or a vertical venting system that is capable of handling and producing a negative breeching pressure of –0.4 “WC. Use a draft gauge to verify the indicated draft value, adjust barometric damper as required. Drill a small hole in the connection pipe at about 2in/ 50mm from the boiler flue outlet and use this hole as your measuring point.

Chimney draft

The suction effect of the chimney draft must extend all the way to the boiler flue pipe connection. The maximum flow rate that can be drawn through the chimney limits the maximum performance of the chimney connection. The boiler performance must be reduced if the chimney does not possess the necessary cross-section. This may only be performend by authorised personnel.

4. **Power venter**

AutoPellet boilers are approved by the manufacturer for installation with the Field Controls SWGAF power venter which is approved for wood pellet burning appliances.
Boilers installed with SWGAF power venters must follow all manufacturer´s installations and must comply with all applicable codes from agencies having authority over the installation.

5. **Cleaning**

Clean the flue gas tube and chimney regularly. Solid fuel burning appliances need to be cleaned frequently because soot, creosote, and ash may accumulate. The hotter the fire, the less creosote is deposited. Cleaning intervals can vary in warm periods due to this and become more frequent.

DANGER

Risk of chimney fire
Creosote-formation and need for removal:Low flue gas temperature can cause creosote. Creosote can condense in a relatively cool chimney. As a result, creosote residue accumulates on the flue lining. If ignited, this creosote will create an extremely hot fire. The chimney and the chimney connector should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

NOTICE

Oxidation of chimney
Do not use metal brushes to clean chimneys made of stainless steel.
Your state and local regulations must be observed.

5.4 Safety systems

The following safety measures are the prerequisite for safe operation of your system.

Emergency stop switch

Every heating system must be able to be switched off with an Emergency Stop switch. The Emergency Stop switch must be outside of the boiler room.

Safety valve

The hydronic system must be equipped with a safety valve. This valve opens before the pressure inside the heating system increases to max. 43 P.S.I.. The safety valve must be installed at the highest point of the boiler, must not be locked and must be within 3.28 ft / 39.37 inch/ 1m of the boiler. A 30 lb/sq in relief value is supplied with each boiler.

Safety temperature sensor

The pellet boiler is equipped with a safety temperature sensor. This is located on the pellet boiler. If the boiler temperature exceeds 230°F then the heating system switches off.

Low water cut off

The hydronic system must be equipped with a low water cut off. If the water level falls below a certain level, the low water cut off switches off the heating system.

NOTICE

Initial start-up
The initial start-up of each pellet boiler must be performed by an authorized installer.

5.5 Installation with an existing boiler

Autopellet boilers are not to be connected to a chimney flue serving another appliance. However, when all State and local codes allow for the sharing of chimney flues, the Autopellet boilers and another appliance burning pellets or a different fuel can be operated simultaneously while connected to a single existing chimney or flue gas system providing the following conditions are met:

- All state and local codes permit the specific installation
- All appliances are installed in accordance with the manufacturer's installation specifications or if lacking manufacturers specifications, the appliance in question is installed in a manner commonly recognized as safe and correct for the application and circumstances
- The chimney or flue gas system must be able to handle the combustion products of either appliance and both appliances when operated simultaneously

NOTICE

Avoid clearance issues that can make servicing difficult:
Be sure to follow suggested clearances when installing the Autopellet boiler with an existing boiler to be sure that service and cleaning can be performed adequately.

CAUTION

Avoid code violations:
When connecting to or with an existing boiler, contact the authority having jurisdiction to be sure the type of installation planned is allowed.
Document the type of boiler that the Autopellet is connected to or with.
Pellet boiler: Make and Model number:_____
Existing boiler: Make and Model number:
_____

DANGER

Possible escape of flue gas:
Do not connect this unit to a chimney flue serving another appliance unless multiple appliances into a single flue is authorized by all authorities having jurisdiction.

6 Fuel

Wood pellets are natural wood (dried sawdust or waste from machining) that has been formed into pellets under high pressure. They have a very low moisture content and very high calorific value. The manufacture of wood pellets is regulated by European standard EN 14961-2.

6.1 Specification for high quality pellets as PFI (Pellet Fuel Institut)

Calorific value	min. 7200 BTU/lbs
Bulk density	min. 40 Lb/cft
Water content	max. 10%
Ash content	max. 1.0%
Ash melting point	at least 2192°F
Length	max. 1.5 inch / 40 mm
Diameter	1/4" - 5/16" / 6 - 8mm
Fine material	max. 0.5 %
Contents	100% untreated natural wood

NOTICE

The pellet boiler is suitable only for pellets of natural wood that comply with PFI premium specifications. Using non-pelletised fuels or pellets that are not manufactured from natural wood will lead to the warranty becoming void and will cause damage to the pellet boiler and the chimney.

WARNING

Never use pellets that contain treated wood, co-lored paper products, cardboard,solvents, plastic, trash or garbage

Never burn trash, plastics, gasoline, solvents, naphtha, household garbage, material treated with petroleum products such as particleboard, railroad ties and pres-sure treated wood, leaves, paper products, cardboard.

6.2 Storing the pellets

1. Pellets are to be stored in a place where they are kept dry all year.
2. Install a back-ventilated partition to prevent pellets from contacting damp walls, or use a fabric tank.
3. Refer to our planning hints for pellet storage rooms and warning signs.
4. Legislation in your country must be observed regarding building specifications for storage rooms.
5. ÖkoFEN also offers FleXILO fabric tanks for storing pellets.

6.3 Measures for the ventilation of storage rooms

To avoid any kind of danger through possible degassing of the pellets, make sure you obey the following guidelines:

- The storage room has to be insulated towards the living area.
- The storage room has to be ventilated into open area.

For further information please consult your expert adviser.

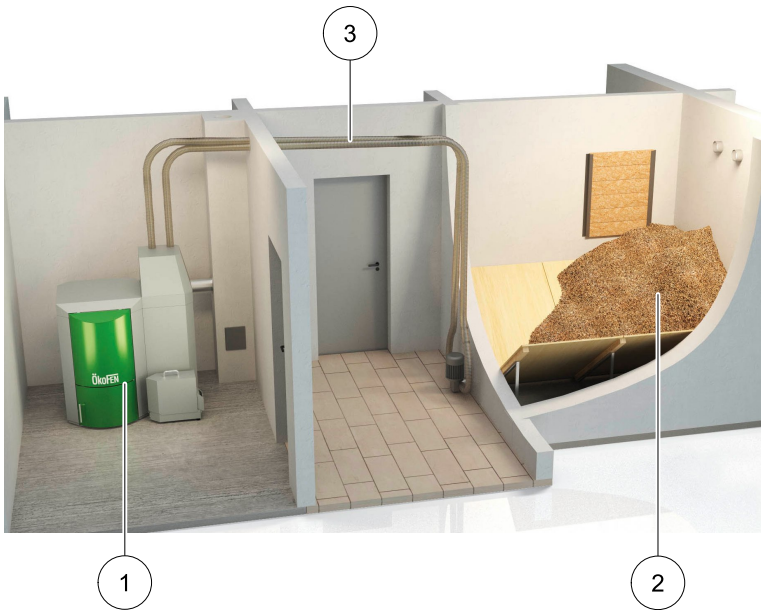
7 Product description

The description of the product is intended to provide an overview of the components that make up an ÖkoFEN pellet heating system, the parts of the pellet boiler and advice on where you can find more information.
The ÖkoFEN concept features different sizes of design and type for each component. These are compatible and designed to match.

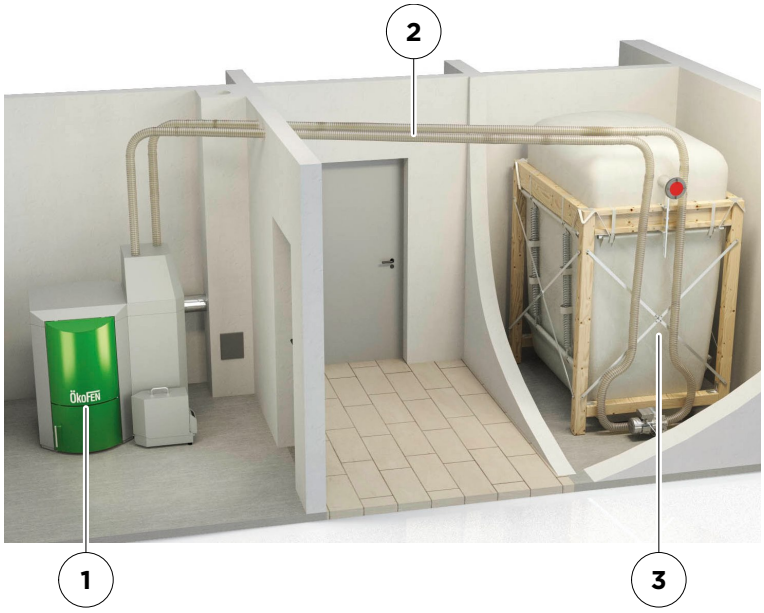
The ÖkoFEN pellet heating system consists of 3 components

1	Pellematic pellet boiler
2	Conveyor system
3	Storage system – storage room or fabric tank

Pellet boiler with storage room



Pellet boiler with fabric tank



7.1 The pellet boiler

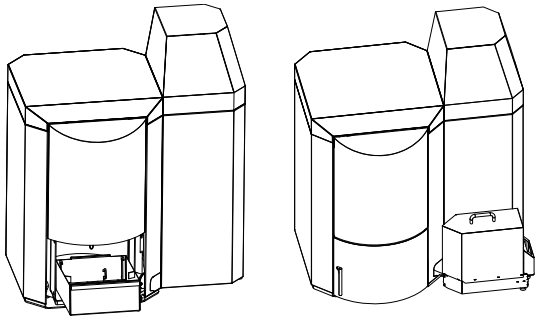
The pellet boiler is equipped with an automatic cleaning system, an ash box with ash compression system and an integrated return water temperature control. The installed programmable logic controller system enables fully automatic operation and highest efficiency. We offer an optional automatic de-ashing system for the highest level of cleanliness and comfort.

Pellematic types and power ratings

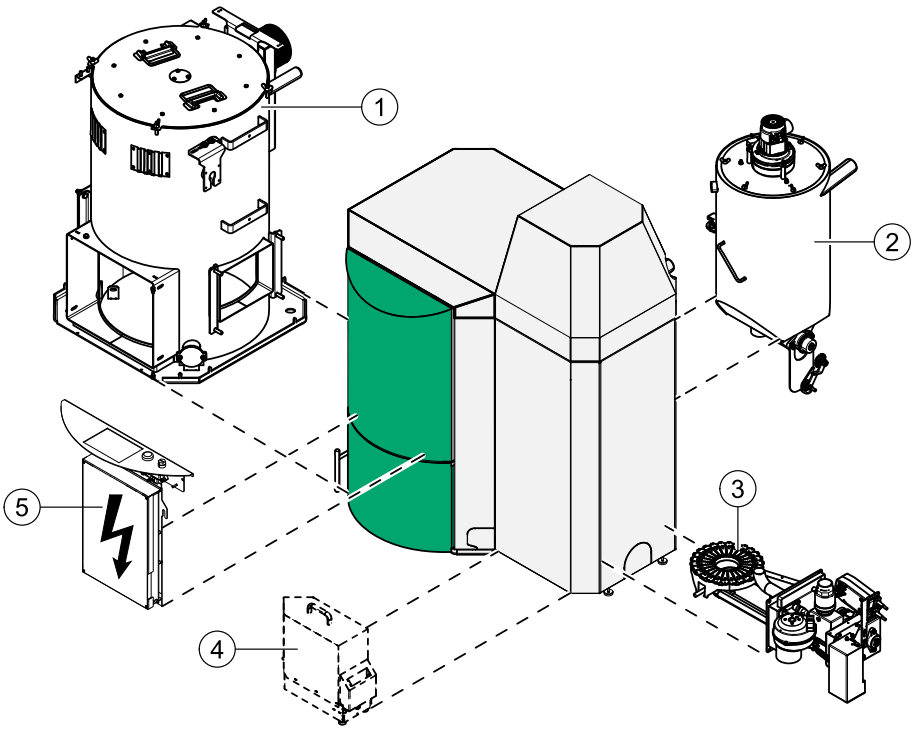
We offer the Pellet boiler with the following power ratings:
Suction-feed systems: 41,000; 51,000; 68,300; 85,300; 109,500; 123,000; 164,000 and 191,000 BTU/hr

All sizes / outputs of the Autopellet boiler are available with external automatic ash compression system.

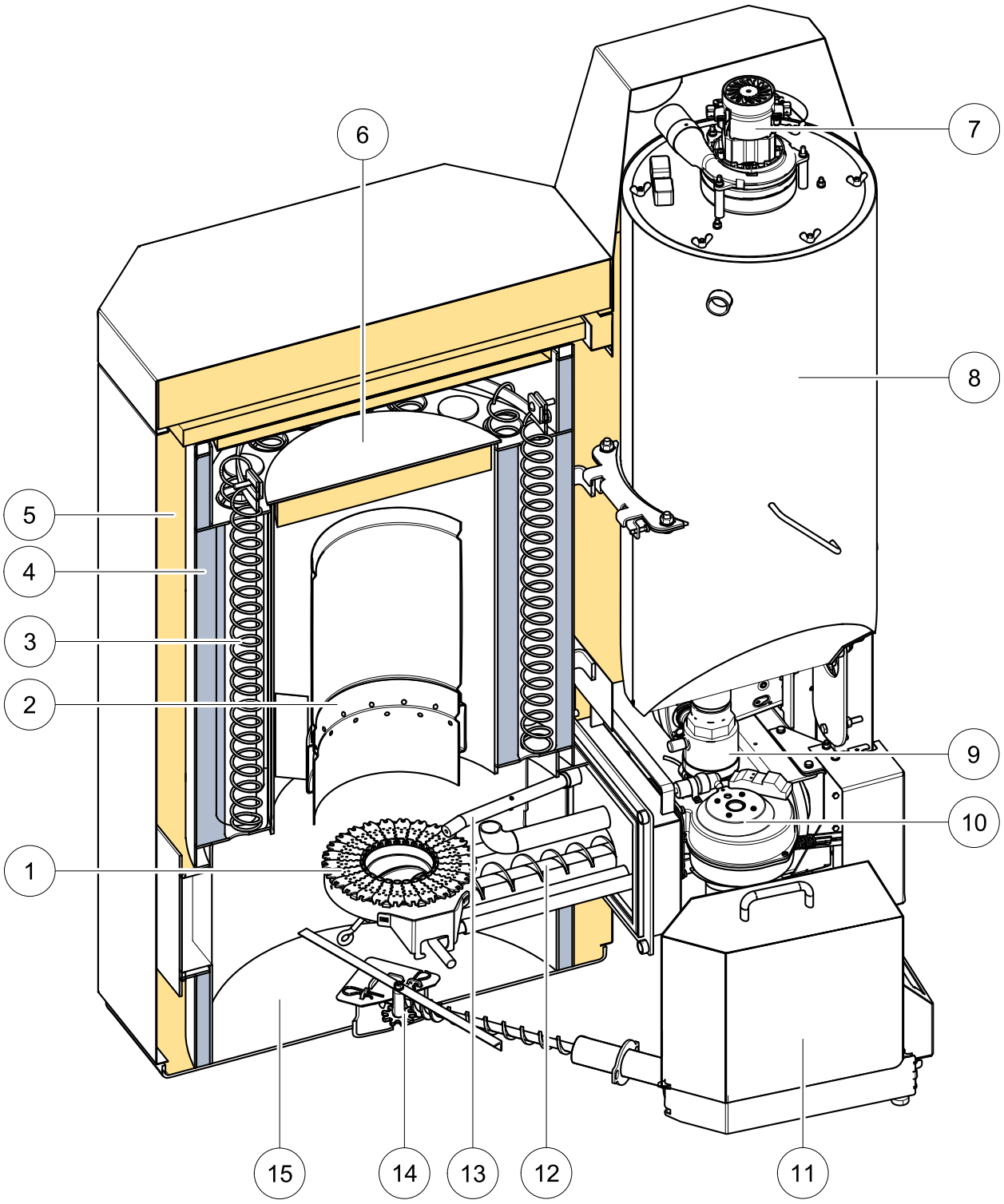
Note:
Refer to the data plate for the power rating of your Pellematic. The data plate is located on the rear side of the Pellematic. Here you will find the type designation, manufacturer's serial number and year of build.



Key components of the Pellematic



1	Boiler (heat exchanger)
2	Vac Hopper / Day tank
3	Burner
4	External automatic ash compression system
5	Boiler controller



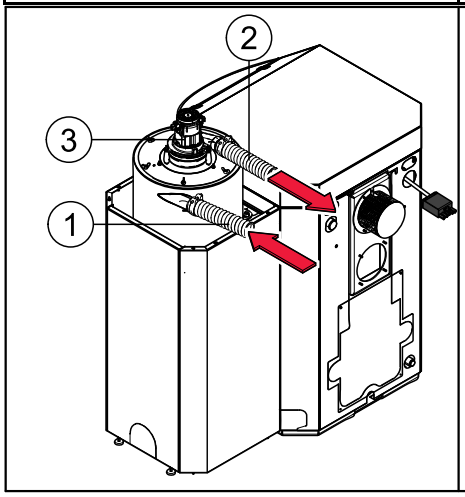
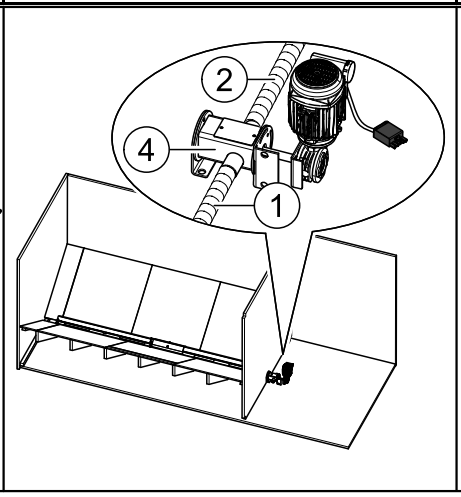
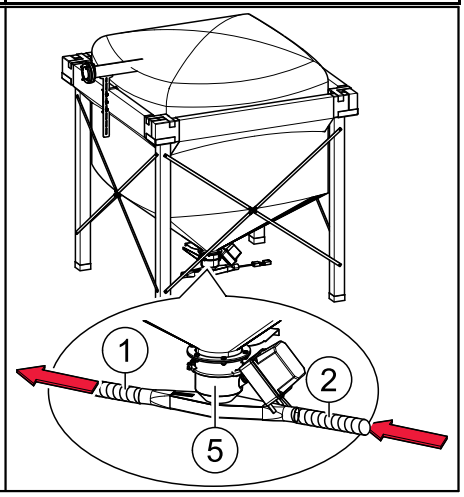
1	Burner plate	9	Fire protection – ball valve
2	Flame tube	10	Burner fan
3	Heat exchanger	11	External ash box
4	Boiler water	12	Burner auger
5	Boiler insulation	13	Electronic ignition
6	Combustion chamber cover	14	De-ashing system
7	Suction turbine	15	Ash chamber / Fire chamber
8	Vac hopper / Day tank		

7.2 Pellet suction system

The pellet suction system consists of the pellet line, air line and a suction fan. The suction fan in the hopper conveys pellets in the pellet line from the storage room or fabric tank to the hopper.

Key components of pellet suction system

1	Pellet line	Line from the storage room auger or fabric tank to the hopper.
2	Air line	Line from the suction fan to the storage room auger or fabric tank.
3	Suction fan	Located above the hopper behind the Pellet boiler burner housing.
4	T-piece	Located at front end of the storage room auger, outside the storage room.
5	Suction flap	Located underneath the fabric tank.

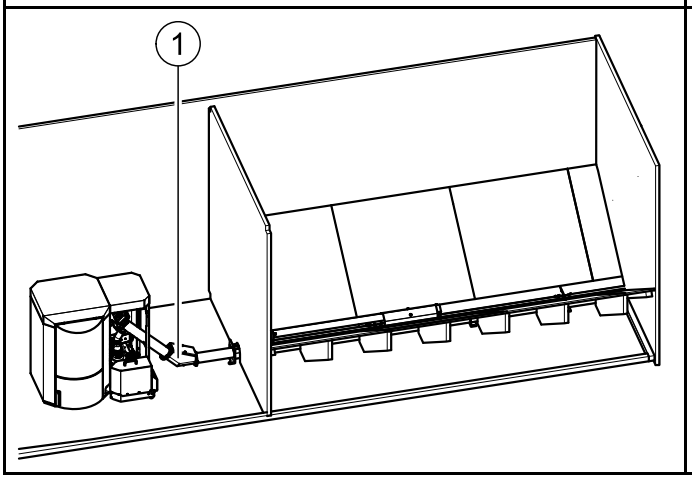
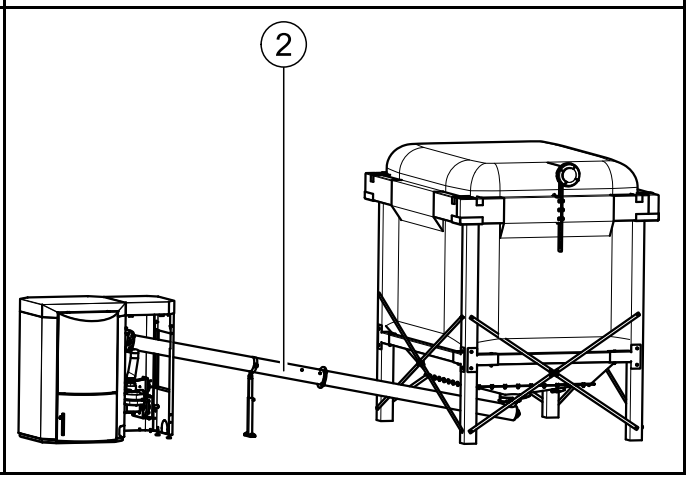
Pellet boiler	Version A pellet storage room	Version B fabric tank
		

7.3 Auger delivery system

The auger system consists of: Delivery system motor, dropshaft, up leading auger with joint or extraction auger with extraction unit. The delivery system motor powers the auger system and transports pellets from the tank room or textile tank to the burner plate.

Key components of the auger system

1	Up leading auger	Delivery auger with motor unit and joint (Connection of delivery auger and pellet boiler)
2	Extraction auger	Delivery auger with auger, emergency gate, supporting leg and handcuffs; (Connection of textile tank and pellet boiler)

Var. A Pellet storage room	Var. B Textile tank
	

7.4 Storage systems

There are two methods for storing pellets: in a storage room with an auger feed system (version A) or in a FleXILO fabric tank (version B). FleXILO fabric tanks can be located inside the central heating room, storage room or protected from wet and sun outside.

NOTICE

Damage to property and loss of warranty
The combination of an ÖkoFEN pellet boiler with a storage and conveyor system from another manufacturer is not permissible.

7.4.1 Pellet storage room

The auger extraction system is part of the ÖkoFEN pellet heating system. The sloping base is to be provided by the customer. Information and important notes on setting up storage rooms can be found in the ÖkoFEN planning documents and on www.oekofen.com. Information on installing the auger extraction system is included in the auger system installation manual. Refer to the instructions on how to make a sloping base.

7.4.2 Flexilo fabric tank

The whole fabric tank system is included in the scope of supply. ÖkoFEN offers various sizes and types. The fabric tank supplied may vary from the example shown above.

Please refer to the installation instructions supplied for the fabric tank. Note also the instructions on setting up and filling.

8 Operating the Pellematic

The pellet heating system is an automatic heating system. All pellet feed system and combustion system sequences are regulated automatically using an electronic boiler controller and heating controller.

8.1 Operating the heating system

NOTICE

Damage caused do to incorrect operation or incorrect settings.
Only trained operators may use the heating system.
Make sure no unauthorised persons enter the central heating room. Keep children away from the central heating room and storage room.

DANGER

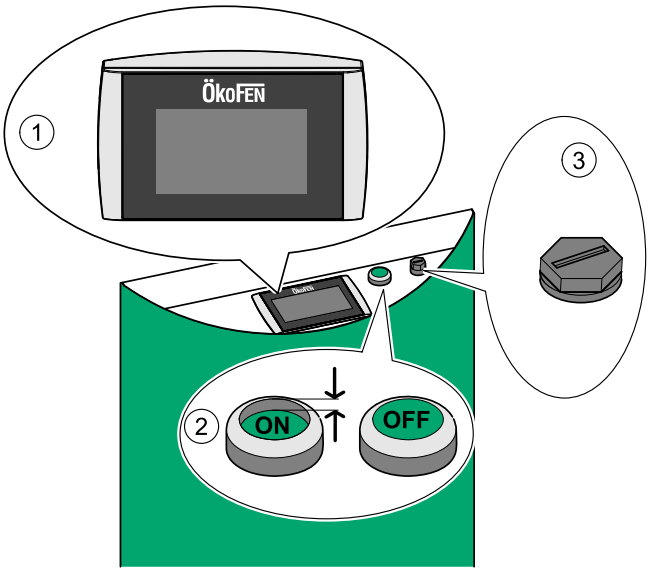
Fire risk
Keep the ash removal door closed while the boiler is in operation.

NOTICE

Standby mode boiler controller
Don´t set the main switch of the boiler controller outside of the heating period to Off, because no buffer battery is used.

8.2 Description of the control panel

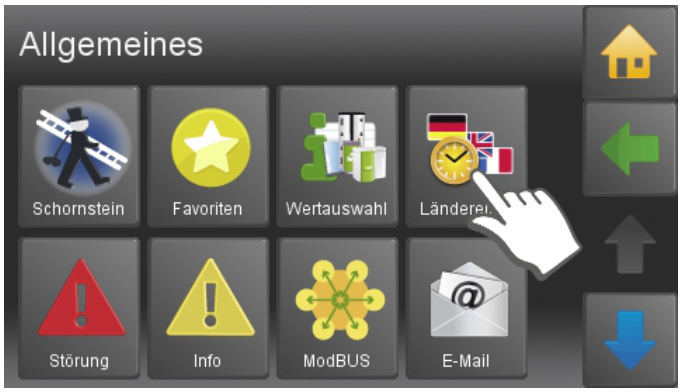
The control panel is located underneath the flap above the door of the boiler.



1	User control unit	Operates the boiler controller and the heating controller.
2	Main switch	Switches off the heating system (both poles) including the power supply to the control panel.
3	Safety temperature sensor	Switches the heating system off, if the boiler temperature reaches 203 °F. The heating controller remains active.

8.3 Setting language, date and time at Pelletronic Touch

Setting the language (The factory setting for the language is German)

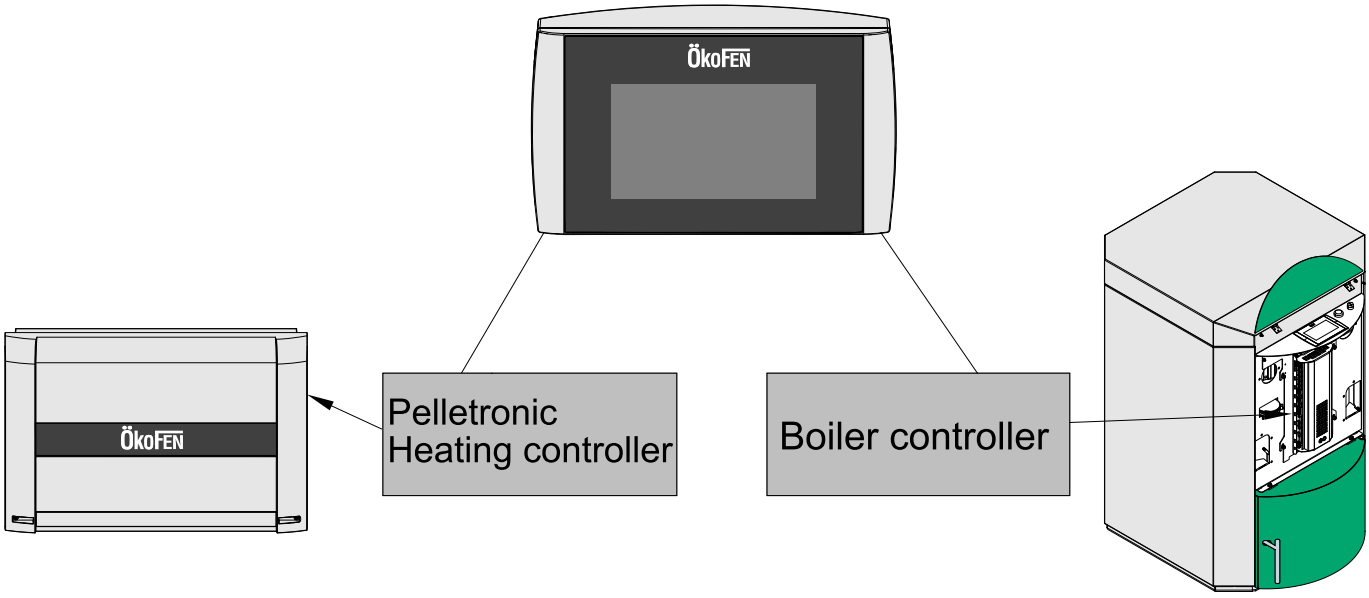


Setting the date

Setting the time

9 Pelletronic heating controller and operating device with touch screen.

The heating controller regulates the heating system, the operating modes, heating circuits, domestic hot water, accumulator, existing boiler and the solar thermal system. All inputs and outputs are connected with the heating controller. Visualization and operation of the heating controller is done with the operating device with touch screen. It displays all menu options and measuring values of the heating controller. All specific settings of the heating system are done with the Touch operating device.

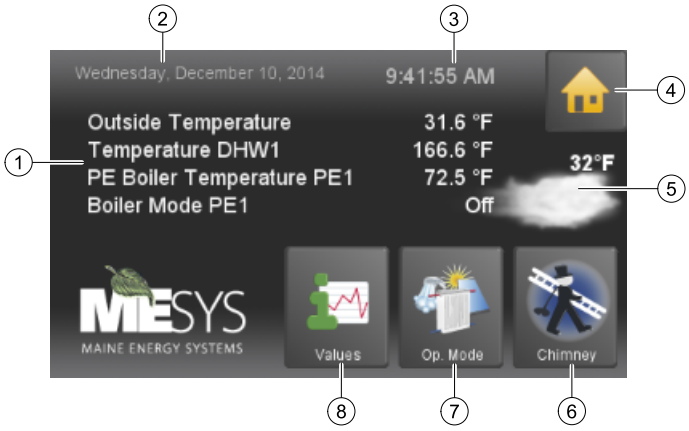


9.1 Operating Device with Touch screen

The Touch operating device is mounted on the control board of Pellematic. The 4.7" color display is surrounded by a foil design with logo. With finger pressure you make settings on the Touch operating device.

9.2 Opening window

The touch panel is dark during in standby mode. As soon as you touch the surface of the touch, light turns on and displays the opening window.



1 Measuring values (adjustable)

2 Date

3 Hour

4 The icon house takes to the main menu

5 Weather

Note:
If there is a malfunction, the corresponding fault message is displayed at this point instead of the weather icon

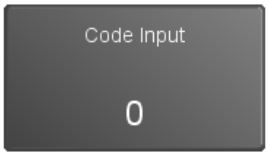
6 Favorite 1 (adjustable)

7 Favorite 2 (adjustable)

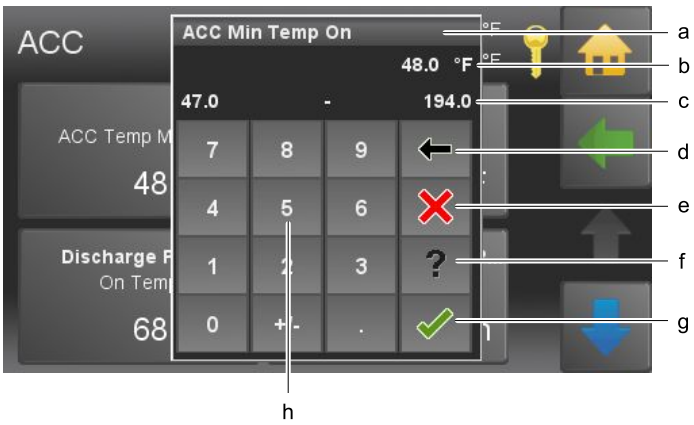
8 Favorite 3 (adjustable)

9.3 User controls and their function

1. **Navigation-icons**

Icon-view	
	If you touch an icon, the icon turns green. The green shows that you are currently on this icon. You get to the enabled menu item .
	The yellow house enters you directly to the main menu.
	The horizontal arrow leads you one step back.
	With the blue down arrow you get to additional lines of information on this item. (Down - scroll down).
	With the blue up arrow you get to additional lines of information on this item. (Top of page - scroll up)
	You get to the respective menu item.
	You get to the settings of the parameter. You come either to a numeric keypad, a time / date block or the text selection.

2. **Numeric keyboard**



a. Name of parameter

b. Value of parameter with unit

c. Min/max value – Values outside this range are not accepted.

d. Delete input of numbers – per contact you delete one place.

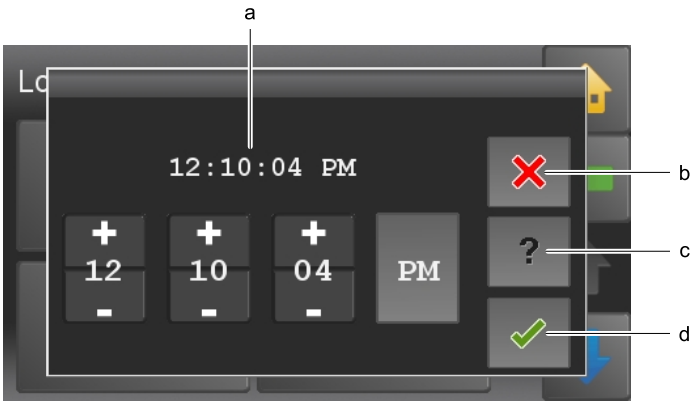
e. Cancel – You return to the menu item. Input of a new value was not accepted. The original value is.

f. Help function – inactive

g. Confirm

h. Numeric keyboard – used to enter values within the min - max range.

3. **Time and date block**



a. Adjustable time or date

b. Cancel

c. Help function – inactive

d. Confirm

With the Plus Minus block you change numbers.

4. **Text selection**

a. Name of parameter

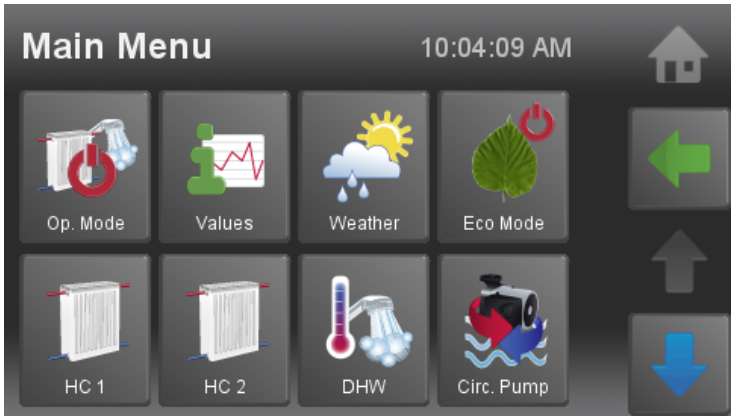
b. Status texts
The number of status texts depends of the parameter.

Choose a status text. The setup menu closes automatically and the chosen status text is displayed in the menu.

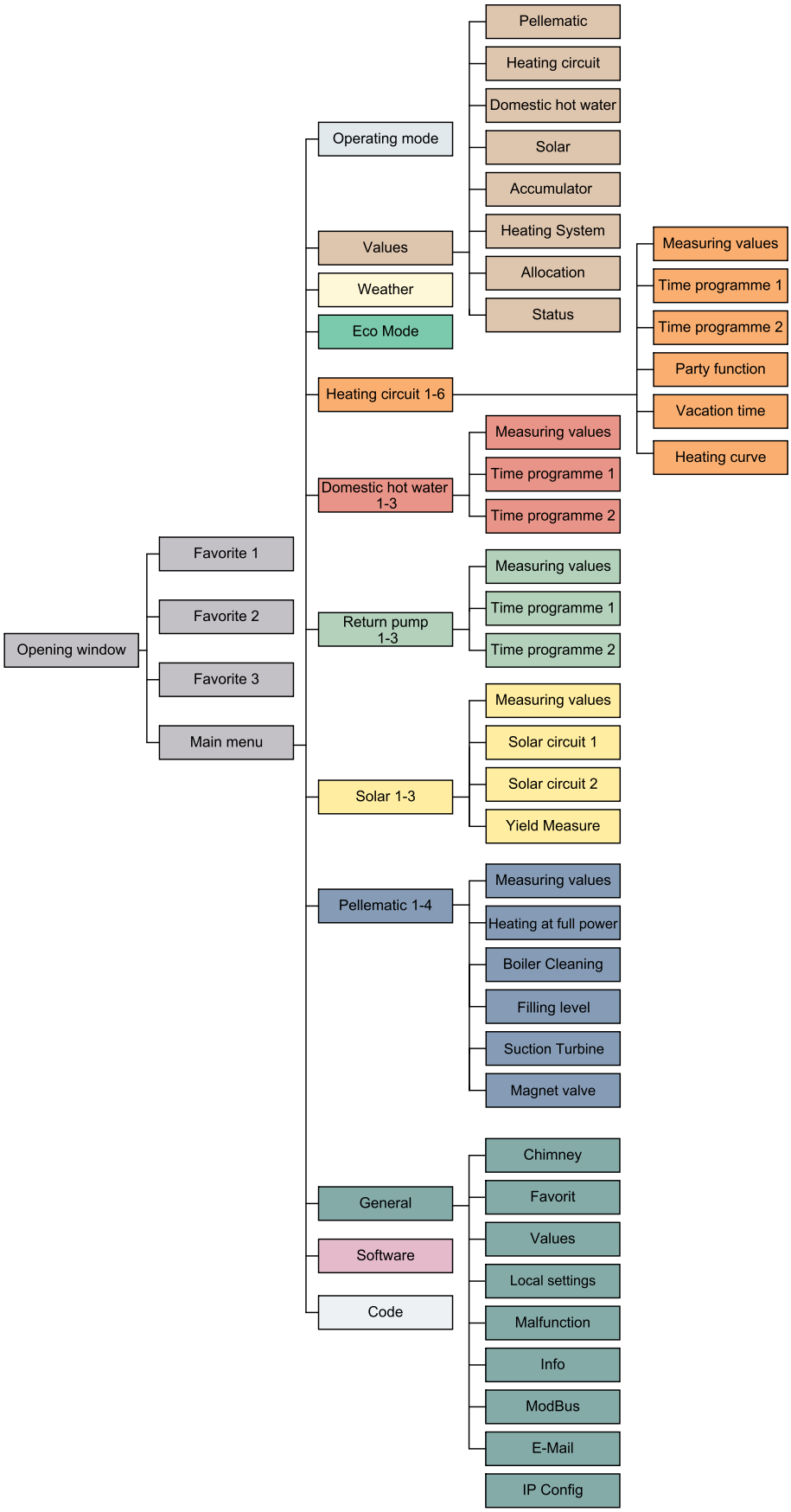
Note:
Although a scroll down menu is open, the navigation icons, menu items and parameters behind are active and by touching them it takes you directly there .

9.4 Main Menu

In the Main menu you see all submenus. By finger pressure on an icon you reach the respective submenu.



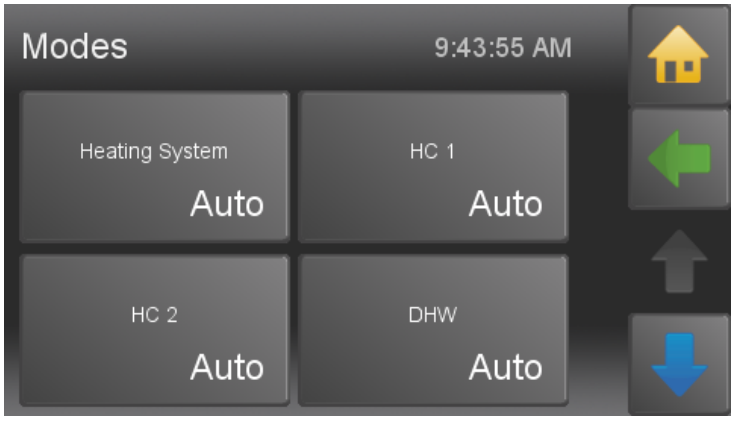
Menu navigation of Pelletronic Touch



10 Mode

In the menu item Mode you can see the mode of your heating system and the mode of the heating circuits, domestic hot water and solar.

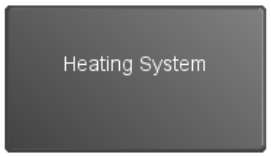
The menu item **Mode** is in the Main menu.



Overview of the operating modes

- Heating Plant
- Heating system 1-6 .
- Domestic hot water 1-3
- Solar 1–3

Choose the operating modes and make settings.



Off The adjusted operating mode of the heating circuits and DHW is inactive.
The frost protection function is active.

Auto The adjusted operating mode of the heating circuits and DHW is active.
The frost protection function is active.

DHW The adjusted operating mode of the DHW is active.
The adjusted operating mode of the heating circuits is active.
The frost protection function is active.

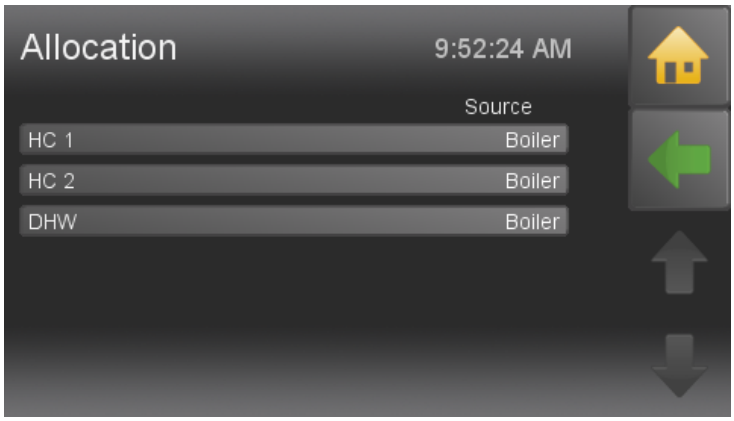
The operating mode heating circuits, domestic hot water and solar are described in the respective chapters.

11 Measuring Values

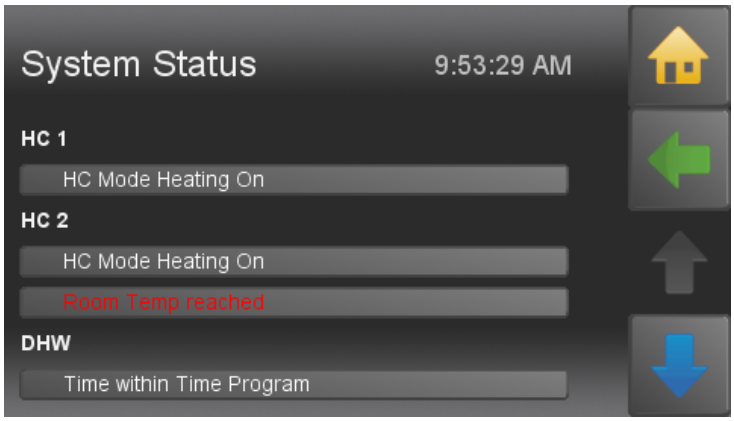
In the menu item of Measuring Values you see all actual and set values of your heating system.

The menu item **Measuring Values** is in the Main menu.

- Pellematic
- Heating circuit
- Domestic hot water
- Solar
- Accumulator
- Return pump
- Heating Plant

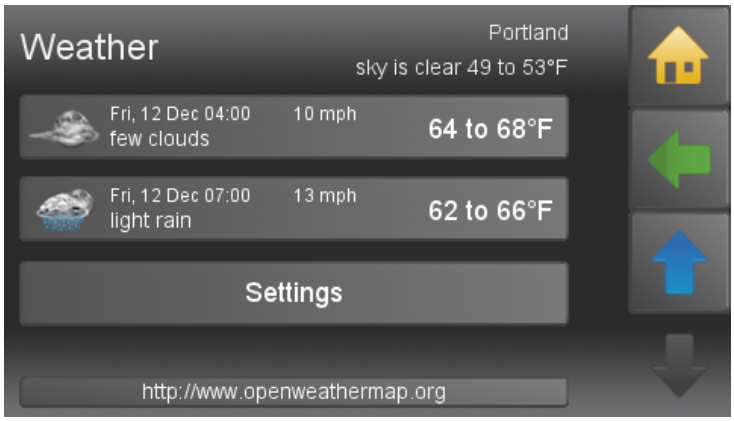


In the menu item **Allocation** you see which heating circuits are allocated to the boiler or to the accumulatores.



In the menu item **Status** you always have an overview about the whole heating system.

12 Weather



Choose **Settings** ( ), to enter your location.

Enter location and country. If the specified location is not found, enter a larger, nearby place.

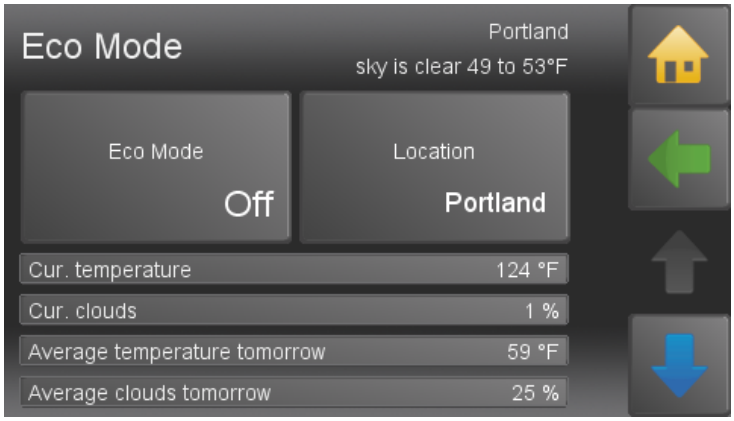
Search with the following details:

- Postal code, location, country
- Postal code, country
- Location, country

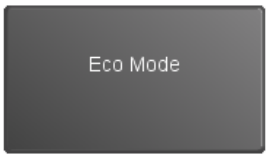
Afterwoods, weather data for the next 3 days are downloaded. An icon for the current weather is displayed on the opening window.

Note:
This feature requires an internet connection.

13 Eco Mode



With the Eco Mode, the influence of weather forecasts can be defined.

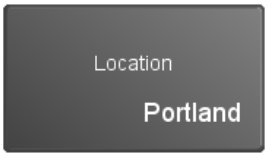


Off: Eco mode inactive.

Comfort: Set temperature minus 0.9 °F

Minimum: Set temperature minus 1.8 °F

Ecologically: Set temperature minus 2.7 °F



Enter location and country. If the specified location is not found, enter a larger, nearby place.
Search with the following details:

- Postal code, location, country
- Postal code, country
- Location, country

Afterwoods, weather data for the next 3 days are downloaded. An icon for the current weather is displayed on the opening window.

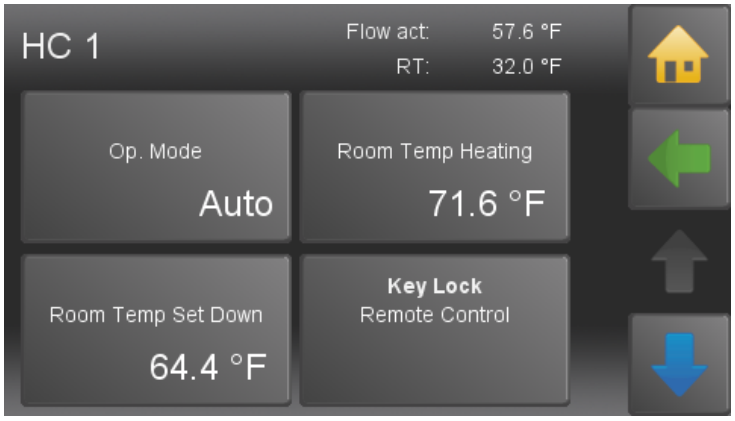
Note:
This feature requires an internet connection.

Cur. temperature	Current temperature according to forecast.
Cur. clouds	Current clouds in % according to forecast.
Average temperature today / tomorrow	Calculated temperature for the forecast period
Average clouds today / tomorrow	Calculated clouds for the forecast period
Sunrise / sunset	Time at sunrise or sunset
Starttime/ Endtime	In this time frame, the Eco Mode affects the heating settings.
Last update	Time of last update of the forecast.

14 Heating Circuit

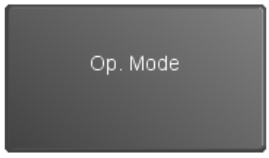
Heating Circuit encloses all for heating relevant parameters and settings. It can occur up to 6 menu items **Heating Circuit.**

Heating Circuit is in the Main menu



Heating circuits settings has following menu items:

- Mode
- Room Temp Heating
- Room Temp Set back
- Time Allocation
- Values
- Time 1
- Time 2
- Party
- Vacation
- Heatingcurve



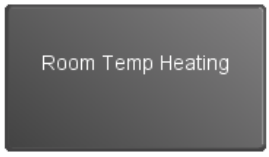
Off Only the frost protection function is active.

Auto The boiler starts in the heating times according to the Set room temperature.

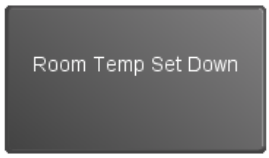
Heating The boiler heats constantly according to the Set room temperature.

Set back The boiler heats constantly according to the Set back room temperature.

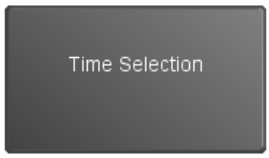
The operating mode of the heating circuits can only be changed if the plant operating mode is set to AUTO.
The adjusted heating limits and maximum flow temperatures are used in all operating modes.



Choose your room temperature (Temperature within the heating times).



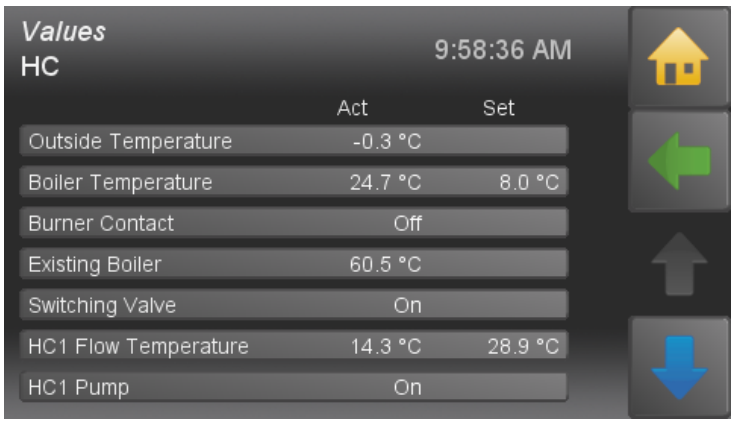
Choose Room Temp Set back (= Minimum temperature beyond the heating times).



Activate **Time 1** (= Time programme 1) and **Time 2**.

14.1 Measuring values Heating circuit

Measuring values HC is in the Main menu.



You see all to the Heating circuit corresponding measuring values:

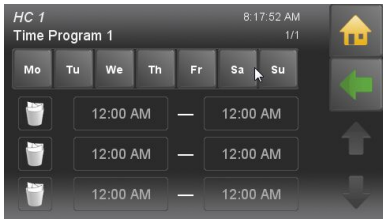
- Actual value
- Set value
- Inputs (sensores)
- Outputs (pumps, mixer and motors)

Outside Temperature	actual Outside Temperature
Boiler Temp	actual Boiler Temperature
Existing Boiler	actual Temperature of available boilers
ACC1 TPO	actual temperature AC upper sensor
ACC1 TPM	actual temperature AC middle sensor
ACC1 Pump	actual performance of Accumulator pump
Booster	Status (Booster On/Off)
Flow Temp	display of the flow temperature
Room Temp	display of the room temperature
Pump	Status (Pump On/Off)
Mixer	Status (Mixer On/Off)

14.2 Time programme Heating circuit

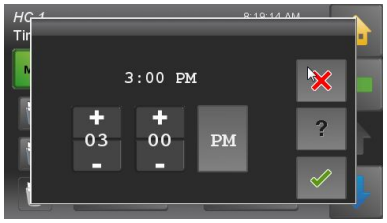
In the heating circuit time programme you fix the heating times.

Time 1 (=Time programme 1) and **Time 2** are in the menu Heating circuit.

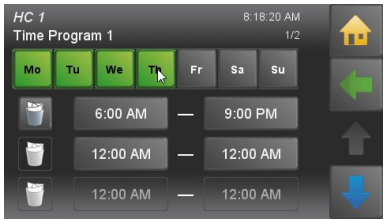


1
Select Time programme 1

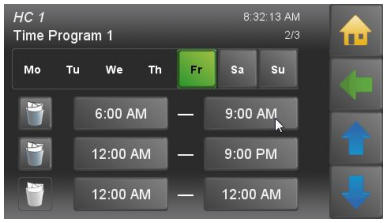
2
Select the heating days.
The activated days are deposited in green.



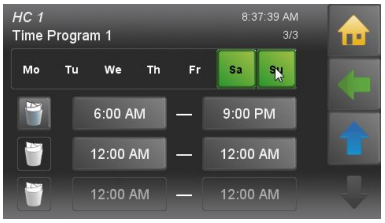
3
Enter the heating times for these heating days (Mo-Th).



4
The heating times for Mo-Th are assigned. With you assign to days heating times further.



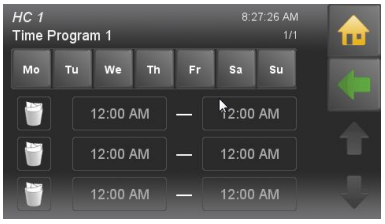
5
Friday was activated. Heating times were assigned.



6
Mo-Fr were assigned heating times
With you get to the remaining days Sa-Su.

7
Sa-Su were assigned to heating times.

8
With and you switch between the heating blocks. You can deactivate heating days in the heating block and activate in another.



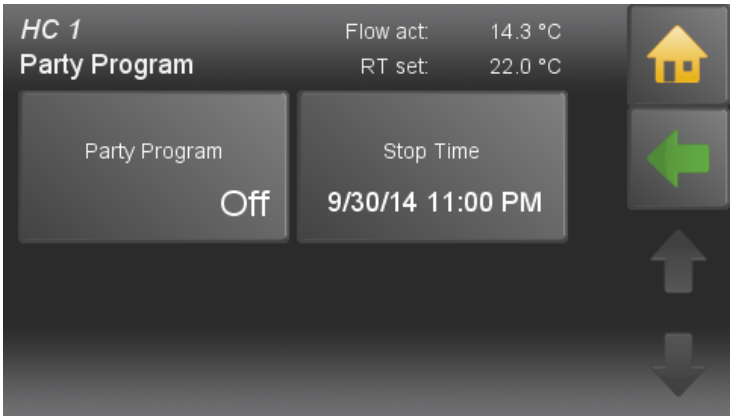
9
With you set all the heating times in the line and below to 0.

10
Go back with . Choose Time 2. For every heating circuit there are 2 time programmes. You can programm 2 time programmes. In the menu item **Time Allocation** you can activate time 1 or time 2.

14.3 Party

The party function extends the heating time once, without changing the heating times.

Party is in the Main menu.

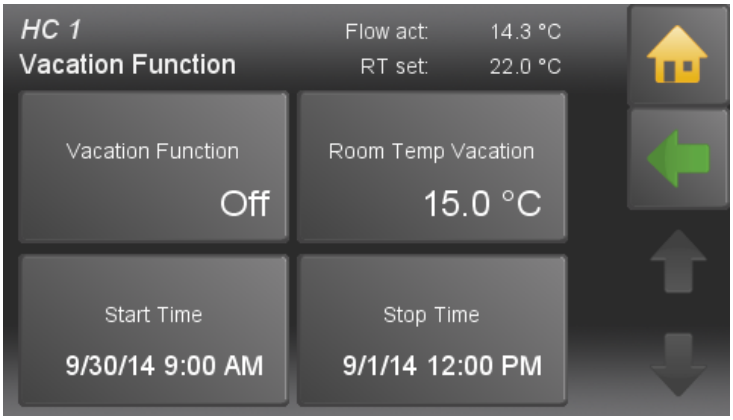


The party function is basically inactive. Enter the time until the room temperature heating should be heated. Activate the Party function.
The heating time is extended up to the indicated time. Then the party function deactivates itself automatically.

14.4 Vacation

The holiday programme cancels the heating times and heats for the entered period on the set temperature level.

Vacation is in the Main menu.



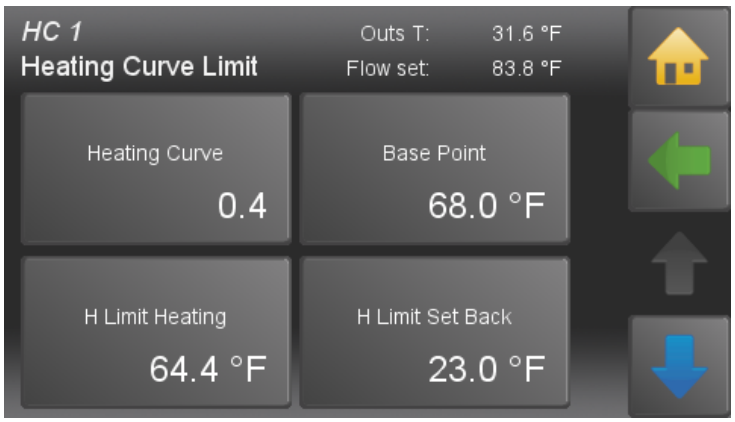
Enter the room temperature on which in your absence the building should be heated. Enter the departure (start time) and return (finish date) and activate the vacation programme.

Note:
To return in an already tempered building, you must enter the day before the return as the finish date.

14.5 Heating curve and Heating limits

By starting up the first time, the authorised technical adviser adjusts the heating curve, the base point and the heating limits on the building situation and the hydraulics. If the Set room temperature is not reached or exceeded, adjust the heat curve with the flow temperatures according to outside temperatures.

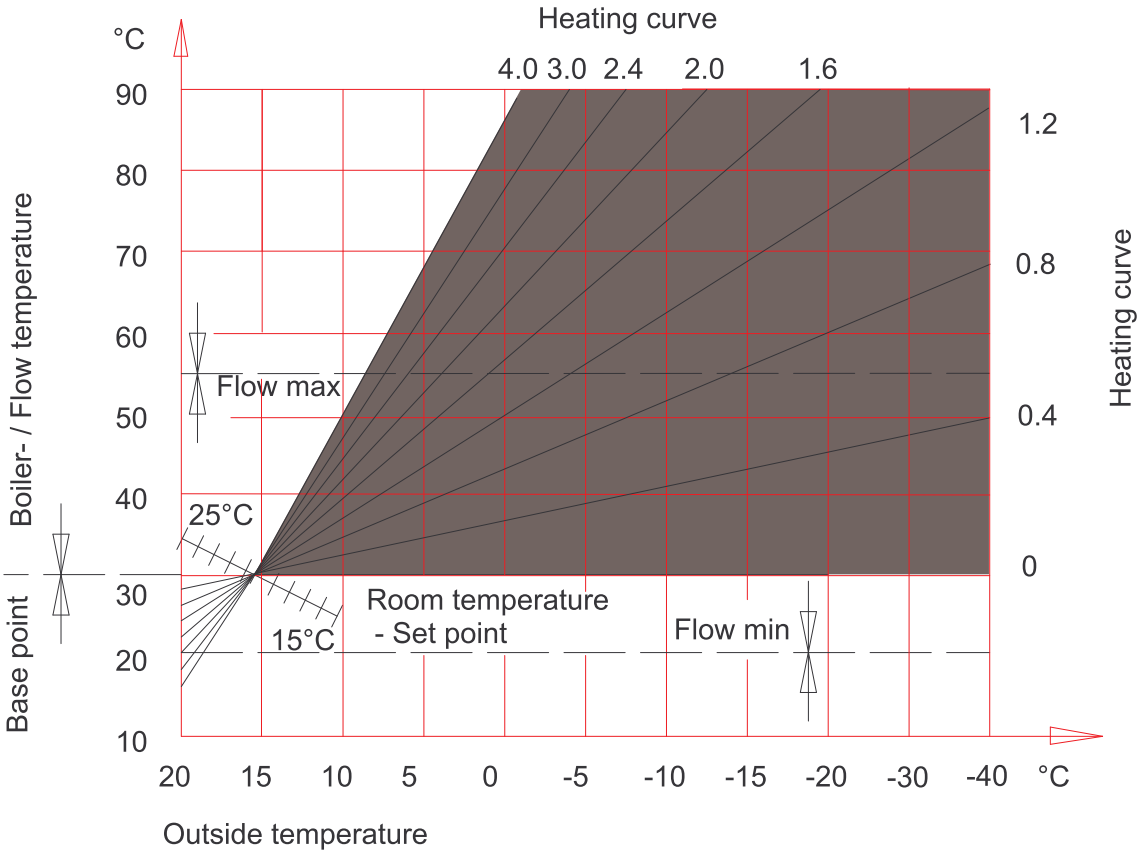
Heating curve is in the menu **Heating circuit**.



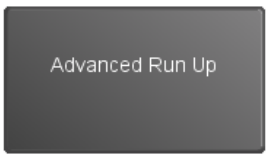
Heating curve 0.0 – 4,0
The heating curve describes the combination between outdoor temperature and the associated flow temperature for a heating circuit.
Base point adjustable from 68 - 113°F
With the change the of base point, you provide a parallel shift of the heating curve.
H limit heating
If the average outside temperature is higher than the set temperature, the heating circuit switches off in the heating mode.
H limit set temperature
If the average outside temperature is higher than the set temperature, the heating circuit switches off in the Set back mode.

Adjustment of heating curve and the base point to the building

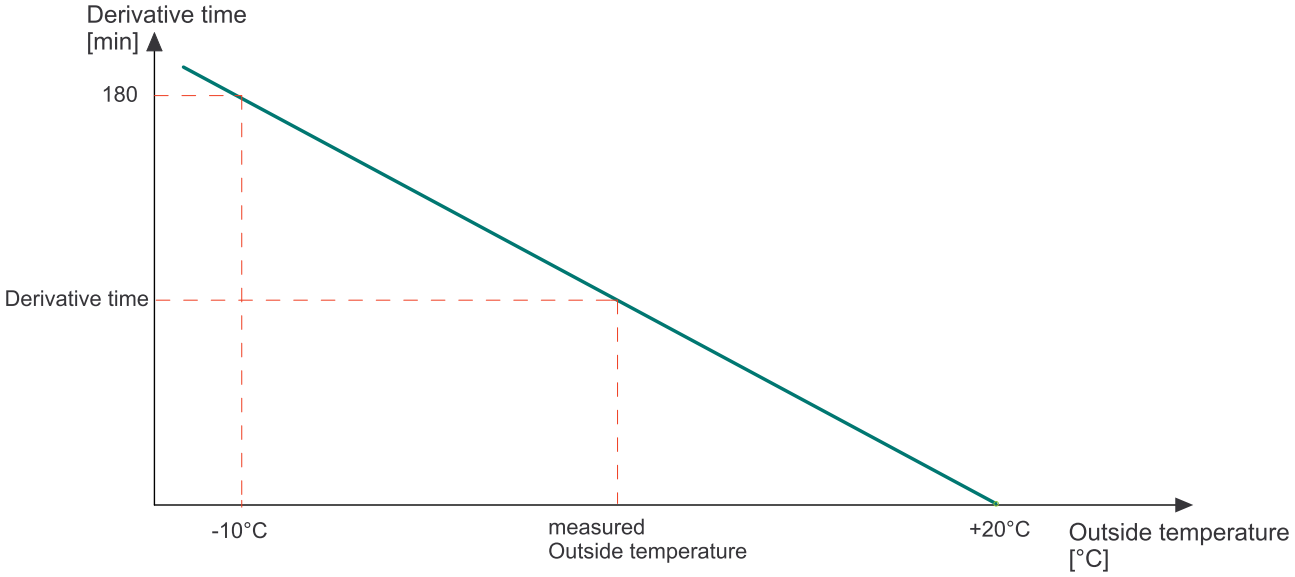
Because of the building´s thermal inertia, it is recommended to perform no more than one adjustment step per day.



Daytime outside temp	Room temperature	
	too warm	too cold
+5 to +15°C	Decrease heating curving value by 0,2	Increase heating curving value by 0.2
	Decrease base point value by 5°	Increase base point value by 5°
-20 to +5°C	Decrease heating curve value by 0.2	Increase heating curve value by 0.2



The advanced run up indicates how long the system has to heat before the start of the heating time, to reach the adjusted **roomtemp heating**.



Room thermostat influence
If the measured room temperature deviates from the set room temperature, the heating controller corrects the flow temperature with the Room thermostat influence.
The Room thermostat influence indicates how much the flow temperature is raised or lowered so that the Set room temperature is reached.

Example:

Room temperature desired value = 20°C

Room temperature actual value = 18°C

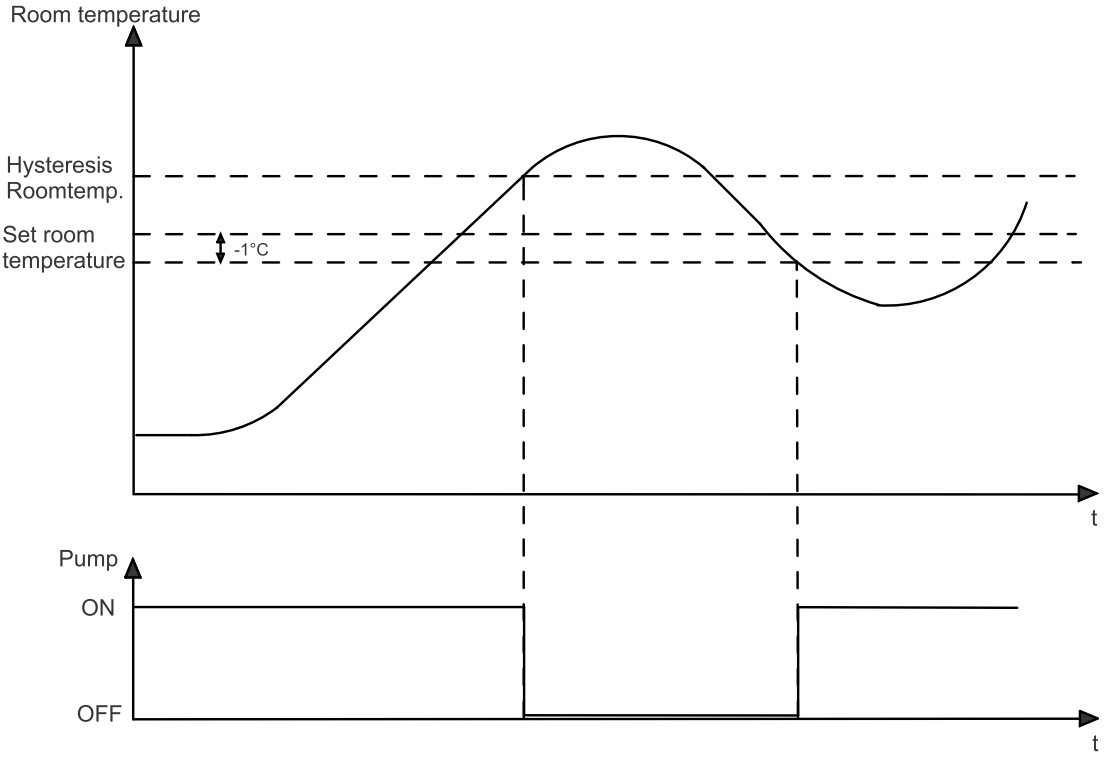
} Temperature difference 2°C

Room sensor influence = 3

Room sensor influence	*	Temperature difference	=	Advanced run up rise/reduction
3	*	2	=	6°C

Room temperature hysteresis

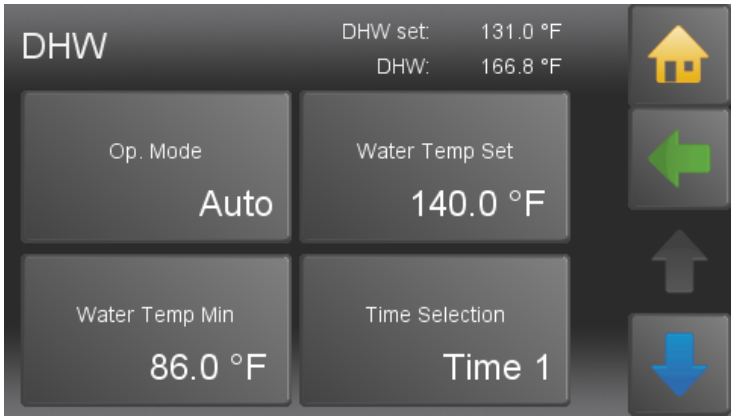
The Room temperature hysteresis prevents the cycling (On Off On Off...) of the heating circuit pump: If the Set room temperature + room temperature hysteresis is reached, the associated pump stops. If the Set room temperature is – 1°C, the pump switches on again.



15 Domestic hot water

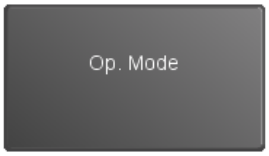
The menu Item **Domestic hot water** contains up to 3 submenu items.
Domestic hot water includes all, for the preperation of hat water, relevant parameters and settings.

Domestic hot water is in the main menu.



DHW settings has following menu items:

- Mode
- DHW Boost
- Water Temp Set
- Water Temp Min
- Time programme
- Values
- Time 1
- Time 2

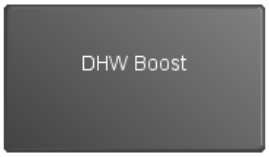


OFF Set water temperature is reduced to 46 °F for frost protection.

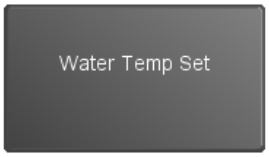
Auto The installation heats the water within the time programme to the **desired hot water temperature**. Outside the time programme the installation heats to **Watertemp min**

On The system heats up the domestic hot water continuously on the Water temp set.

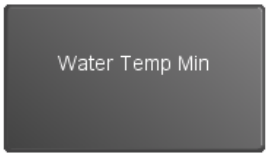
You can change the mode domestic hot water only when the **Operation mode** is on **AUTO**.



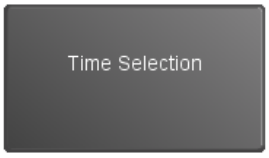
Heats the hot water once on the Water temp set.



Set the water temperature.



Set the minimum water temperature. The water temperature never falls below this value, unless the domestic hot water mode is on **OFF**.



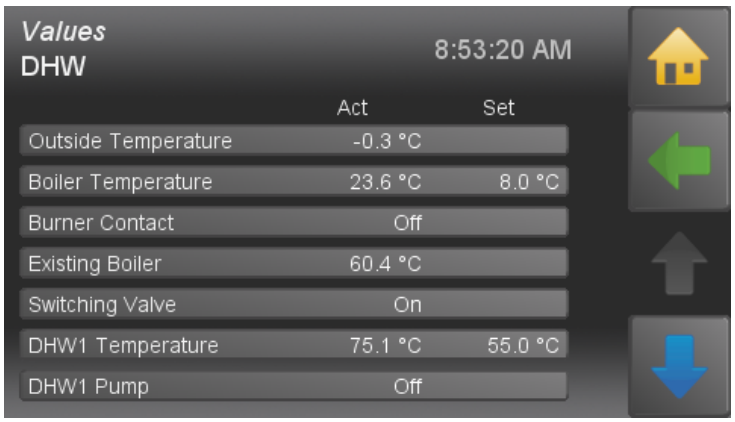
Activate **Time 1** (= Time programme 1) and **Time 2.**

You are able to see a list of all measuring values that are involved in the menu domestic hot water.

In the DHW time programme you set the times of the hot-water processing. The DHW time programme works the same way like the heating circuit time programme. See chapter14.2 Time programme Heating circuit, page 38

15.1 Measuring values Domestic hot water

Measuring values DHW is in the Main menu.



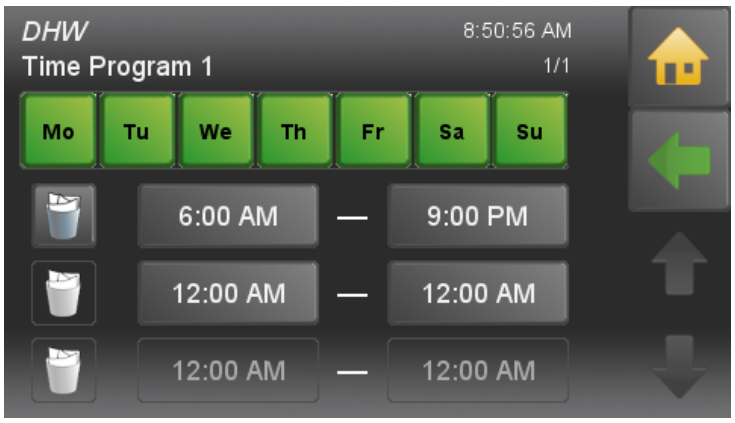
You see all the Heating circuit corresponding measuring values:

- Actual value
- Set value
- Inputs (sensores)
- Outputs (pumps, mixer and motors)

15.2 Time programme DHW

In the DHW time programme you set the times for the hot-water processing.

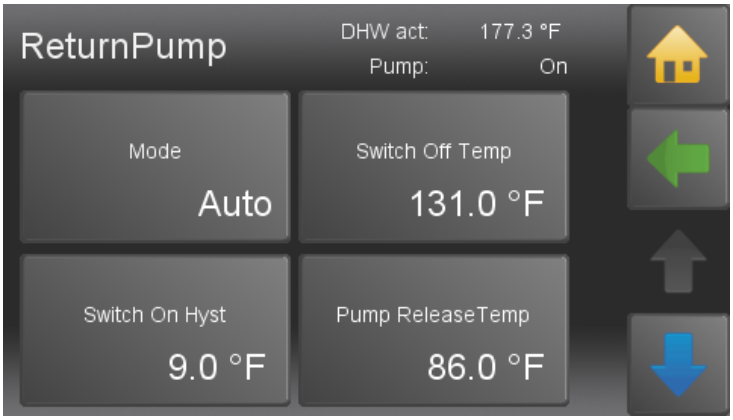
Time 1 (=Time programme 1) and **Time 2** are in the menu **Domestic hot water**.



The domestic hot water time programme works the same way like the heating circuit time programme.
See chapter 14.2 Time programme Heating circuit, page 38

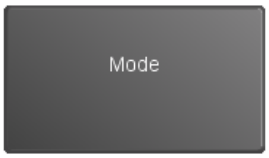
16 DHW Return pump

DHW Return pump is in the Main Menu.



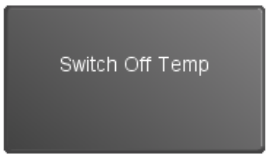
The Return pump enables the immediate DHW tap of the water taps. DHW Return pump has following menu items:

- Mode
- Switch off temperature
- Switch on hysteresis
- Time allocation
- Values
- Time 1
- Time 2

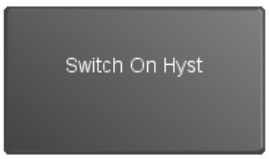


Off DHW Return pump inactive

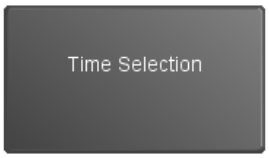
Auto Temperature regulation within the time programme



If the return temperature sensor of the DHW Return pump reaches the **Switch off temperature**, the pump switches off.



If the return temperature falls below the switch off temperature – the DHW Return pump switches on again!



Choose the time programme 1 or 2.

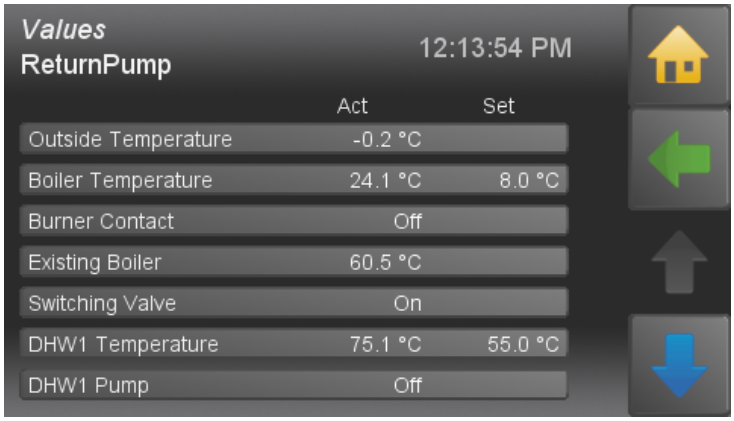
You see all the DHW pump corresponding measuring values.

Set the run times of the Return pump. The return pump – time programme works the same way like the heating circuit time programme.
See chapter 14.2 Time programme Heating circuit, page 38

Note:
A **Return Pump** and a **booster** rule out each other.

16.1 Measuring values DHW Return pump

Measuring values DHW Return pump is in menu DHW Return pump.



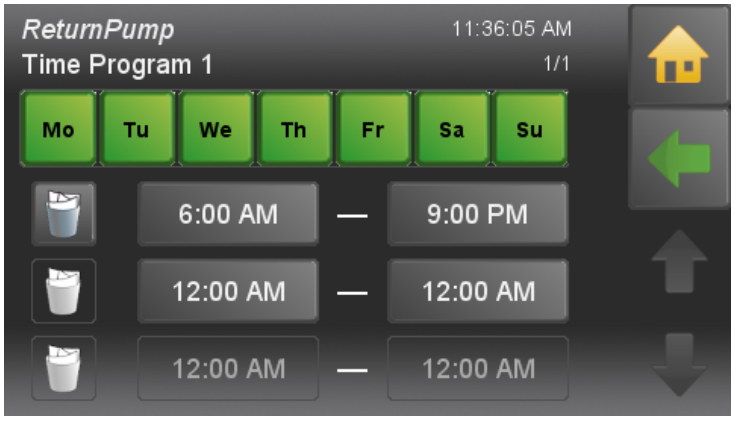
You see all the Heating circuit corresponding measuring values:

- Actual value
- Set value
- Inputs (sensores)
- Outputs (pumps, mixer und motors)

16.2 Time programme DHW return pump

In the Time Programme DHW Return Pump you set the times for the hot water in the water purchasers.

Time 1 (=Time programme 1) and **Time 2** are in the menu **DHW return pump.**

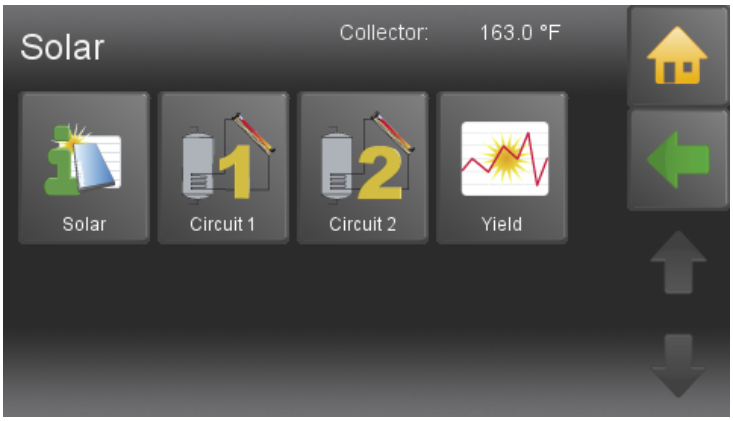


The DHW return pump time programme works the same way like the heating circuit time programme.
See chapter 14.2 Time programme Heating circuit, page 38

17 Solar

Solar includes all relevant parameters and settings for the solar thermal system. You can control up to 6 solar circuits.

Solar is in the Main menu.

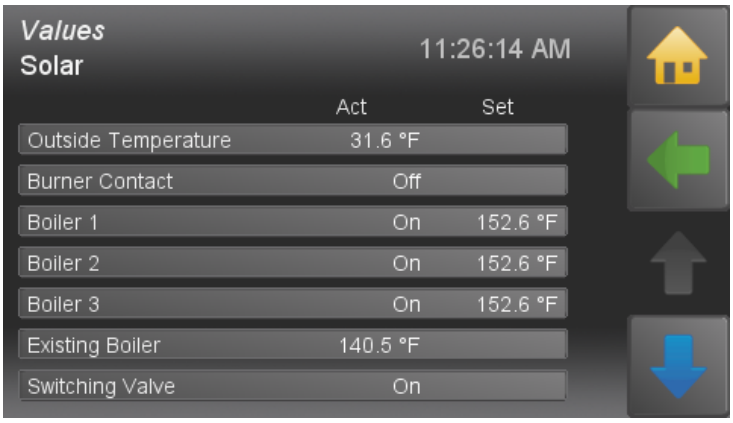


Solar has following menu items:

- Measuring values Solar
- Solar circuit 1–2
- Solar energy- yield

17.1 Measuring values Solar

Measuring values Solar is in the menu Solar.

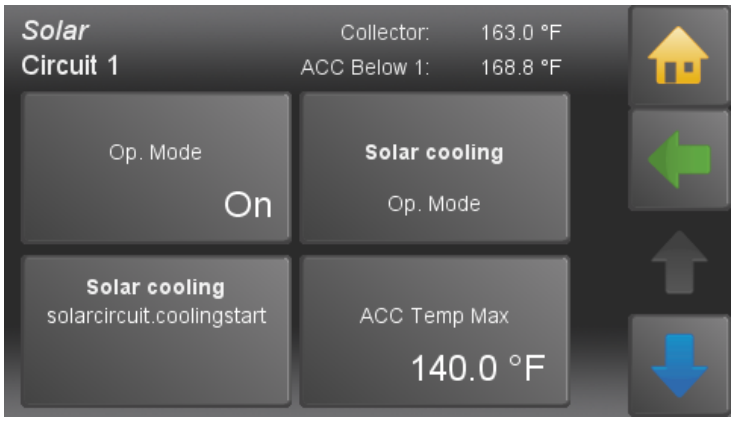


It displays all measuring values of Solar:

- Actual values
- Set values
- Inputs (sensors)
- Outputs (pumps, mixer and motors)

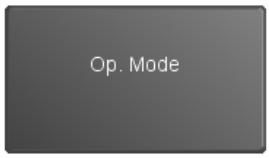
17.2 Solar circuit

Solar circuit 1 and 2 are in menu Solar.

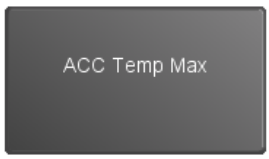


Solar circuit has following menu items:

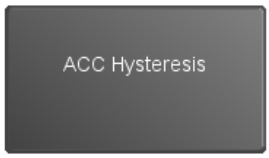
- Operation Mode
- ACC Temp Max
- ACC Hysteresis
- Collector Hyst On
- Collector Hyst Off



Off: No charge
On: Charge as long as **Collector temperature + hysteresis** is lower than the temperature of the **Adj ACC sensor below** or the **ACC temp max**



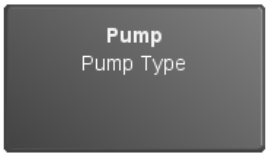
If the temperature in the ACC is higher than the ACC temp Max, the solar pump switches off. The limit sensor measures the temperature in the ACC.



The solar circuit pump is switched off due to the ACC temp Max is reached. The temperature must fall under ACC temp Max minus hysteresis, then the solar circuit pump switches on again. The hysteresis prevents a solar pump cycling (On Off On Off).

If the temperature differnce between the collector sensor and TPU, ACC lower sensor is higher than the Coll Hyst A, the solar pump switches On.

If the temperature differnce between the collector sensor and TPU, ACC lower sensor is lower than the Coll Hyst A, the solar pump switches Off.



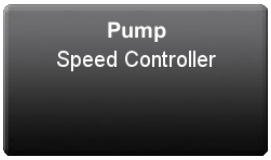
The menu **Pumptype** contains the following modes:

Asynchronus: Asynchronus pump – direct output 230VAC on/off
Async.Regulated: Asynchronus pump – pulsed output 230VAC
Heating Efficient: PWM1 - PWM signal inverted
Solar Efficient: PWM2 - PWM direct signal

Note:
When using a A-class pump as **Accumulator pump** the pump cannot be regulated from Solar circuit 2.

NOTICE

Material damage by false selection of pump!



Off: Speed controller Off
On: Speed controller On

NOTICE

Material damage by false configuration of pump type and speed controller!

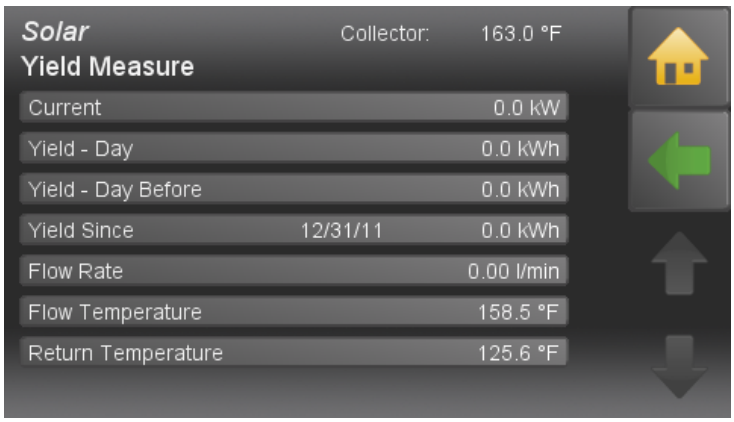
17.3 Yield - Solar Energy

This function measures the yield of the solar thermal system and displays current energy and logs previous days.

For the function solar energy it is necessary to install:

- Pulse volume meter (must be connected to **24 VOLT** and **Z_IN**)
- Flow temperature sensor
- Return temperature sensor

Yield - Solar Energy is in the menu Solar.



Yield measuring of solar energy has following menu items:

- Actual
  Display of the current solar energy, refreshes every 60 sec.
- Yield - Day
  Display of todays solar energy since 00:00.
- Yield - Day before
  Display of yesterdays solar energy.
- Yield since
  Display of the solar energy since the last set date.
- Flow rate
  Display of the current flow rate, refreshes every 60 sec.
- Flow temperature
  Display of the current flow temperature
- Return temperature
  Display of the current return temperature

18 Pellematic

Pellematic includes all the relevant parameters and settings for the control of the pellet boiler.
There are up to 4 Pellematic boilers possible.

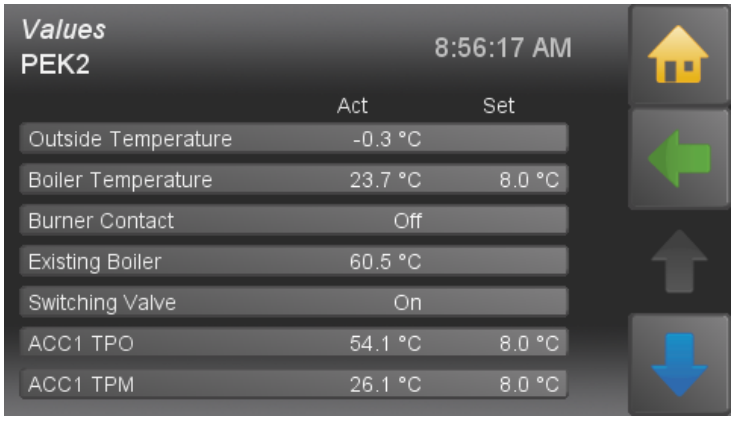
Pellematic is in the Main menu.

Pellematic has following items:

- Measuring values Pellematic
- Permanent operation
- Full power
- Burner plate cleaning
- Boiler cleaning
- Pellet level
- Suction turbine

18.1 Measuring values

Measuring values is in the menu Pellematic.



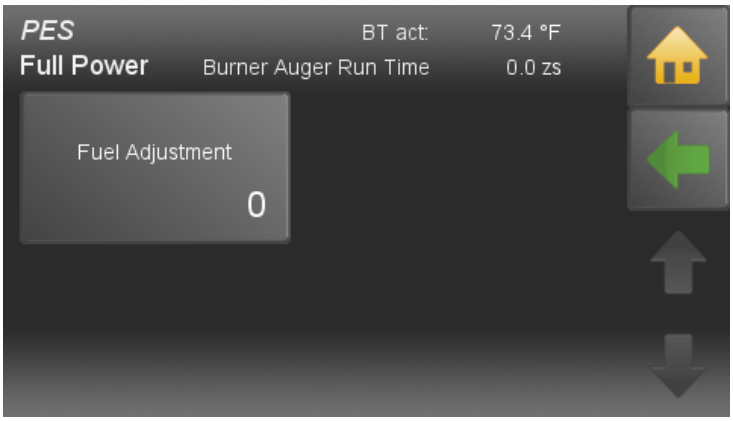
It displays all measuring values of Pellematic:

- Actual values
- Set values
- Inputs (sensors)
- Outputs (pumps, mixer and motors)

See chapter 14.1 Measuring values Heating circuit, page 37

18.2 Full Power

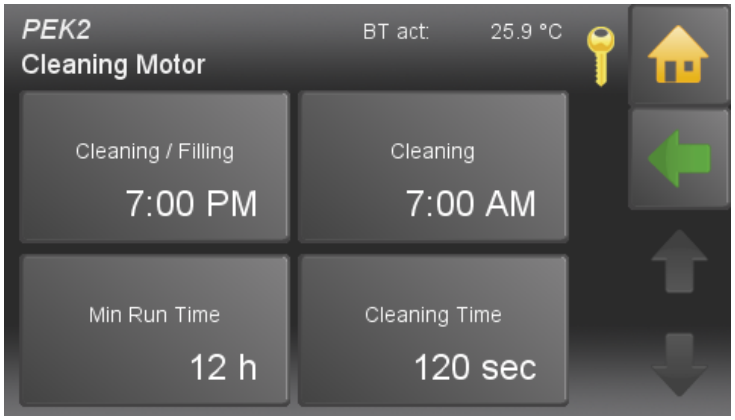
Full Power is in the menu Pellematic

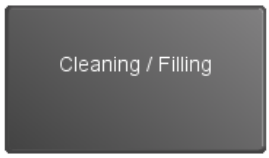


In the menu item Full Power can you adjust the fuel feed.

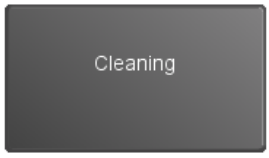
Fuel Adjustment:
The burner auger run time is calculated automatically by the PLC depending on the rated power and the boiler setpoint temperature. The burner motor is controlled accordingly. You can reduce or increase the value calculated by the PLC 10 steps up or down.

18.3 Boiler cleaning

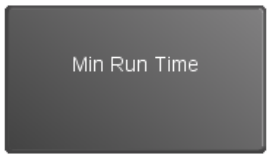




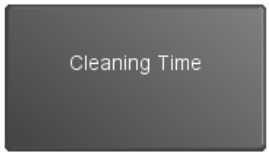
The value to be set is the time (full hour) at which the boiler cleaning sequence is performed. On vacuum systems the hopper is also filled at the same time, regardless of whether it is empty or not.



You can set in **Cleaning/Filling** a second cleaning sequence. The value to be set is the time (full hour) at which the additonal boiler cleaning sequence is performed. Example: 20h = additional boiler cleaning sequence performed at 20:00. On vacuum systems the hopper is also filled at the same time, regardless of whether it is empty or not.
Default value -1h: It is not performed a second cleaning sequence.

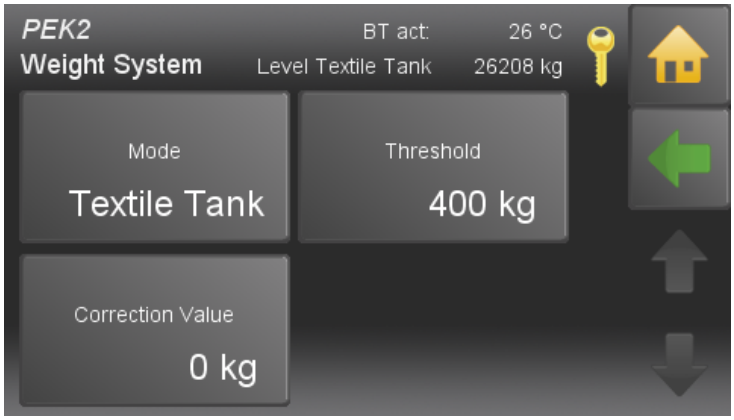


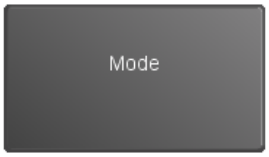
Min Run Time of the boiler until next cleaning sequence. Value adjustable.



Duration of the boiler cleaning sequence in seconds. Value adjustable.

18.4 Level detection system





Selection options:

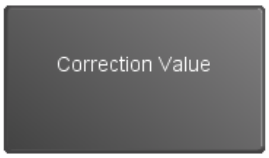
Off	Function level detection system inactive.
Textile tank	Level detection system of textile tank by weighting cells.
Storage room	Put in the filling quantity after a pellet delivery. Level detecion by weighting system of hopper. Only possible with Pelletboilers of the type PES 36-56.
Cap sensor	Filling level detection in textile tank or storage room by capaciti-ve sensor.

Insert filling amount after filling the storage room.

Note:
Displayed only if mode is set on **Storage room**.

The threshold value, **Minimum weight** for a warning message, is adjustable.
The warning message appears on the operating device and will be terminated when filling level rerises above the adjusted Minimum weight.

Note:
Only displaed if mode is set on **Storage room** or **Textile tank**

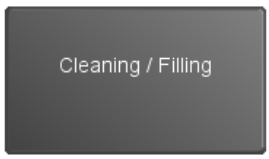


Set the display of the current weight to 0 by putting in the negative of the cur-rent weight shown.

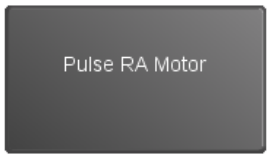
Note:
Displayed only if mode is set on **Storage room** or **Textile tank**.

18.5 Suction turbine

Note:
The menu item **Suction turbine** is only visible in suction systems.



Set a Time (full hours), at which the hopper gets refilled, regardless how full it is at this time.
At the same time the purification of the boiler will take place.
This adjustment matches Cleaning/Filling.



Frequency for storage room suction systems in pulse mode, only for vacuum systems.

Pause time for storage room extractor motor - suction system in pulse mode. If pause time = 0 then no pulse mode.

Run time of burner auger until next Suction Interval.
The hopper is filled at this time regardless whether it is empty or not.

- 175 min = 12 – 20 kW
- 225 min = 25 – 32 kW
- 90 min = 36 – 56 kW

19 General

General includes the complete heating control related settings and individual operating options for the customer.

General is in the Main menu.

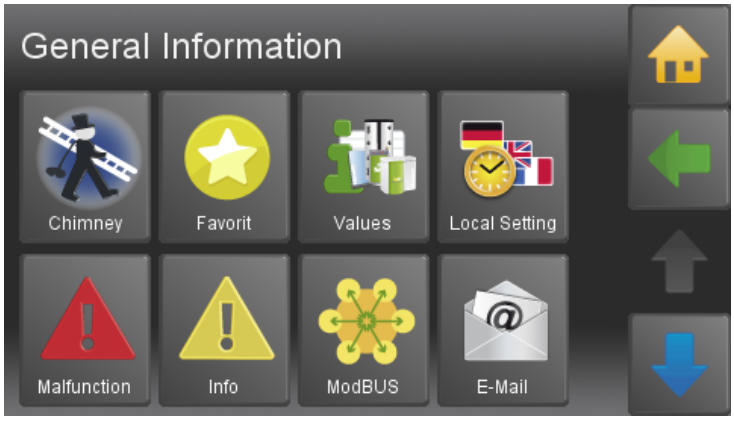
The menu **General** includes::

- Chimney
- Favorit
- Local setting
- Malfunction
- Info

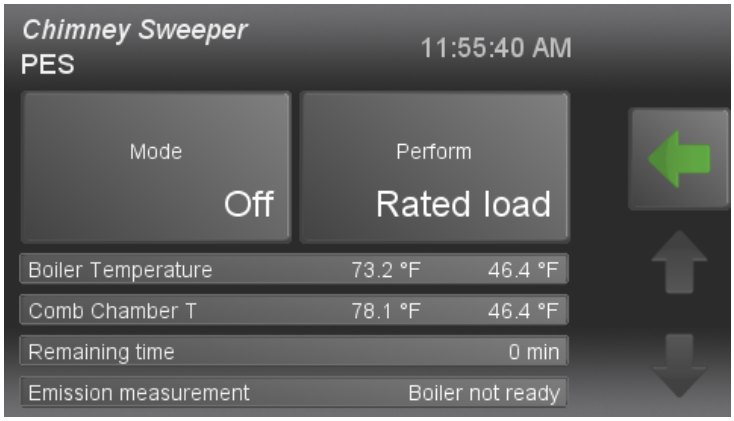
19.1 Chimney

The function chimney is only for chimney droughts and authorized service technicians. It is used for the measurement of exhaust gas.

The menu item **Chimney** is situated in the menu General.



Please choose the function **Chimney**.



- The boiler temperature is set to 140 °F for a total runtime of 30 minutes.
- You also can see actual boiler temperature and the rest of the time limit.
- After the expiry of the time limit the function chimney ends.time of expiry the operation Chimney sweeper ends.
- The button Cancel ends the function Chimney.

19.2 Favorite

Favorite is in the menu General.

With this function you can display most commonly used menus in the start menu. This enables you a direct access.
Select the menu item that should be displayed as a favorite 1 in the Start menu.

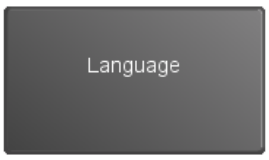
The selected item is green and the icon is displayed in the Start menu and is active.

19.3 Local Settings

Local Settings is in the menu General.

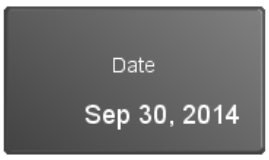
Local Settings has following menu items:

- Language
- Unit
- Date
- Time

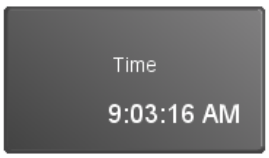


Choose between the languages German, English UK, English U.S. French, Spanish, Italian, Dutch, Danish and Russian.

You can choose between isometric and imperialist number system.



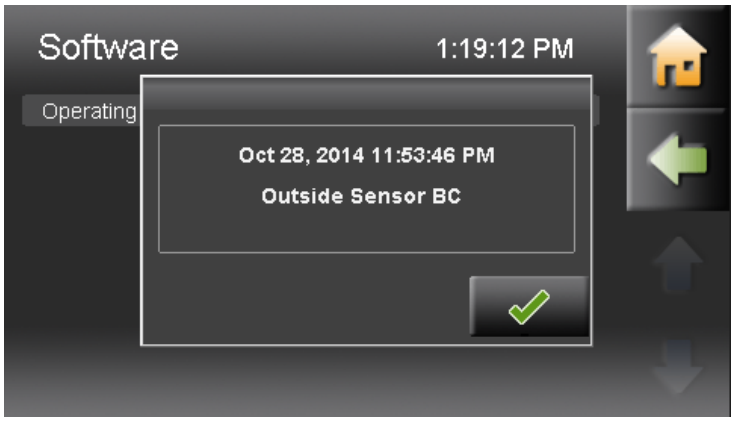
Set the current date.



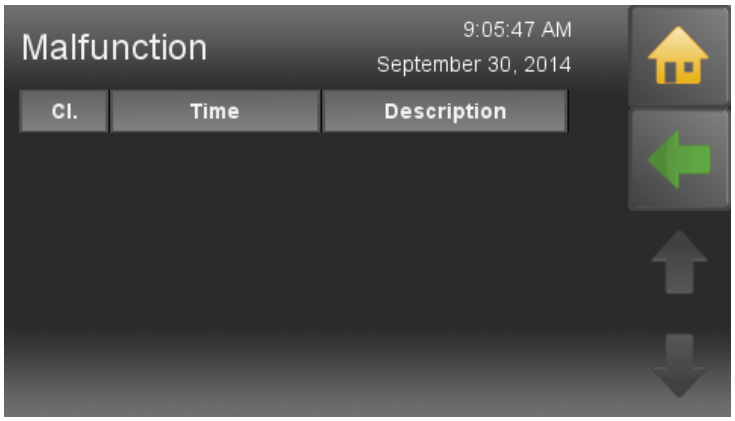
Set the current time.

19.4 Malfunction

Malfunction is in the menu General.



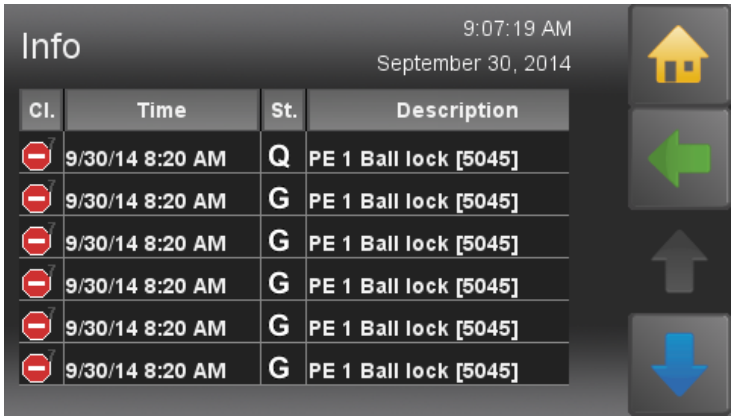
Fault messages can overlayed on all menu items and appear immediately if a fault occurs. Every fault message appears with the date, time and name on the display. It remains until it is acknowledged.



The menu remains the fault incident reports, as long as they are corrected up.

19.5 Information

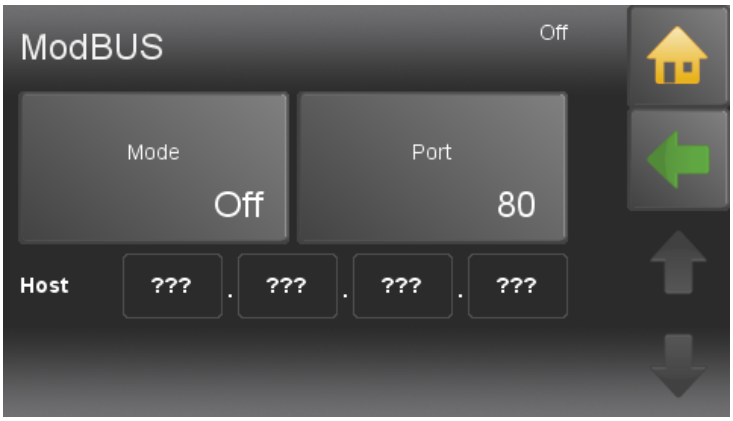
Information is in the menu General.

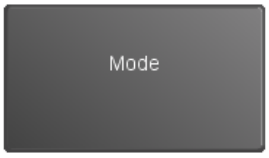


In the menu item information are all faults listed chronologically.
The fault texts have 3 status

- C.....COME — when the fault occurs
- Q.....QUIT — when the fault has been rectified
- G.....GONE — when the fault has been reset by pressing ENTER

19.6 ModBUS



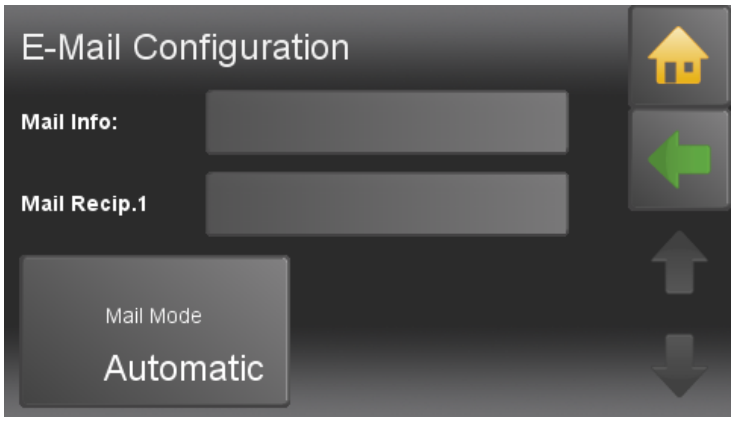


Off

TCP Server

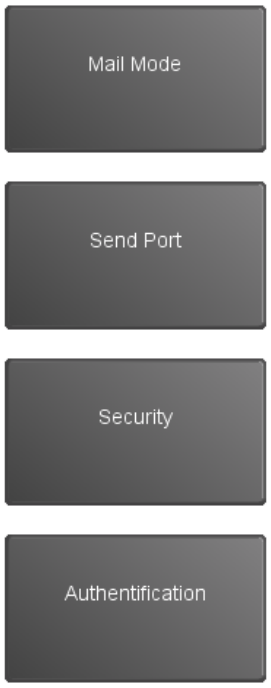
Defaultport for ModBUS is 502.

19.7 E-Mail



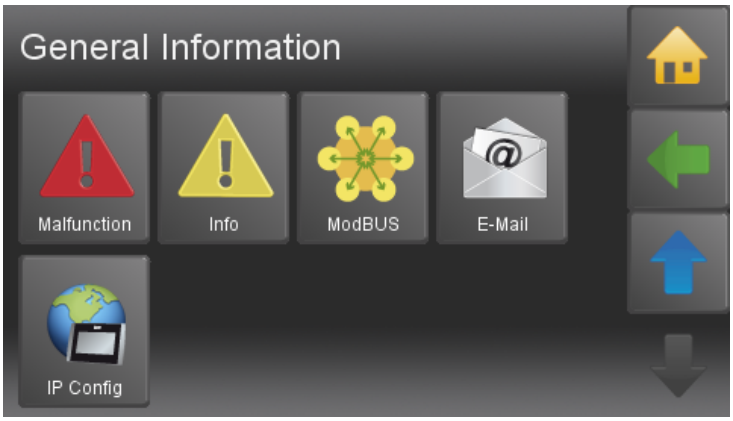
Delivery of disturbance-emails is done through an Maine Energy Systems server.

Only the recipient address needs to be configured.

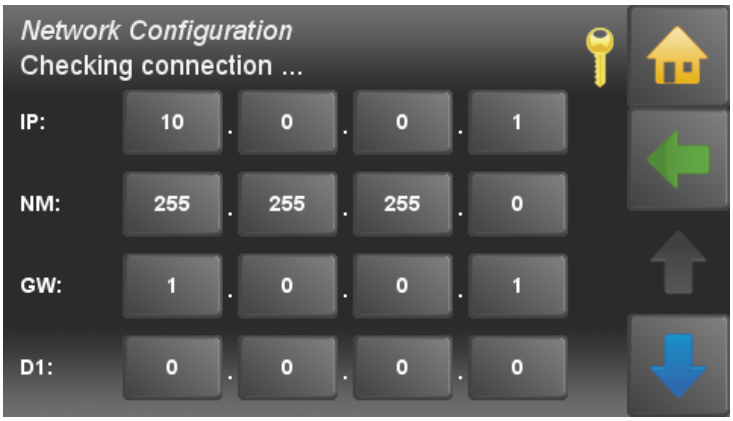


To ensure maximal flexibility, E-mail settings can set individually.

19.8 IP Config



Please choose the submenu item **IP Config** in the menu General.



Insert the **IP (Adress)**, **NM (Netmask)** and **GW (Gateway)** , D1 (in most cases similar to GW) and **D2 (optional)**.

IP: IP address in the local network

NM: Networkmask is required in the local network.

GW: The gateway enables the touch operating device the access to the internet.

D1, D2: Server, which provide routing information

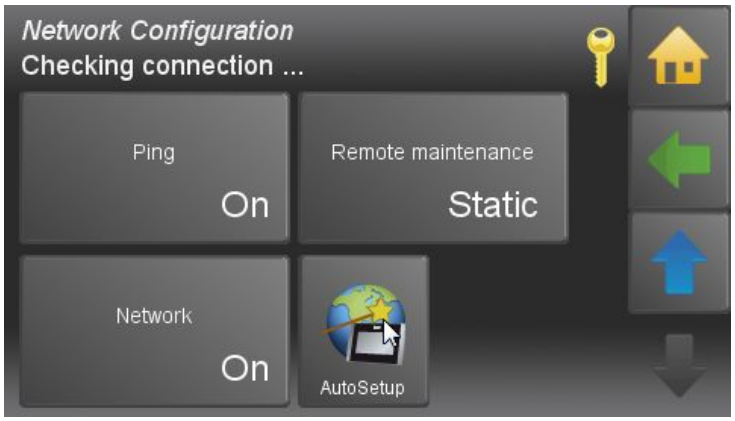
Set **DHCP On** or **Off** depending on your network.

Enter the **Port** (Default **80**).

Web: IP address in local network

Web User: Networkmask is required in local network

Web Password: The gateway enables the touch operating device the access to the internet.

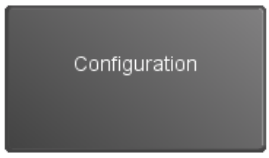


Activate optionally the **Ping** function.

NOTICE

To prevent the modem from switching into standby mode, a ping command is executed every 10 minutes.

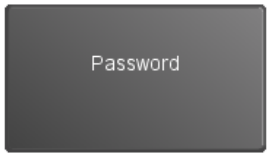
You get the data from your network technician.



This menu item is only active when a compatible USB wireless adapter is connected. (not every wireless stick works with the Touch operating device)
By default, this item is hidden and located in LAN mode.
If the wireless mode is enabled, a password box appears.

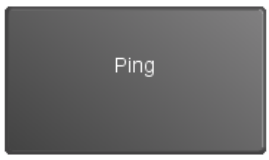
Dynamic address assignment on the local network (should be disabled if possible).

If a WLAN stick is recognized and supported, an Additional LAN & WLAN button appears.

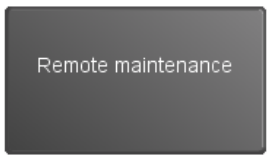


Password of router.

Address extension with which the touch remote control is accessible.
In principle, you can make your own choice, certain ports are associated with special services, e.g. 25 Mail, 80 Web and so on.



The ping prevents the internet connection from beeing closed by the router.
Therefore a query to the Maine Energy Systems server is started at certain time intervals.
So the router detects that the connection is still active.



Automatic: This will attempt to automatically set up the router using the UPNP protocol port forwarding.
If this service is disabled on the router or doesn't work properly, it is canceled accompanied by an appropriate error message.
As this function is time-consuming (may take a few minutes), it is running in the background. Whatever the UPNP
If available, the Touch operating device registers on the Maine Energy Systems remote control server with it's current external IP Address.
In case of change of address by the external provider, this is detected and sent to the server Maine Energy Systems.

Manual: In this mode, the port forwarding must be set manually. (for lack of UPNP)

The port of the touch panel must correspond to the external shared port.
The touch then registers with the external IP address and port on ÖkoFEN remote maintenance server.
In case of change of address by the external provider, this is detected and sent to the Maine Energy Systems server.

Static: In this mode, no connection data is transferred to the Maine Energy Systems server and the online service of Maine Energy Systems can not be used.
But the remote controll of the Touch operating device remains active and can be uses as before via port forwarding, DynDns, fixed external IP, LAN and so on.

Back to the menu **General**.

Remote maintenance access

This function determines the network settings automatically.
For this the DHCP mode is activated and the required settings are set automatically.
Afterwards DHCP is deactivated.
Because of this, the IP address of the contol unit can change.

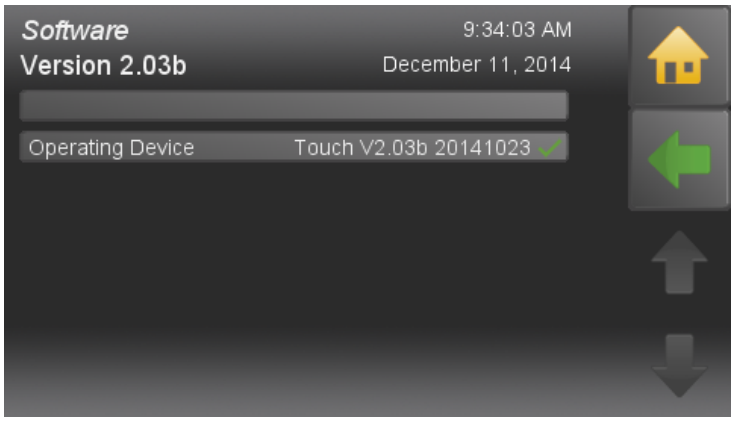
The settings are set as follows:

- DHCP Off
- Ping On
- Port 8080
- Remote maintenance: Automatic

All functions for the network/internet can be disabled here.

20 Software

Software is in the Main menu.



Software shows you the name of the current software.

21 Emptying the ash pan

CAUTION

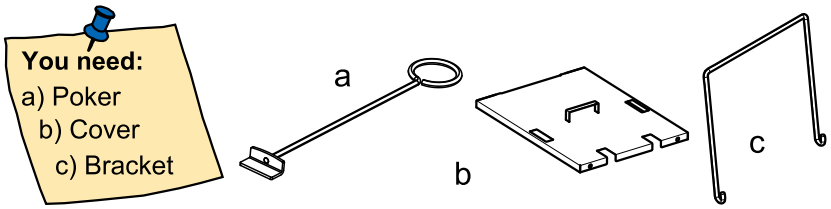
Risk of burns
Do not touch the boiler vessel. Use gloves.

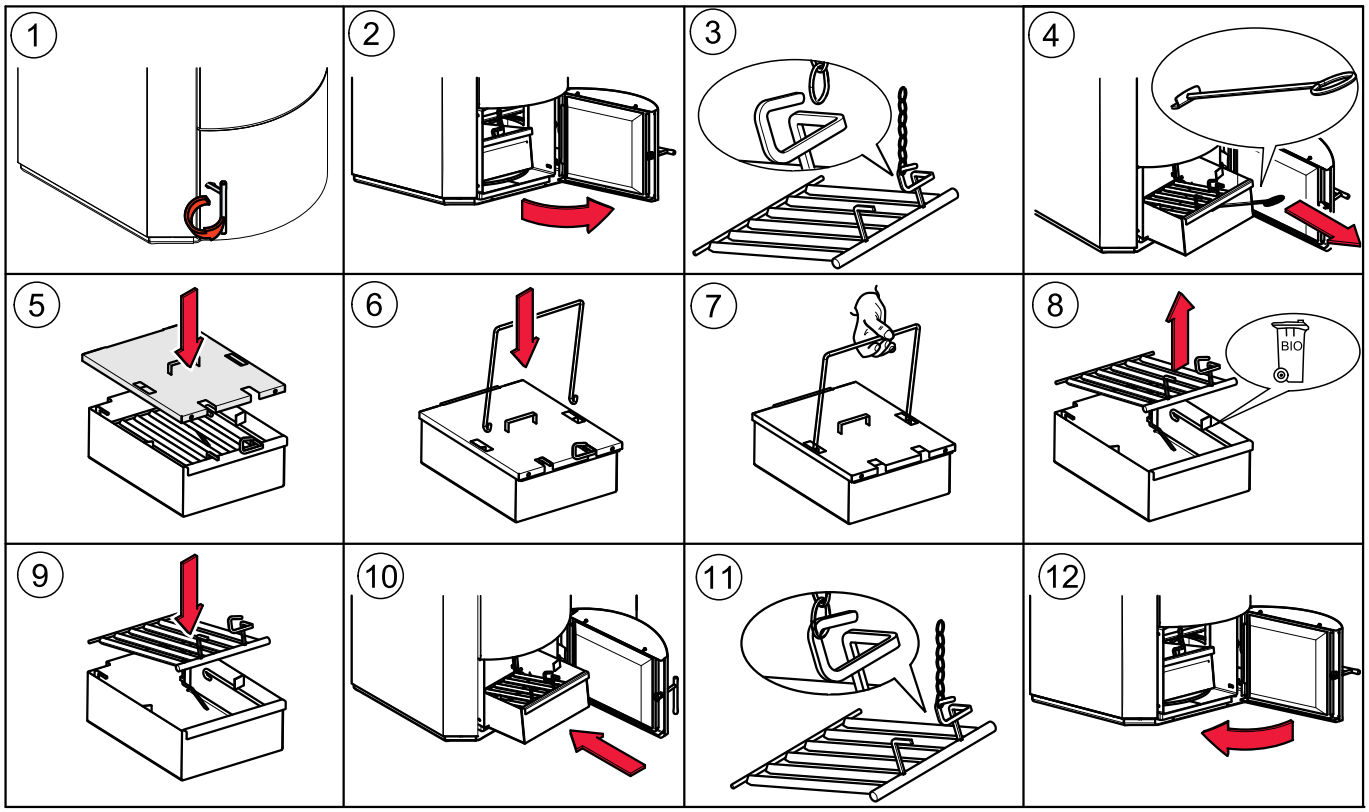
DANGER

Risk of fire
Bring out the ash pan immediatly.
Do not dispose ash until it has completely cooled down.
Empty ash only into a not flammable steel container.
Do not use ash container to store waste or other material.
Do not empty ash onto flammable floors or materials.

Emptying the ash pan

Note:
Check the level of the ash pan and empty it at regularly intervals (at least every 2 weeks). No warning is displayed indicating that ash pan needs to be emptied when it is full (unlike external ash box)





* No riddle grate for systems with burner plate cleaning system.

22 Emptying the ash box

Only on boilers with external ash box. We also offer an optional automatic external ash box. This compresses the ash and reduces the frequency at which it needs to be emptied. It enables the ash to be disposed off without creating dust. Installation is performed by the service technician when the pellet boiler is installed. An external ash box can also be retrofitted.

NOTICE

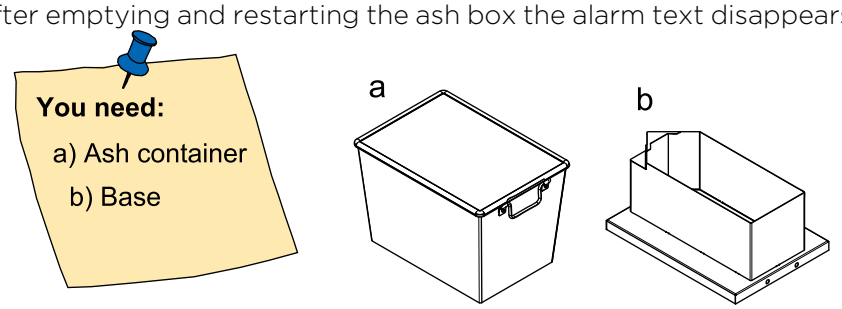
Damage to property
Empty the ash box before a longer off-time of the boiler. Otherwise the auger and the opening mechanism can be blocked through firmly bonded ash.

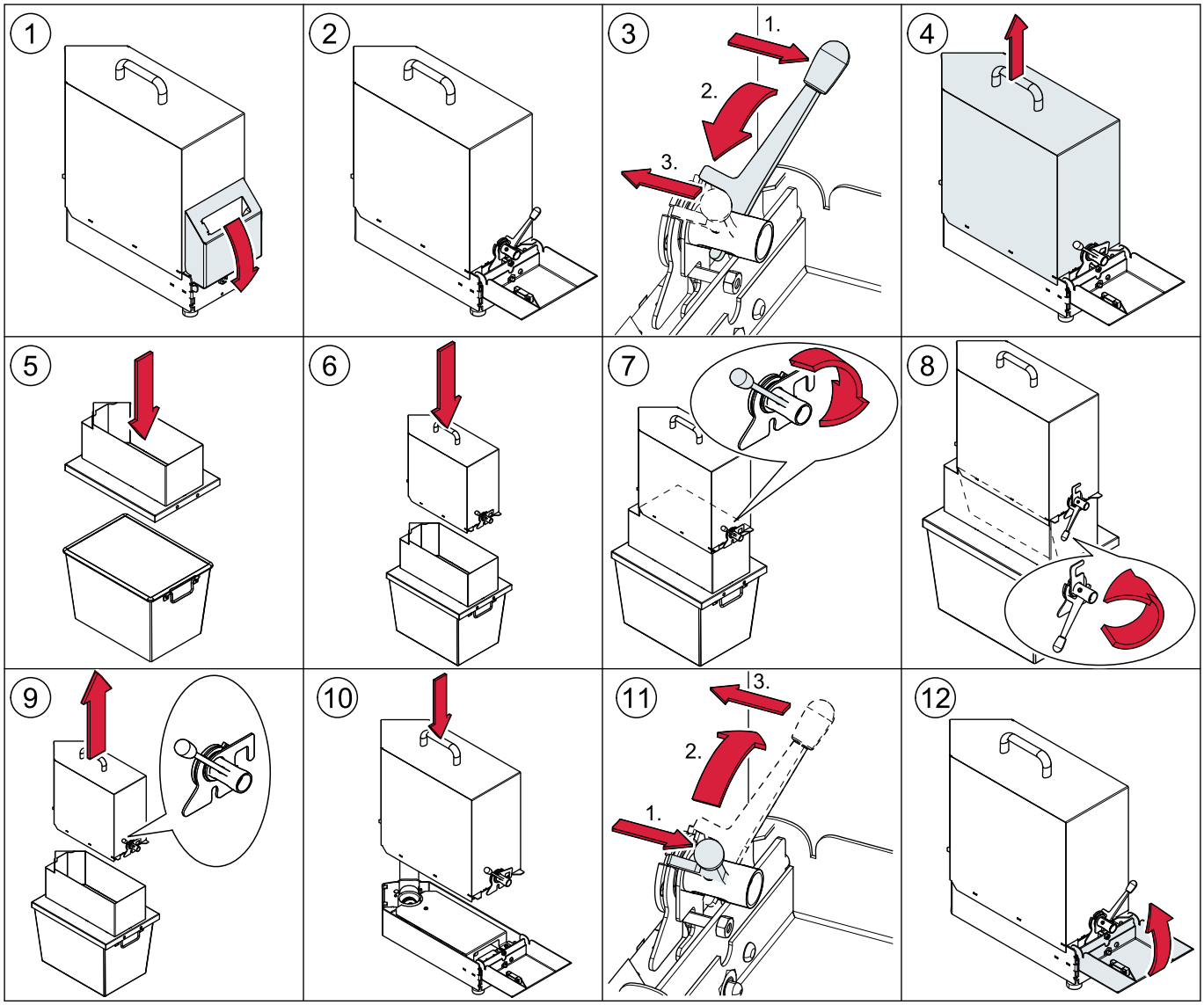
DANGER

Risk of fire
Bring out the ash box immediatly.
Do not dispose ash until it has completely cooled down.
Empty ash only into a not flammable steel container.
Do not use the ash container to store waste or other material.
Do not empty ash onto flammable floors or materials.

Emptying the ash box

Note:
When the ashbox is full then **Ash!!!** appears on the display with the alarm text **Ash box full**.
After emptying and restarting the ash box the alarm text disappears automatically.





23 Maintenance and servicing

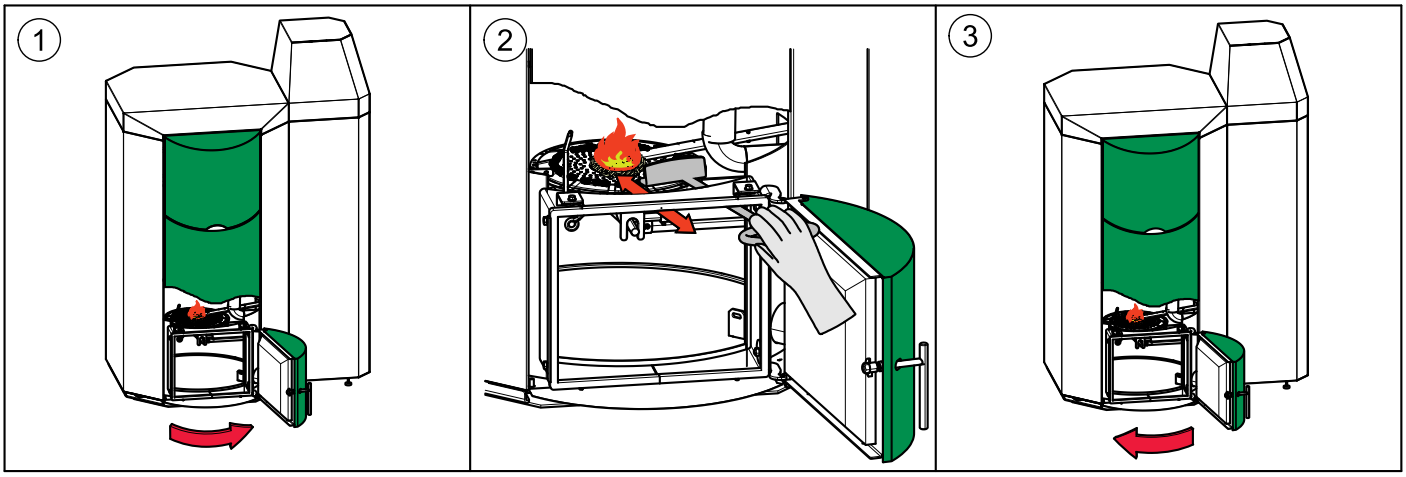
Regular checks of the pellet heating system are a prerequisite for reliable, efficient and environment-friendly operation.

NOTICE

This wood heating appliance needs periodic inspection and repair for proper operation. It is against federal law to operate this wood heating appliance in a manner inconsistent with operating instructions in the manual.

23.1 Maintenance

The maintenance, boiler cleaning and cleaning of flue gas connection it is necessary at least once a year. For PE(S) 36-56 it is necessary in any case at least every 2000 operating hours. Pellets which produces tendentially more slagging (ash melting point <2372 °F) and pellets with higher bulk density (> 650kg) leads to additional cleaning of the burner plate at regular intervals.



23.2 Cleaning the boiler every year

NOTICE

The pellet boiler is equipped with an automatic cleaning system that cleans the heat exchanger every day. In addition, you need to clean the boiler manually once a year before the start of the heating season.

NOTICE

Cleaning of the pellet boiler has to be performed from a authorized service technician at least every third year.

WARNING

Risk of burns
Do not clean the boiler until it has been allowed to cool down.
Switch off the heating system at least 6 hours before opening the boiler.
Switch off the main switch before starting any maintenance work on the system.

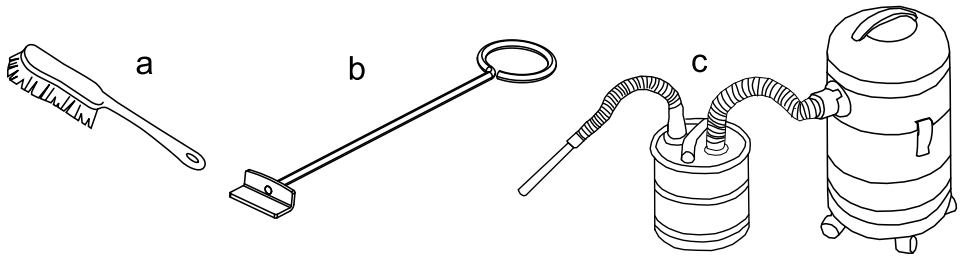
CAUTION

Risk of cut injuries due to sharp edges
Use gloves.

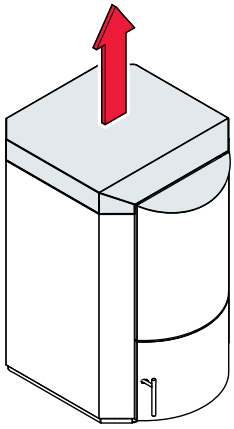
Note:
Check first of all, if all seals are in a good condition and the doors closes tightly.

Procedure for cleaning the boiler

You need:
a) Brush
b) Poker
c) Vacuum cleaner with ash filter



1



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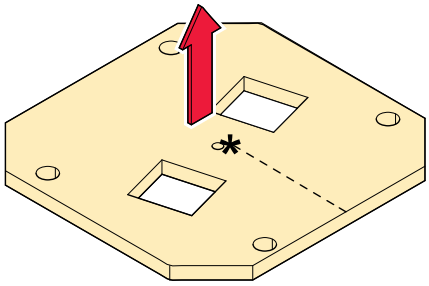
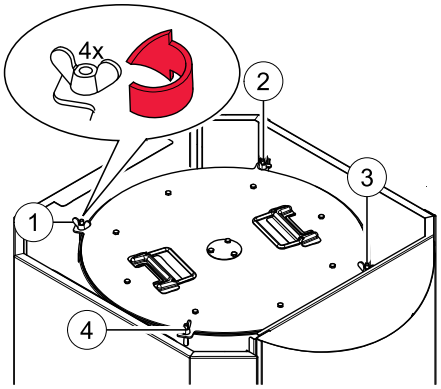


* Take out the combustion chamber sensor if there is one

3



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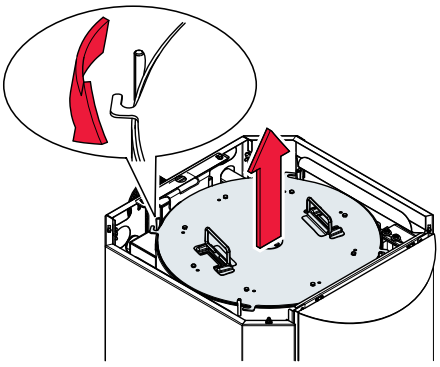

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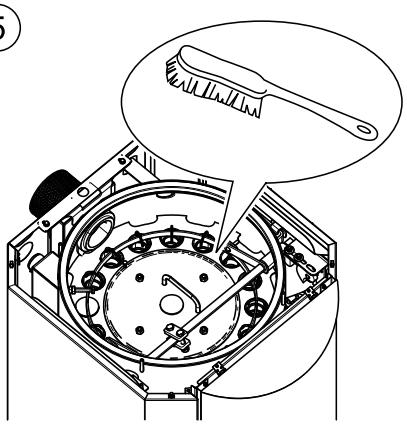

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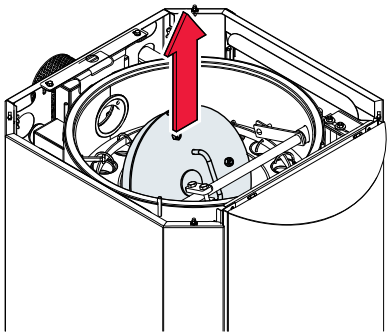

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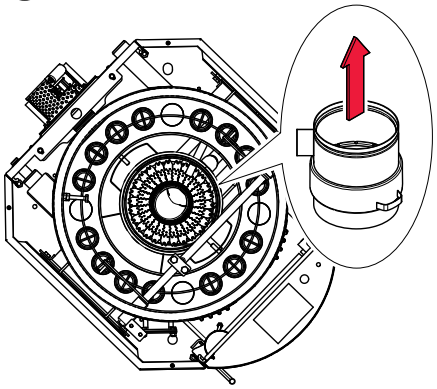

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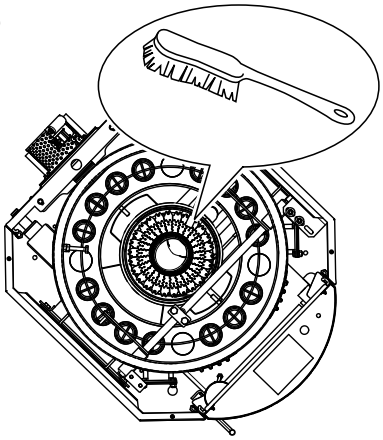

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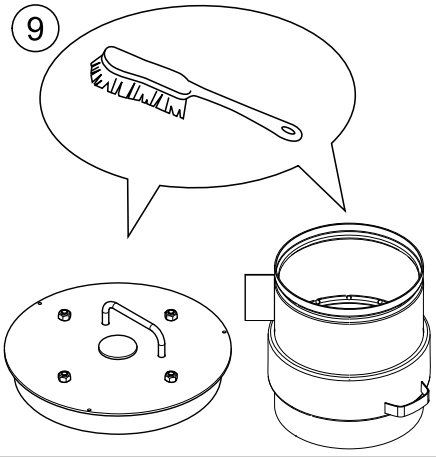
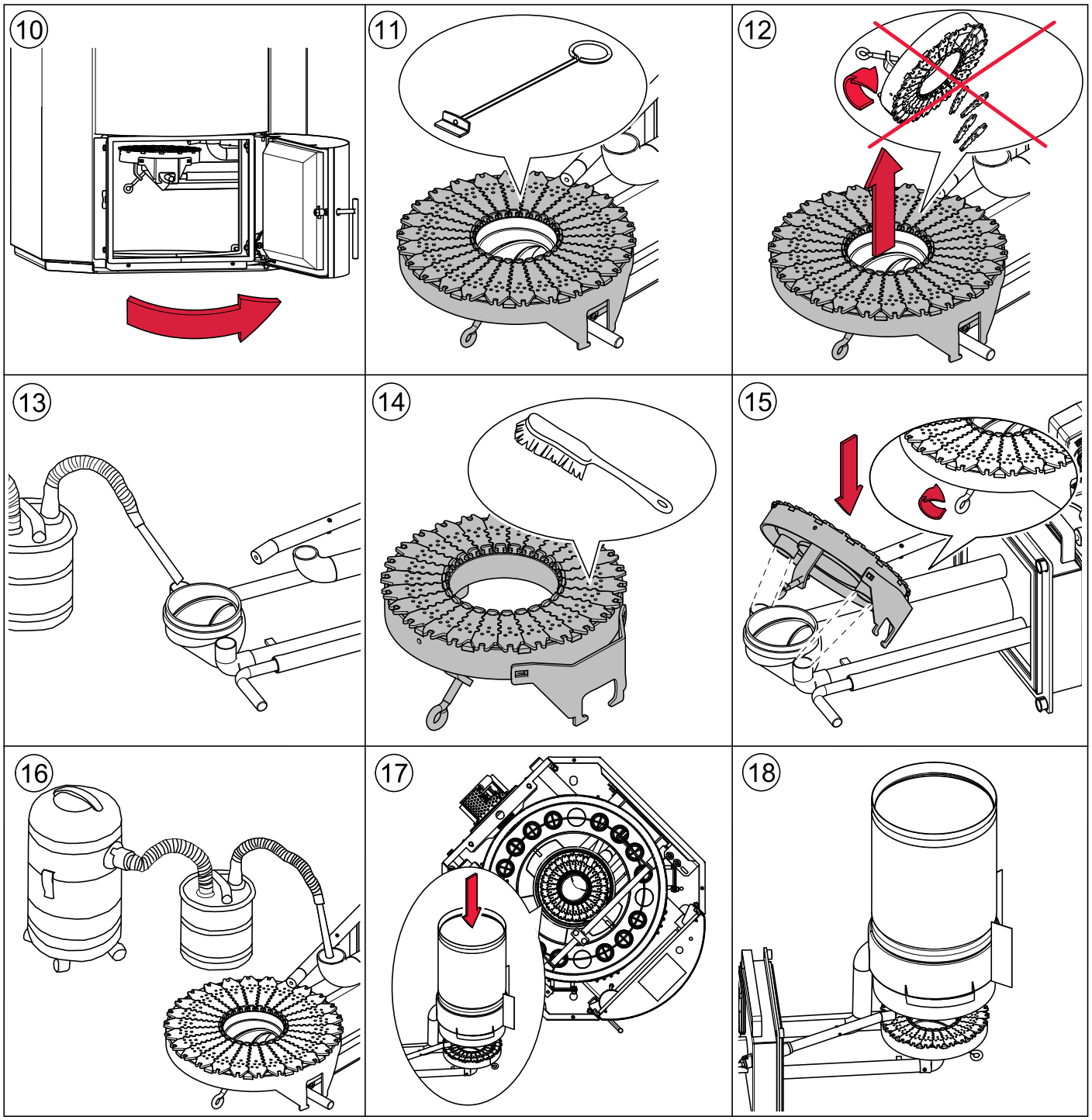


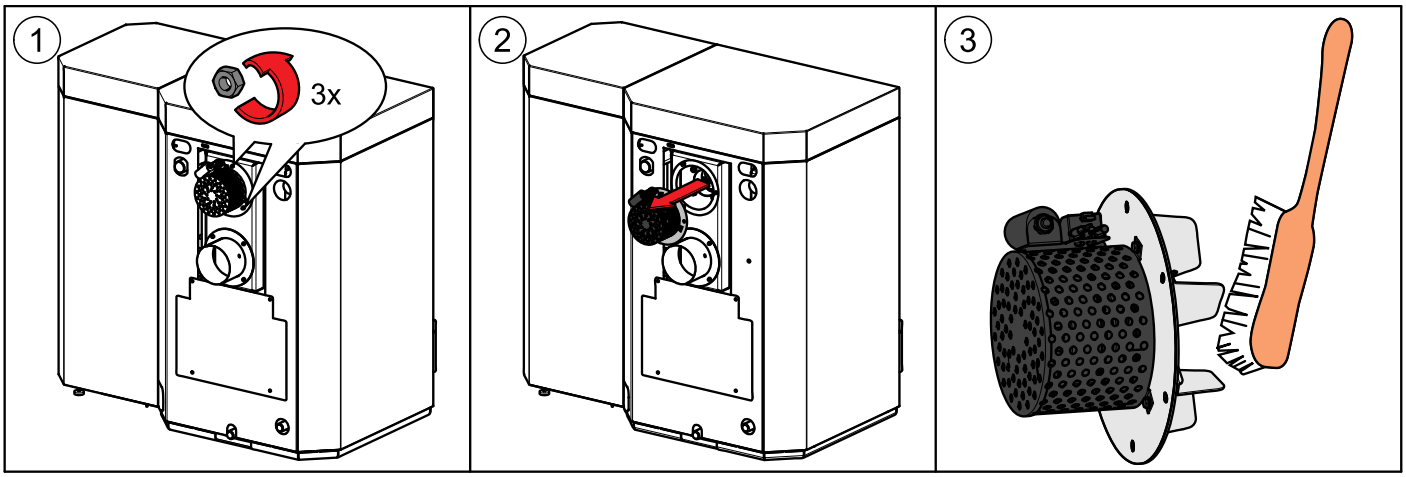
NOTICE

Reduction in boiler performance and damage to pellet boiler due to blockages in the air inlet
Clean the air intakes, the burner plate and the flame tube.



Note:
The individual parts of the multi segmented brazier may not be in raised position!

Cleaning the Induced draft blower:



23.3 Maintenance intervals

We recommend taking out a maintenance contract with your service technician.

23.4 Repairs

Only authorised specialists may carry out repair work on this system. Use original spare parts only. Not using original spare parts will cause the warranty to become void.

23.5 Checking the boiler room and storage room

Checking the pellet heating system regularly prevents malfunctions and unexpected failure of the heating system.

Boiler room

Make sure that no flammable materials are stored in the boiler room.

Make sure that no washing is hanging in the boiler room.

Check the display on the control panel for malfunction messages.

Check the flue gas tube and chimney. Clean it regularly.

Maintenance clearances as given in Installation Manual must be observed at all times.

Do not store fuel or any other materials within these clearances.

Storage room

DANGER

Risk of suffocation
Ventilate the pellet storage room sufficiently before entering.
Switch off the heating system before entering.

Check the level of pellets in the textile tank and order more pellets in good time.

Tested & Listed By O-T-L Portland Oregon USA
C US
OMNI-Test Laboratories, Inc.

MESys

Maine Energy Systems, LLC
8 Airport Road, Bethel, Maine 04217
Voice: 207.824.6749 Fax: 207.824.4816

Report No. 0444PB004S

Type: Pellematic56	**S/N:** XUT xx	**CATALOG No.:** PES56
Date of manuf.: 02/2018	**Rated heat power:** 191000BTU/hr	
Tested to: UL 2523-2013. CSA B366.1-2011 EN303-5		
Manufactured By: MESys LLC, Bethel, Maine	**FUEL:** WOOD PELLETS	
U.S. ENVIRONMENTAL PROTECTION AGENCY certified to comply with the 2020 particulate emissions standard using wood pellets.		
This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owners manual.		
Particulate Emissions, 0.045lb./million btu - 0.904grams/hr. **CO emissions**, 0.027grams/min. **Annual Efficiency,** (HHV) 86.3%		
Water Capacity: 30.6 Gallons	**Operating Temp:** 194 °F	
Max Operating Pressure: 3 BAR / 43.5 PSI / 1204 inches WC		
Chimney	Approved factory built stainless steel or tile-lined masonry	
MAX DRAFT: 0.11 inches WC MIN DRAFT: 0.04 inches WC		
Diameter: 7 INCH	**Electrical Rating:** 220 V, 60 Hz, 14 A, 1760 W	
FLOORING: COMBUSTIBLE FLOORS CAN BE USED WITH A NON-COMBUSTIBLE SHIELD. MINIMUM CLEARANCES ARE 18IN/457MM IN THE FRONT AND 8IN / 203MM ON EACH SIDE.		
PARTS	**Fan Flue Gas:** E1001A	**Controller Display:** E1330
Motor Ash Box: E1302	**Motor Flame Return Protection:** E1413A	
Motor Cleaning Device: E1054	**Motor Hopper:** E1197	
Motor Burner Plate Cleaning: E1204	**Suction Turbine:** E1192	
Motor Burner Screw: E1002	**Low Water Cut Off:** Safgard 550SV	
Controller Board: E1412	**Pressure-Relief Valve:** Watts Co335M1	
Motor Auger Screw: FKAEM 150 / FKAE-S	**Fan Burner:** E1005S	

General information

As require by the United States Departmen of Environmental Protection the following information is given for the:
AutoPellet 10-56 wood pellet fired central heating boiler. Manufactured by Maine Energy Systems, of 8 Airport Road, Bethel, Maine, 04217

- The AutoPellet has a thermal output levels from 6 kW or 20,500 btu/h to 191,000 btu/h and complies with EPA 2020 requirements.
- This wood heater has a manufacturer-set minimum low burn rate that must not be altered.
  It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.
- Complete installation information is found in the Installation Manual.
- Although operational information is elsewhere in this manual, there are specific concerns for correct operation that can directly affect the emissions profile of this equipment.
  It is therefore necessary that we mention these important points.
- Fuel loading and selection. Your AutoPellet is equipped with completely automatic fuel loading.
  Thus, other than selecting the correct fuel, there are no loading instructions as such. Fuel selection is straight forward.
  Only PFI Premium 100% wood pellets should be used in your boiler.
- Among the materials that are specifically prohibited to be burned in your **AutoPellet** are: trash, plastics, gasoline, rubber, naphtha, household garbage, material treated with petroleum products such as particleboard, railroad ties, and pressure treated wood.
  Burning these materials may result in release of toxic fumes or render the boiler ineffective and cause smoke.
- Your AutoPellet pellet fired boiler is completely automatic ignition as well as the loading as before mentioned.
  There are therefore no starting procedures to be followed. The boiler correctly starts itself when required by building load.
- There are no user adjustments required for the air controls on your AutoPellet.
- It is important to have your AutoPellet boiler serviced by a trained professional who is aware of the importance to ensure that there are no inlet air restrictions in or around your boiler's combustion blower.
  And that the air passages within your boiler are free of debris, (creosote, ash, etc.)
  The flue pipe and chimney are also clean and free of debris / restrictions.
  And that the combustion chamber door seal is airtight when the door is closed and secured.
- Ash removal is also completely automatic on your AutoPellet boiler. Ashes should be placed in a metal container with a tight-fitting lid.
  The closed container of ashes should be placed on a noncombustible floor or on the ground, away from all combustible materials, pending final disposal. The ashes should be retained in the closed container until all cinders have thoroughly cooled.
  When cooled ashes can be disposed of on your lawn, garden or local transfer station.
- Your AutoPellet is not a catalytic type burner.
- A person or persons responsible for the operation of a hydronic heater must comply with all applicable laws or other requirements, such as State laws or regulations as well as local ordinances.
- A person or persons operating a hydronic heater should be aware that they are responsible for operation in such a manner that does not create a public or private nuisance condition.
  The Manufacturer's distance and stack height recommendations and the requirements in any applicable laws or other requirements may not always be adequate to prevent nuisance conditions due to terrain or other factors.
- Your AutoPellet should be installed with a minimum stack height of 16 feet.
  Providing correct draft as given in the Installation manual.
- Draft is the force which moves air from the appliance up through the chimney.

The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors.
Too much draft may cause excessive temperatures in the appliance and may damage the catalytic combustor.
Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney Inadequate draft will cause the appliance to leak smoke into the room through appliance and chimney connector joints an uncontrollable burn or excessive temperature indicates excessive draft.

- The efficiency of your AutoPellet, running at full power is >85%. This is the result of a laboratory test and was measured using the HHV of the fuel used.
- You should never operate a combustion appliance of any type in your home without there being a properly installed smoke and CO detector.
  Your local fire department usually has good advice on placement of these detectors and how many your home may need for complete coverage.

Author & Manufacturer

MAINE ENERGY SYSTEMS LLC
8 Airport Road — P.O. Box 547 Bethel
Maine 04217

E-Mail: info@maineenergysystems.com
www.maineenergysystems.com

Please read carefully prior
to installing and servicing.

SAVE THESE INSTRUCTIONS

Installation Manual

Pellet heating with vacuum suction system, type

AutoPellet®
PES 36 — 56

FA_V2.03

AutoPelletTOUCH

USA

Title: Installation Manual AutoPellet® PES 36 — 56
Article number: PE 3671 USA 2.0

Version valid from: 03/2015
Approved: Wohlinger Christian

Author & Manufacturer

MAINE ENERGY SYSTEMS LLC
8 Airport Road — P.O. Box 547 Bethel
Maine 04217

E-Mail: info@maineenergysystems.com
www.maineenergysystems.com

1 Dear Customer

Maine Energy Systems specializes in wood pellet heating, our company enjoys an exclusive license from ÖkoFEN to manufacture AutoPellet boilers here in the USA. We represent expertise, innovation and quality. We are delighted that you have decided to purchase our product.

- This instruction manual is intended to help you operate the product safely, properly and economically.
- Please read this instruction manual completely and take note of the safety warnings.
- Keep all documentation supplied with this unit in a safe place for future reference.
  Please pass on the documentation to the new user if you decide to part with the unit at a later date.
- Installation and first start up must be carried out by an installer certified by Maine Energy Systems.
- Please contact your authorised dealer if you have any questions.

We place great importance on the development of new products. Our R&D department continues to question accepted solutions and works continually on new improvements. That is how we maintain our technological lead. We have already received several awards for our products in Austria and abroad. Our products fulfil European and USA requirements regarding quality, efficiency and emissions.

Tested & Listed By O-T L Portland Oregon USA
C US
OMNI-Test Laboratories, Inc.
Report No. 0444PB004S

2 Use only for the purpose intended

The pellet boiler is designed to heat water for central or other indirect heating systems and hot water supply for buildings. It is not permissible to use the pellet boiler for any other purpose. Reasonable foreseeable inadvertent uses for the pellet boiler are not known.

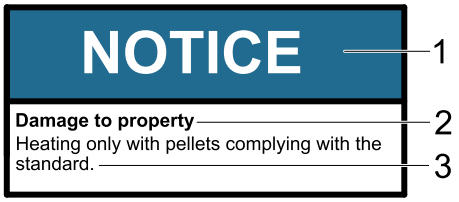
The boiler fulfils the requirements of UL 2523-2013 and CSA B366.1–2011.

3 Types of safety warning sign

The warning signs use the following symbols and text.

Types of safety warning sign

1. Risk of injury
2. Consequences of risk
3. Avoiding risk



1. Risk of injury:

Danger - indicates a situation that could lead to death or life-threatning injury.

Warning - indicates a situation that could lead life-threatning or serious injury.

Caution - indicates a situation that could lead to injury.

Note - indicates a situation that could lead to property damage.

2. Consequences of risk

Effects and consequences resulting from incorrect operation.

3. Avoiding risk

Observing safety instructions ensures that the heating system is operated safely.

4 Warnings and safety instructions

Observing safety instructions ensures that the heating system is operated safely.

4.1 Basic safety instructions

- Never get yourself into danger; give your own safety the utmost priority.
- Keep children away from the boiler room and storage room.
- Observe all safety warnings on the boiler and in this user manual.
- Observe all instructions relating to maintenance, servicing and cleaning.
- The pellet heating system may only be installed and started up for the first time by an authorised installer. Professional installation and start up is the prerequisite for safe and economical operation.
- Never make any changes to the heating system or flue gas system.
- Never close or remove safety valves.

4.2 Warning signs

DANGER

Risk of poisoning
Make sure that the pellet boiler is supplied with sufficient combustion air.
The openings in the combustion air inlet must never be partially or completely closed.
Ventilation systems, central vacuum cleaning systems, extractor fans, air conditioning systems, flue gas blowers, dryers, fuel storage ventilation fans or similar equipment must never be allowed to draw air from the boiler room and cause a drop in pressure.
The boiler must be connected tight to the chimney using a flue gas tube.
Clean the chimney and the flue gas tube at regular intervals.
The boiler room and pellet storage room must be sufficiently supplied with air and ventilated.
Before entering the storage room it must be ventilated with sufficient air and the heating system switched off

DANGER

Risk of electric shock
Only an authorised installer may connect the pellet boiler to the power supply.
Always disconnect / de-energize the power supply before working on the boiler.

DANGER

Risk of explosion
DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, ENGINE OIL, OR OTHER INAPPROPRIATE MATERIALS.
DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.
Switch off the heating system before filling the storage room.

DANGER

Risk of fire
Do not store any flammable materials in the boiler room.
Do not hang out any washing in the boiler room.
Do not operate with fuel loading or ash removal doors open.

WARNING

Risk of burns
Do not touch the flue gas connector or flue gas pipe.
Do not reach into the ash chamber.
Use gloves to empty ash box if boiler not equipped with automatic ash compression
Do not clean the boiler until it has been allowed to cool down.

CAUTION

HOT SURFACES
Keep children away.
Do not touch during operation.
Do not operate if maximum draft as listed on boiler nameplate is exceeded.
Doing so can allow non-controlled combustion.

CAUTION

Risk of cut injuries due to sharp edges.
Use gloves for performing all work on the boiler.

NOTICE

Damage to property
The pellet boiler is suitable only for pellets which comply with PFI premium or EnPlus -A1 pellets specifications.
The use of any other fuel voids your warranty and can cause damage to the pellet boiler and chimney.

NOTICE

Damage to property
Do not use the heating system if it, or any of its components, come into contact with water.
If water damage occurs, check the heating system by an authorized service technician and replace damaged parts.

WARNING

All cover plates, enclosures, and guards must be maintained in place at all times, except during maintenance and servicing.

4.3 What to do in an emergency

DANGER

Risk to life
Never get yourself into danger; give your own safety the utmost priority.

What to do in the event of a fire

- Switch off the heating system.
- Call your local fire department and or 911.
- Use approved fire extinguishers (fire protection class ABC).

What to do if you smell smoke

- Switch off the heating system.
- Close the doors leading to living areas.
- Ventilate the central heating room.

5 Prerequisites for installing a pellet boiler

You must fulfil the following conditions before operating a fully automatic pellet boiler.

5.1 Guidelines and standards for installing a pellet boiler

Overview of standards and guidelines applying to the installation of a pellet boiler.

Check whether you need to obtain planning permission or approval from the authorities for installing a new heating system or changing your existing system. Installation must meet all requirements for pellet fired heating systems in your specific location.

5.2 Boiler room

The pellet boiler is installed in the boiler room.

1. **Safety instructions for the boiler room**

   DANGER

   Risk of fire
   Do not store flammable materials or liquids in the vicinity of the pellet boiler.
   Do not permit unauthorised persons to enter the boiler room - Keep children away.
   Do not operate with fuel loading or ash removal doors open.

2. **Air supply and ventilation of boiler room**

   The boiler room must be fitted with air supply and ventilation openings (at least 31 inch^2/200cm^2).In any case you must comply with the state and local regulations

3. **Combustion air supply**

   The pellet boiler needs a supply of combustion air. The supply of combustion air can:

   a. take place using one or more air supply and ventilation openings in total min. 31 inch^2.

   b. or through a special air supply line directly from outside, where the diameter of the air supply line must be at least 4 inch/ 100mm in for type PE(S) 12 – PE(S) 32. Ambient air independent operation of PES 36-56 types is also available on request. In any case, properly sized room ventilation is still required to allow your barometric draft controller to function properly.

   Never operate the pellet boiler if the air intake openings are partially or completely closed.

   Contaminated combustion air can cause damage to the pellet boiler. Never store of use cleaning detergents containing chlorine, nitrobenzene or halogen in the room where the heating system is installed, if combustion air is drawn directly from the room. It is recommended that no washing or drying of laundry is done in the boiler room or where the boiler may draw air from.

   Do not hang out washing in the boiler room.

   Prevent dust from collecting at the combustion air intake to the pellet boiler.

4. **Damage due to frost and humid air**

   The boiler room must be frost-proof to ensure trouble-free operation of the heating system. The temperature of the boiler room must not fall below 37°F and must not exceed 90°F. The air humidity in the boiler room must not exceed 70%.

5. **Danger for animals**

   Make sure that household pets and other small animals cannot enter the boiler room. Fit mesh over any openings.

6. **Flooding**

If there is a risk of flooding, switch off the pellet boiler and disconnect from the power supply before water enters the boiler room. You must have all components that come into contact with water replaced, before you start up the pellet boiler again.

5.3 Flue gas system

The flue gas system consists of a chimney and a flue gas tube. The flue gas tube connects the pellet heating system to the chimney. The chimney leads the flue gas from the pellet heating system out into the open.

1. **Design of the chimney**

   The dimensions and design of the chimney is very important. The chimney must be able to ensure sufficient draft to safely draw away the flue gas regardless of the status of the boiler. Low flue gas temperatures can cause sooting and moisture damage on chimneys that are not insulated. For this reason **moisture-resistant chimneys** (stainless steel or ceramic) should be used. An existing chimney that is not damp-resistant needs to be rennovated before use. Follow guidelines below:

Boiler size		**PE(S) 12 – 20**	**PE(S) 25 – 32**	**PE(S) 36 – 56**
Flue gas tube diameter (at boiler)	inch/mm	5/130 or 6/150	6/150	7/180
Flue gas temp. / rated power	°F	320	320	360
Flue gas temp. / partial load	°F	212	212	230
Min. draft – full load/part load	in/wc	-0.04 / -0.02		

Chimney size	**Min. Height**
6in x 6in	17ft
7in x 7in	16ft
8in x 8in	16ft
6in round	19ft
7in round	17ft

Recommended and UL-103HT approved chimney materials are:

a. Selkirk sure temp

b. Supervent (JSC)

c. Security chimneys (secure temp ASHT)

Use flue gas pipe from chimney to boiler as required by your local code.

CAUTION

Unregulated combustion
Please observe that combustion air openings and flue pipes are not reduced in size or closed. Make end user aware of these guidelines and their potential danger.
Clean the chimney and the flue gas tube at regular intervals.
Check if the draft inducer is clean and in a good condition.

2. **Flue gas temperature**

   The flue gas temperatures are approximately the same for all Autopellet boilers covered in this manual.

   The dewpoint of flue gas with wood pellets (max. 10% water content) is approx. 120°F.

It is possible to increase the flue gas temperature to prevent condensation inside the chimney and avoid damage due to damp. Only authorised installers may increase the flue gas temperature.

Note:
The increase in flue gas temperature results in reduced efficiency and thus increases fuel consumption.

3. **Negative pressure of the chimney**

The boiler must be connected to a chimney or a vertical venting system that is capable of handling and producing a negative breeching pressure of –0.4 "WC. Use a draft gauge to verify the indicated draft value, adjust barometric damper as required. Drill a small hole in the connection pipe at about 2in/ 50mm from the boiler flue outlet and use this hole as your measuring point.

Chimney draft

The suction effect of the chimney draft must extend all the way to the boiler flue pipe connection. The maximum flow rate that can be drawn through the chimney limits the maximum performance of the chimney connection. The boiler performance must be reduced if the chimney does not possess the necessary cross-section. This may only be performend by authorised personnel.

4. **Power venter**

AutoPellet boilers are approved by the manufacturer for installation with the Field Controls SWGAF power venter which is approved for wood pellet burning appliances.
Boilers installed with SWGAF power venters must follow all manufacturer´s installations and must comply with all applicable codes from agencies having authority over the installation.

5. **Cleaning**

Clean the flue gas tube and chimney regularly. Solid fuel burning appliances need to be cleaned frequently because soot, creosote, and ash may accumulate. The hotter the fire, the less creosote is deposited. Cleaning intervals can vary in warm periods due to this and become more frequent.

DANGER

Risk of chimney fire
Creosote-formation and need for removal:Low flue gas temperature can cause creosote. Creosote can condense in a relatively cool chimney. As a result, creosote residue accumulates on the flue lining. If ignited, this creosote will create an extremely hot fire. The chimney and the chimney connector should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

NOTICE

Oxidation of chimney
Do not use metal brushes to clean chimneys made of stainless steel.
Your state and local regulations must be observed.

5.4 Safety systems

The following safety measures are the prerequisite for safe operation of your system.

Emergency stop switch

Every heating system must be able to be switched off with an Emergency Stop switch. The Emergency Stop switch must be outside of the boiler room.

Safety valve

The hydronic system must be equipped with a safety valve. This valve opens before the pressure inside the heating system increases to max. 43 P.S.I.. The safety valve must be installed at the highest point of the boiler, must not be locked and must be within 3.28 ft / 39.37 inch/ 1m of the boiler. A 30 lb/sq in relief value is supplied with each boiler.

Safety temperature sensor

The pellet boiler is equipped with a safety temperature sensor. This is located on the pellet boiler. If the boiler temperature exceeds 230°F then the heating system switches off.

Low water cut off

The hydronic system must be equipped with a low water cut off. If the water level falls below a certain level, the low water cut off switches off the heating system.

NOTICE

Initial start-up
The initial start-up of each AutoPellet boiler must be performed by an authorized installer.

5.5 Installation with an existing boiler

Autopellet boilers are not to be connected to a chimney flue serving another appliance. However, when all State and local codes allow for the sharing of chimney flues, the Autopellet boilers and another appliance burning pellets or a different fuel can be operated simultaneously while connected to a single existing chimney or flue gas system providing the following conditions are met:

- All state and local codes permit the specific installation
- All appliances are installed in accordance with the manufacturer's installation specifications or if lacking manufacturers specifications, the appliance in question is installed in a manner commonly recognized as safe and correct for the application and circumstances
- The chimney or flue gas system must be able to handle the combustion products of either appliance and both appliances when operated simultaneously

NOTICE

Avoid clearance issues that can make servicing difficult:
Be sure to follow suggested clearances when installing the Autopellet boiler with an existing boiler to be sure that service and cleaning can be performed adequately.

CAUTION

Avoid code violations:
When connecting to or with an existing boiler, contact the authority having jurisdiction to be sure the type of installation planned is allowed.
Document the type of boiler that the Autopellet is connected to or with.
Pellet boiler: Make and Model number:_____
Existing boiler: Make and Model number:
_____

DANGER

Possible escape of flue gas:
Do not connect this unit to a chimney flue serving another appliance unless multiple appliances into a single flue is authorized by all authorities having jurisdiction.

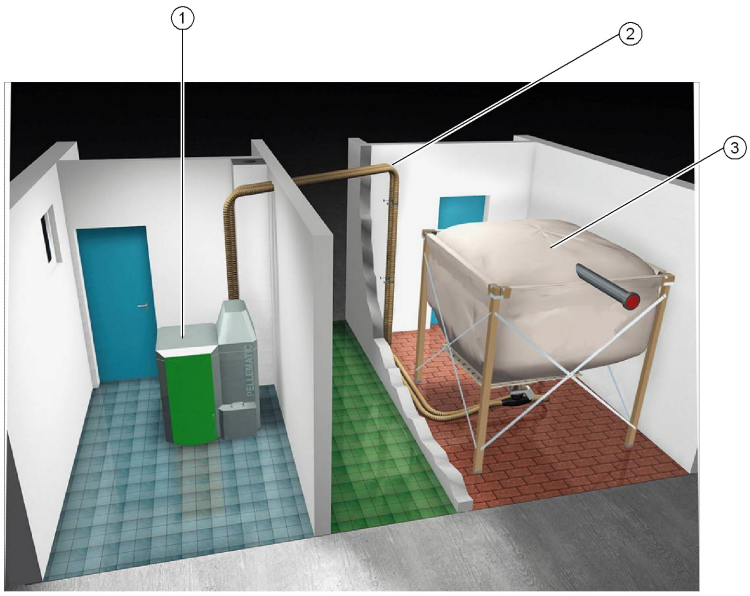
6 Product description

The description of the product is intended to provide an overview of the components that make up a pellet heating system, the parts of the pellet boiler and advice on where you can find more information.

The pellet heating system consists of 3 components

1	Pellet boiler
2	Conveyor system
3	Storage system – textile tank

Pellet boiler with textile tank



The concept features different sizes of design and type for each component. These are compatible and designed to match.

6.1 The pellet boiler

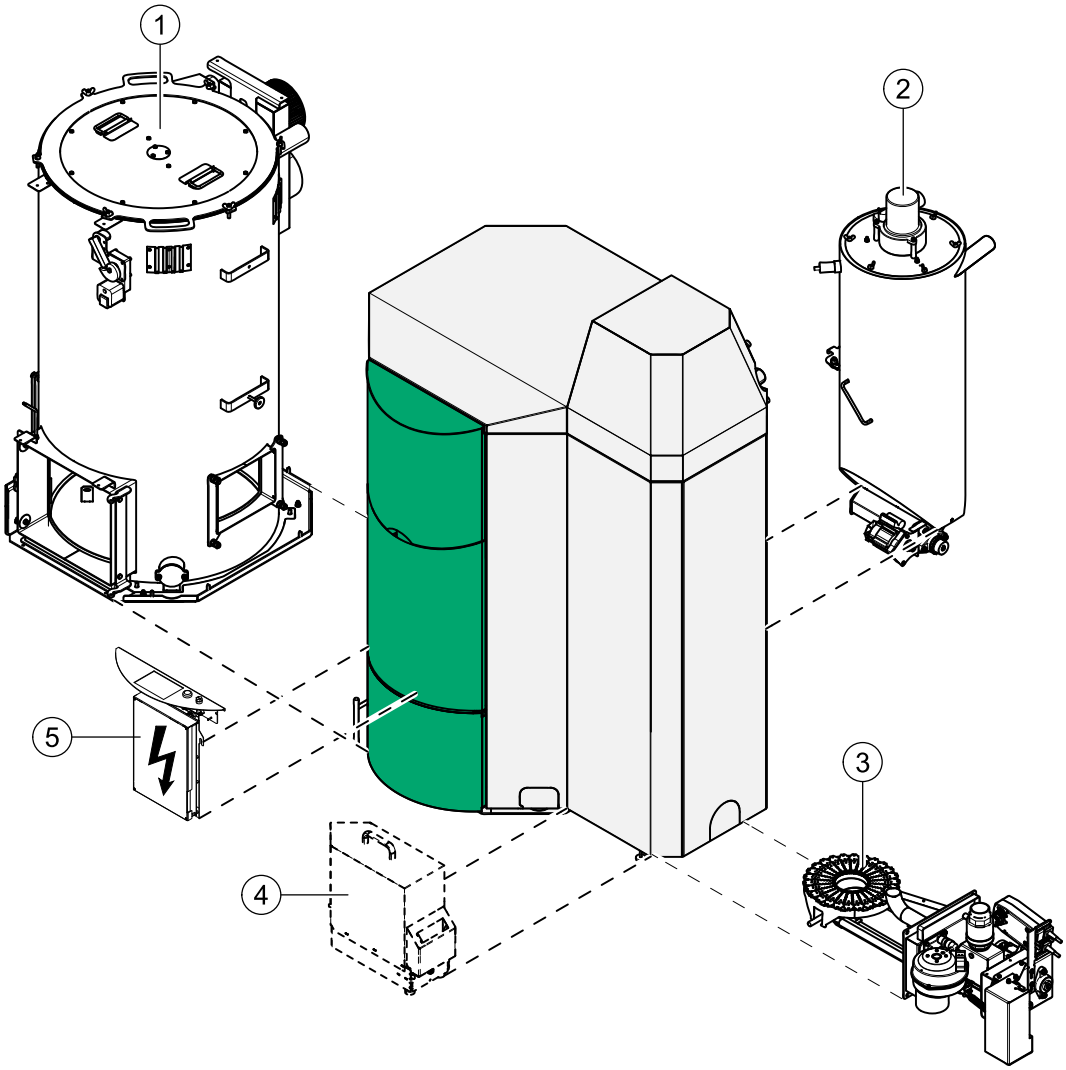
The pellet boiler is equipped with an automatic cleaning system, mounted within the fire chamber and an integrated return water temperature control. The installed programmable logic controller system enables fully automatic operation and highest efficiency. We offer an optional external automatic ash compression system for the highest level of cleanliness and convenience.

AutoPellet types and power ratings

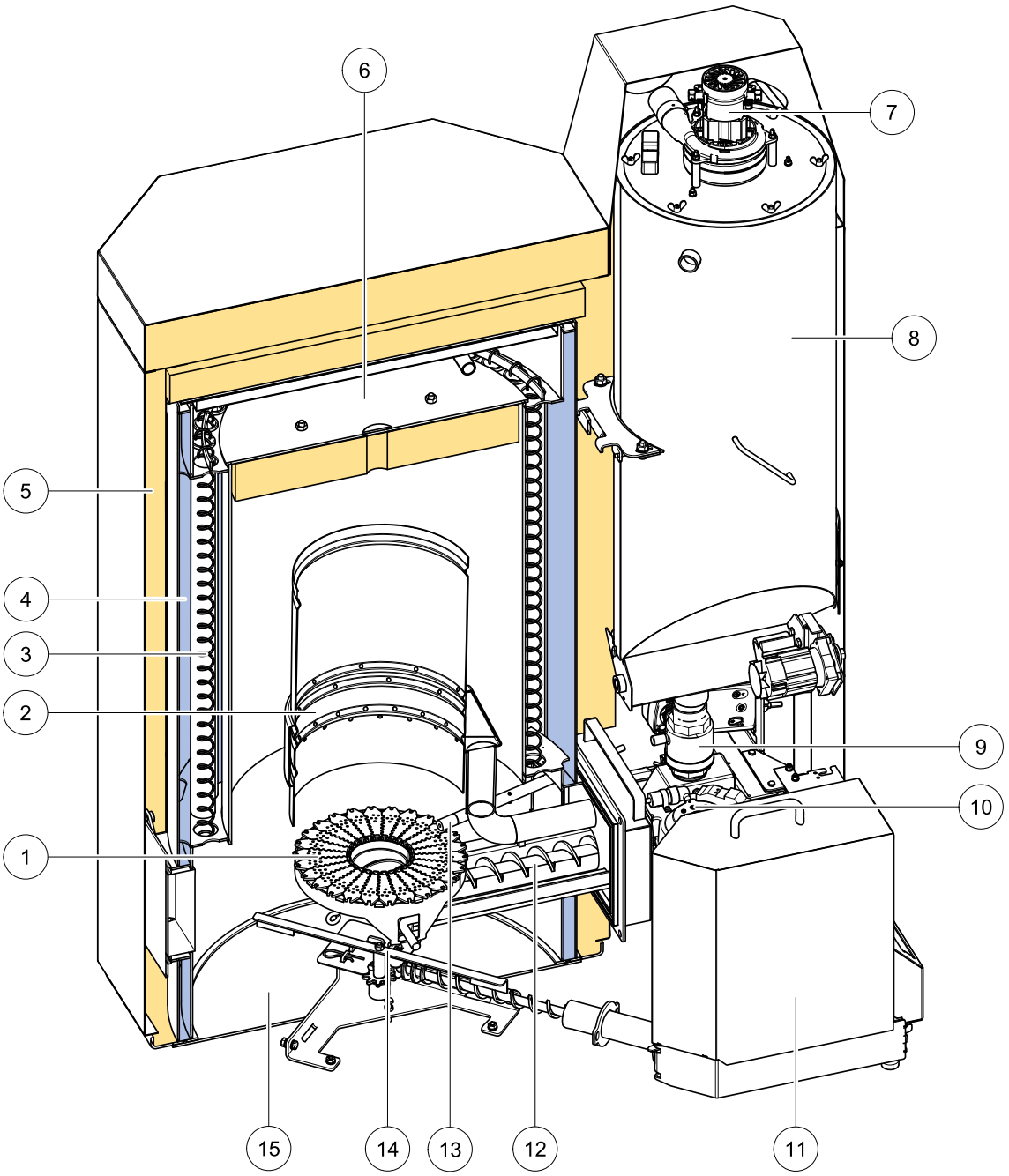
We offer the Pellet boiler with the following power ratings:
Suction-feed systems: 41,000; 51,000; 68,300; 85,300; 109,500; 123,000; 164,000 and 191,000 BTU/hr

Note:
Refer to the data plate for the power rating of your AutoPellet. The data plate is located on the rear side of the AutoPellet. Here you will find the type designation, manufacturer's serial number and year of build.

Key components of the AutoPellet



1	Boiler (heat exchanger)
2	Vac Hopper / Day tank
3	Burner
4	External automatic ash compression system
5	Boiler controller



1	Burner plate	9	Fire protection – ball valve
2	Flame tube	10	Burner fan
3	Heat exchanger	11	External ash box
4	Boiler water	12	Burner auger
5	Boiler insulation	13	Electronic ignition
6	Combustion chamber cover	14	De-ashing system
7	Suction turbine	15	Ash chamber / Fire chamber
8	Vac hopper / Day tank		

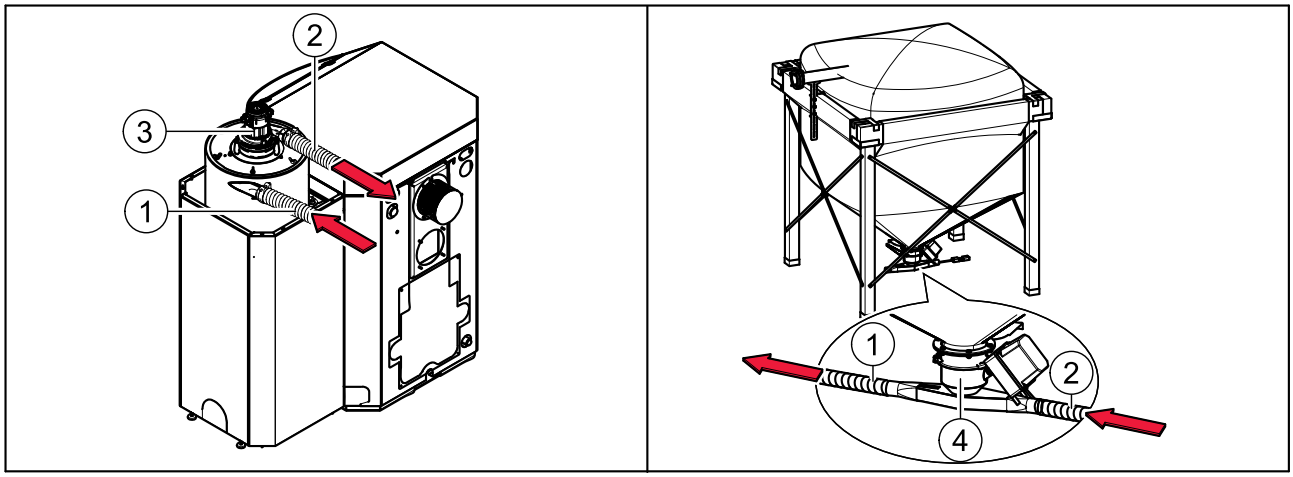
6.2 Pellet suction system

The pellet suction system consists of a pellet line, an air line and a suction turbine. The suction turbine in the hopper conveys pellets in the pellet line from the storage room or textile tank to the hopper.

Key components of pellet suction system

1	Pellet hose	Hose from textile tank to the hopper.
2	Air hose	Hosee from the suction turbine to the textile tank.
3	Suction turbine	Located above the hopper underneath the AutoPellet burner casing.
4	Suction switch	Located underneath the textile tank.

Pellet boiler **FleXILO textile tank**



6.2.1 Assembly of the vacuumsystem

The pellet hose and the air hose are flexible spiral hoses made out of plastic. A copper braid avoids the static loading of the spiral hose.

To avoid damage to the spiral hose, you must observe the following assembly guidelines:

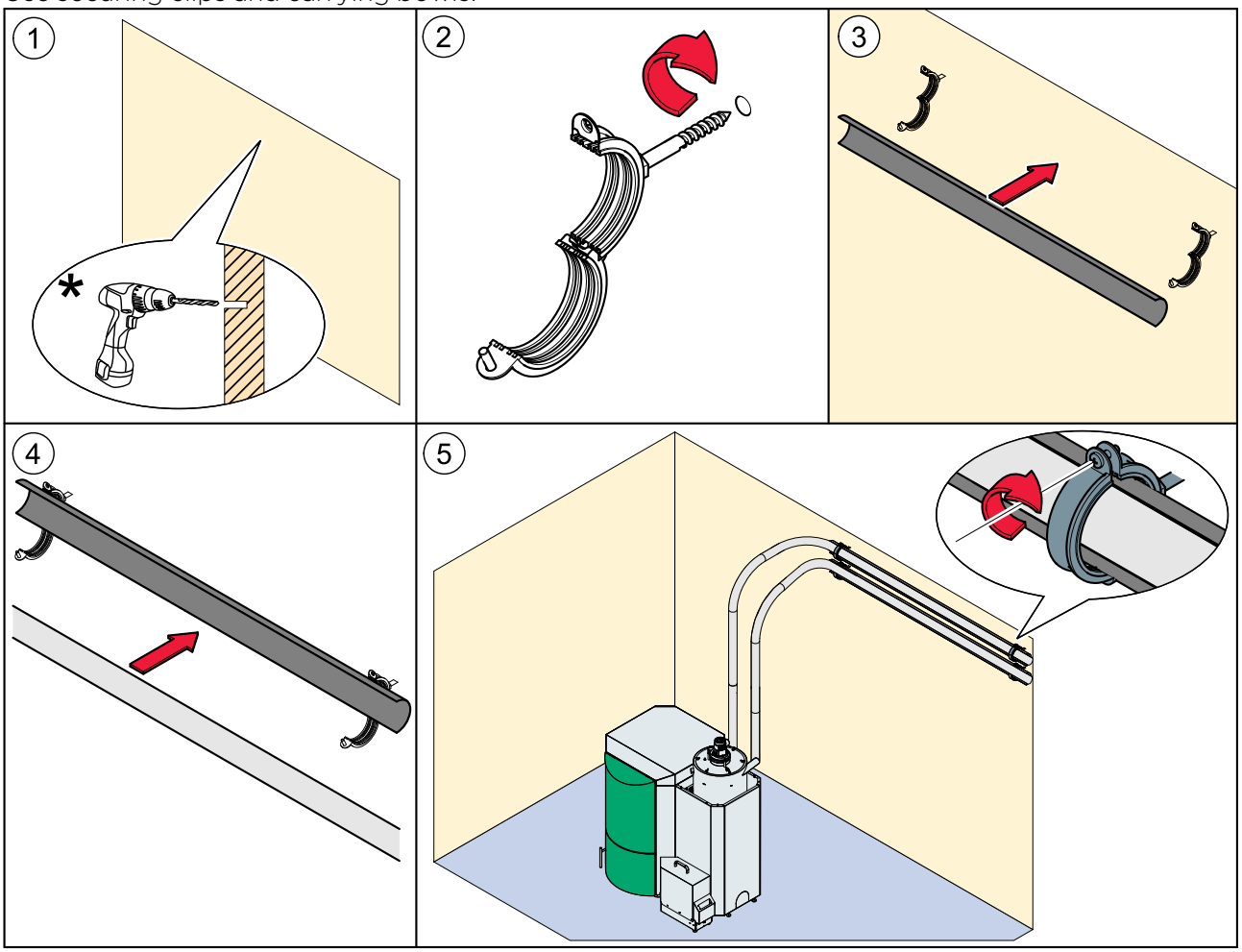
Bending radius	The hose should be led as briefly as possible and with a few curves as necessarily. Bending radius may never be smaller than **12inch**.
Upward gradients	Max difference in height = **236inch** **Note:** A difference in height of up to 118inch can be overcome at one time. Larger differences in height must by interrupted with a 4 foot horizontal run of the pellet hose.
Impact protection	The spiral hose can be mounted up to 236inch exactly straight. In such cases however, it is very important to create a slight "S" in the pellet piping before a sharp curve to slow down the pellets to prevent hose damage.
Installation in the soil and openings:	When installing pellet lines underground remember! The pellet lines are not designed for direct burial and require protection from being crushed or chewed by varmints. Protective piping should be minimum 4 inch and sealed at each end. There should be no bends greater than 15 degrees in the underground sections of the pellet hose.
Tightness	To avoid problems with your pellet lines, it is important to have all hose connections secured completely air tight with hose clamps.
Static neutralization	The hoses are provided with a copper braid, those the hose keeps antistatic. In order to ensure the function of the anti-statics, those copper braid must be attached at each end to the existing grounding become.
Fire protection	At a wall break-through to the heating room must be installed a fire protection seal in the pellet- and the air hose.

Crossing The pellet hose and the air hose should cross each other as few times as possible.

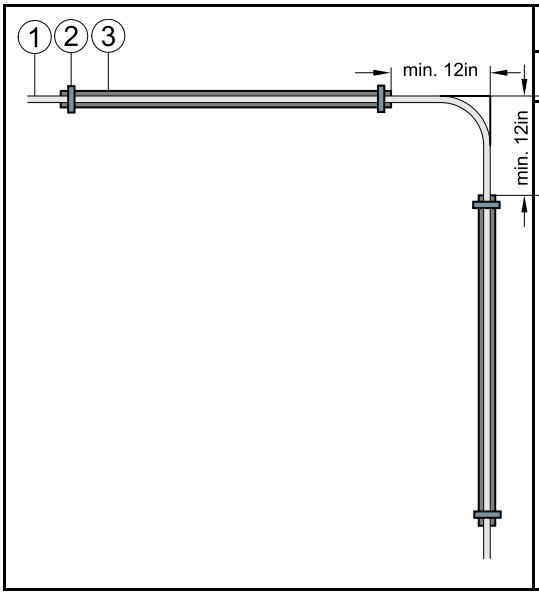
Length of the spiral hose The maximum total length of the spiral hose is 130 feet.
The maximum for pellet hose and air hose are each 60 feet.

Assembly

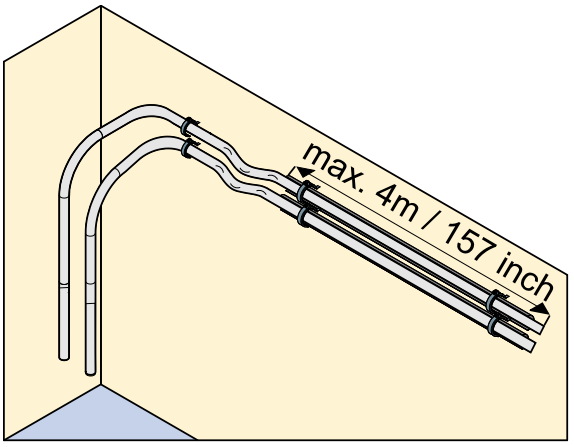
Use securing clips and carrying bowls.



*Pay attention to the defined distances!

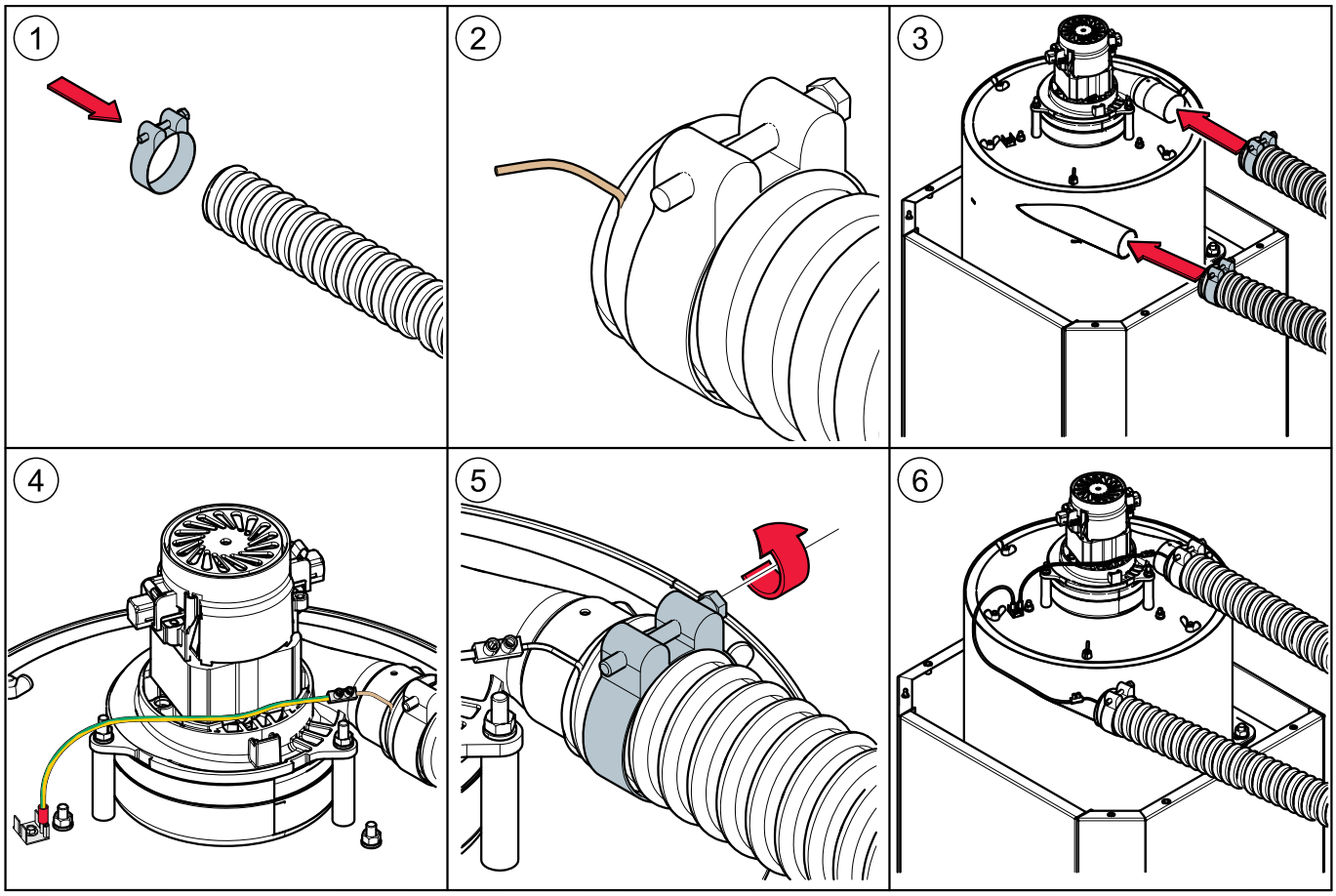


1	Hose
2	Clip
3	Carrying bowl



Note:
Impact protection by swirling of the pellets.

Connection of the pellet and air hose to the suction turbine



6.3 Storage systems

For storing pellets we offer a FleXILO textile tank. FleXILO textile tanks can be located inside the boiler room, storage room or protected from wet and sun outside.

NOTICE

Damage to property and loss of warranty
The use of an AutoPellet boiler with a storage or conveyor system from another manufacturer is not permissible and will result in voiding your warranty along with undependable operation.

6.3.1 Flexilo textile tank

Maine Energy Systems offers various sizes and types of fabric tanks. The fabric tank supplied may vary from the example shown above.

Please refer to the installation instructions supplied for the fabric tank. Note also the instructions on setting up and filling.

7 Bringing the pellet boiler into the boiler room

This section describes the prerequisites as well as the working sequence required.

1. Transport
2. Notes on bringing the unit into the building
3. Casing parts
4. Dismantling the casing parts

7.1 Transport

We supply the pellet boiler on a pallet. The pellet boiler is ready to be connected.
The control unit for the boiler controller and the operating drvice is integrated into the control panel.

If it is not possible to bring the boiler into the building at ground level, then you can remove the casing, the burner, the hopper and the boiler controller. This will reduce the weight of the unit and make it easier to carry.

NOTICE

Contamination and corrosion
Make sure that the pellet boiler is located under a roof if it needs to be stored outside before it is transported/ brought into the building. It is also necessary to transport the boiler in a closed in truck or trailer. Boilers transported otherwise will lose their warranty.

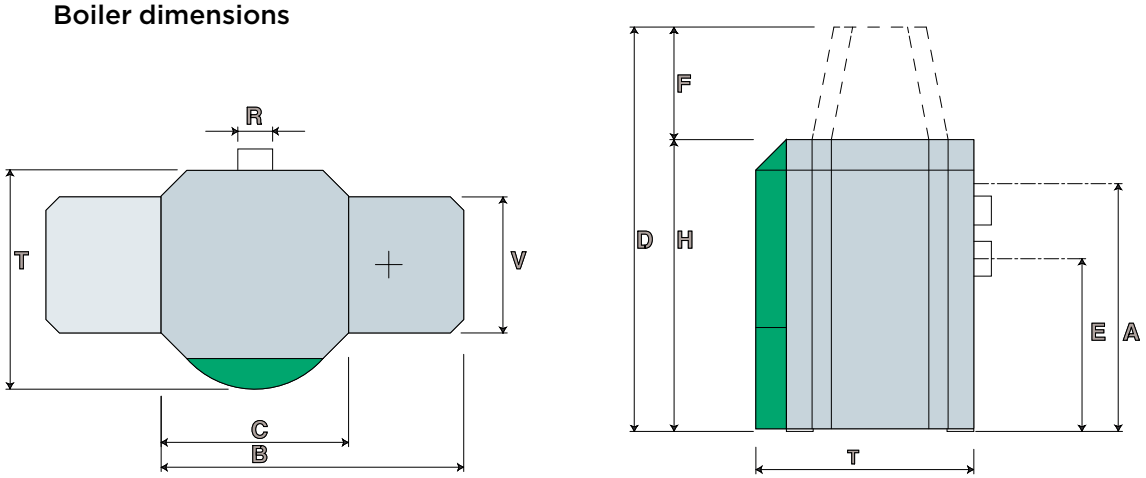
7.2 Notes on bringing the unit into the building

Before bringing the unit into the building, check the dimensions of all doors to ensure that the boiler has sufficient clearance and can be set up properly.

Minimum door width — max. unit dimension

PE, PES	12, 15, 20	27,5 inch / 750mm
PE, PES	25, 32	29,75 inch / 800mm
PES	36, 48, 56	31,2 inch / 900mm

Boiler dimensions



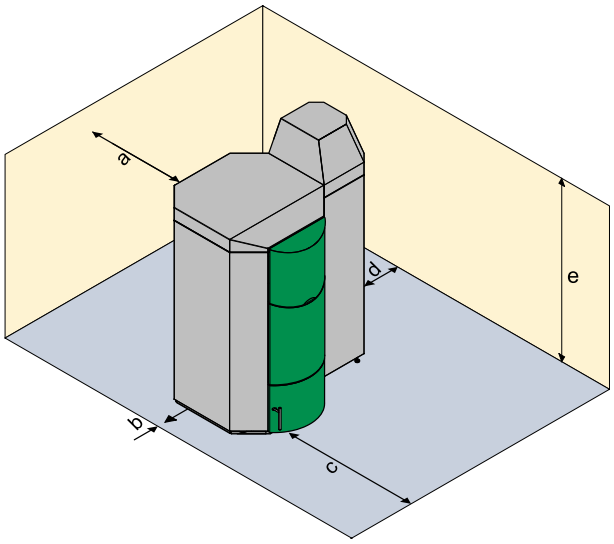
Boiler size		PE(S) 12	PE(S) 15	PE(S) 20	PE(S) 25	PE(S) 32	PE(S) 36	PE(S) 48	PE(S) 56
B – Overall width of pellet boiler	inch	44 1/2	44 1/2	44 1/2	46 3/4	46 3/4	51	51	51
	mm	1130	1130	1130	1186	1186	1297	1297	1297
C – Width of boiler casing	inch	27 1/2	27 1/2	27 1/2	29 3/4	29 3/4	34	34	34
	mm	700	700	700	756	756	862	862	862
H – Height of boiler casing	inch	43	43	43	51	51	61	61	61
	mm	1090	1090	1090	1290	1290	1553	1553	1553
D – Height of pellet suction system	inch	55	55	55	63	63	73	73	73
	mm	1392	1392	1392	1592	1592	1855	1855	1855
F – Height of suction filling unit	inch	12	12	12	12	12	12	12	12
	mm	302	302	302	302	302	302	302	302
T – Depth of boiler casing	inch	32	32	32	34 1/4	34 1/4	39	39	39
	mm	814	814	814	870	870	990	990	990
V – Depth of burner casing	inch	20	20	20	20	20	20	20	20
	mm	508	508	508	508	508	508	508	508
E – Flue gas tube connection height	inch	25 1/2	25 1/2	25 1/2	33 1/4	33 1/4	41	41	41
	mm	645	645	645	844	844	1040	1040	1040
A – Height of suply/ return	inch	35 3/4	35 3/4	35 3/4	43 3/4	43 3/4	52	52	52
	mm	896	896	896	1110	1110	1320	1320	1320
R – Diameter of flue gas tube	inch	5	5	5	6	6	7	7	7
	mm	130	130	130	150	150	180	180	180

Boiler Weight

Boiler size		PE(S) 12	PE(S) 15	PE(S) 20	PE(S) 25	PE(S) 32	PE(S) 36	PE(S) 48	PE(S) 56
Weight of boiler packaged on pallet with wooden frame	Lb	858	858	858	1003	1003	1430	1430	1430
Weight of boiler with casing, hopper and burner	Lb	533	542	551	696	705	1327	1336	1344
Weight of boiler without casing, hopper and burner	Lb	529	529	529	664	664	930	930	930

Minimum clearance dimensions required

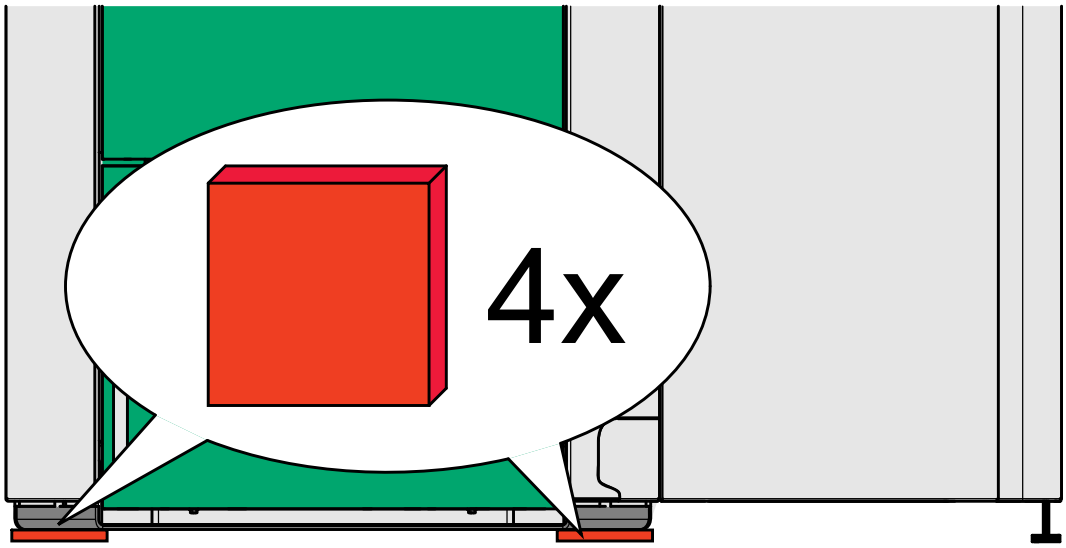
Note:
To install the heating system properly and ensure economical operation, you need to make sure that minimum clearance dimensions indicated below are observed when setting up the boiler. **In addition, make sure that legislation in your country is complied with relating to the minimum clearance of the flue gas tube.**



a	Minimum clearance to the edge of removable top cover of the boiler. For flue pipe clearance, refer to applicable codes.	inch mm	18 450
b	Min. clearance of side of boiler	inch mm	5 50
c	Min. clearance of front of boiler	inch mm	28 700
d	Min. clearance to housing - burner side.	inch mm	12 300
e	Min. ceiling height. And the distance from ceiling to top of boiler must be enough to remove all covers.	inch mm	80 2000

Note:
Place the boiler according to the minimum clearances to the flue pipe connection point as defined in NFPA 31, or if NFPA is not recognized, then the code pertinent to the installation location.
Make sure that you also comply with local legal regulations.
For clearances required for floor protection, see following page.

Placement of rubber plates



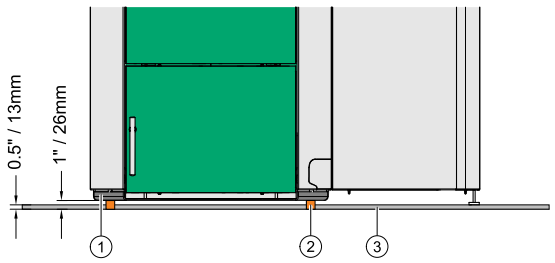
NOTICE

The pellet heating boiler must be placed on the supplied rubber plates.

7.3 Flooring

The boiler room floor must be flat and level and must be able to support boiler gross weight. The floor must comply with the requirements of NFPA 31.

Generally the boiler should be placed on non-combustible floors. However, a shielding material can be placed underneath the boiler and the chimney connector in the case of a combustible floor like shown on the following drawing.

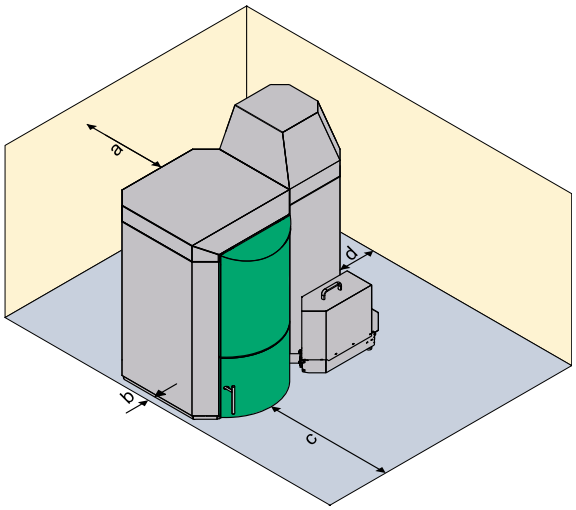


1	Boiler base plate
2	Spacer
3	Shielding material

The spacer must be able to support the weight of the boiler and has to be non combustable. The shielding material must be equivalent to a ½in / 13mm micro board with a K-value of 0.49 (W/m K) (R-value of 1.02 Km2/W) or greater. For more information contact Maine Energy Systems.

DANGER

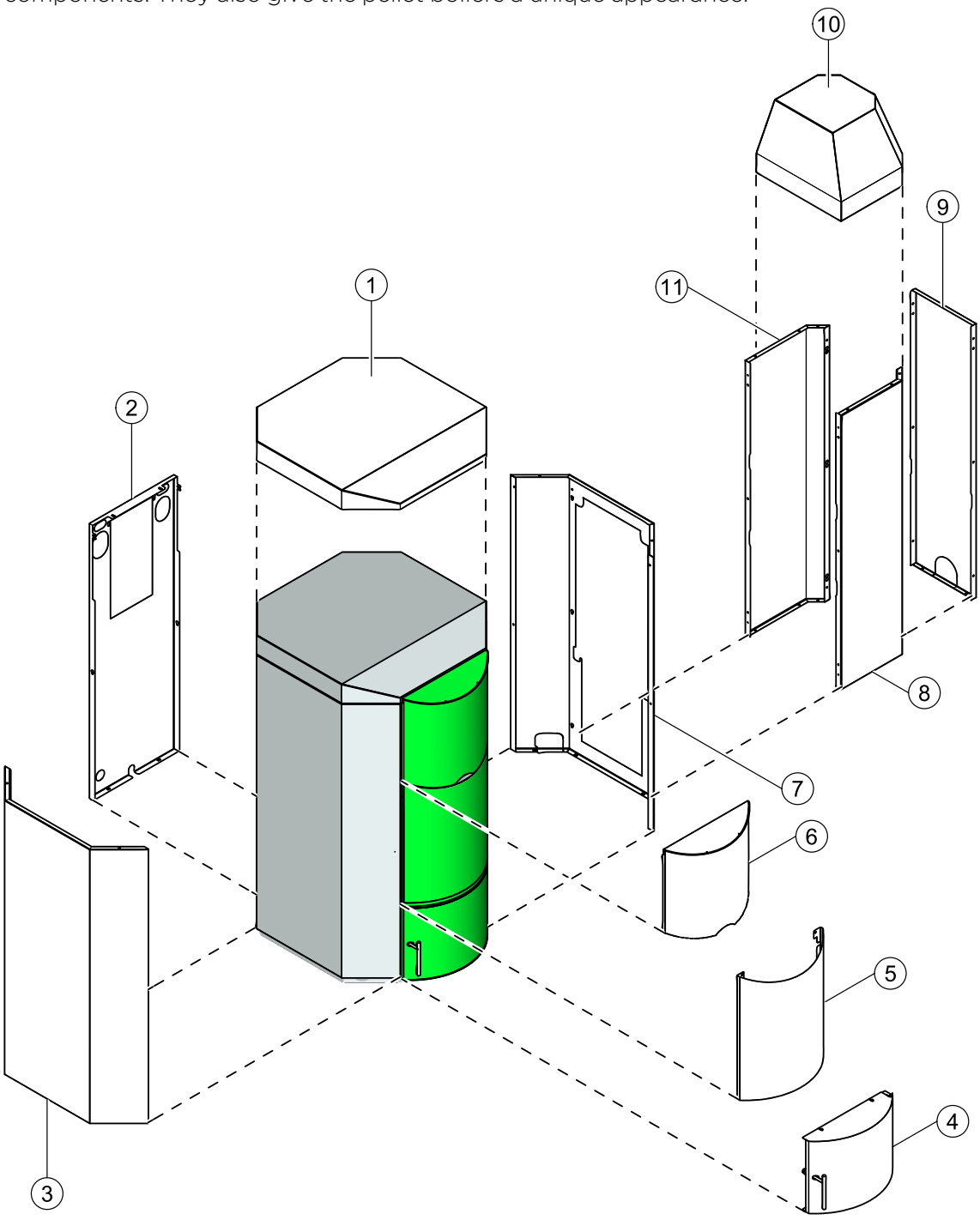
Risk of fire:
The non-combustible flooring needs to extend out to the clearances shown on the chart below.



Minimum clearances of shielding material required for floor protection		
Min. clearance of the shielding material from the boiler back – Note also the local restrictions in your area (a)	inch	17
Min. clearance of the shielding material from the boilers left side panel (b)	inch	8
Min. clearance of the shielding material from the boilers front panel (c)	inch	27
Min. clearance of the shielding material from the boilers right side panel (d)	inch	12

7.4 Casing parts

The boiler is protected by a casing on all sides. The casing parts prevent contact with hot, moving and live components. They also give the pellet boilers a unique appearance.



1	Boiler casing cover	7	Boiler side panel with opening
2	Boiler rear panel	8	Burner side panel (same as 11)
3	Boiler side panel without opening	9	Burner lug without opening
4	Boiler door panel (semi-circle)	10	Burner cover suction system
5	Boiler front panel (semi-circle)	11	Burner side panel (same as 8)
6	Boiler raise panel (semi-circle)		

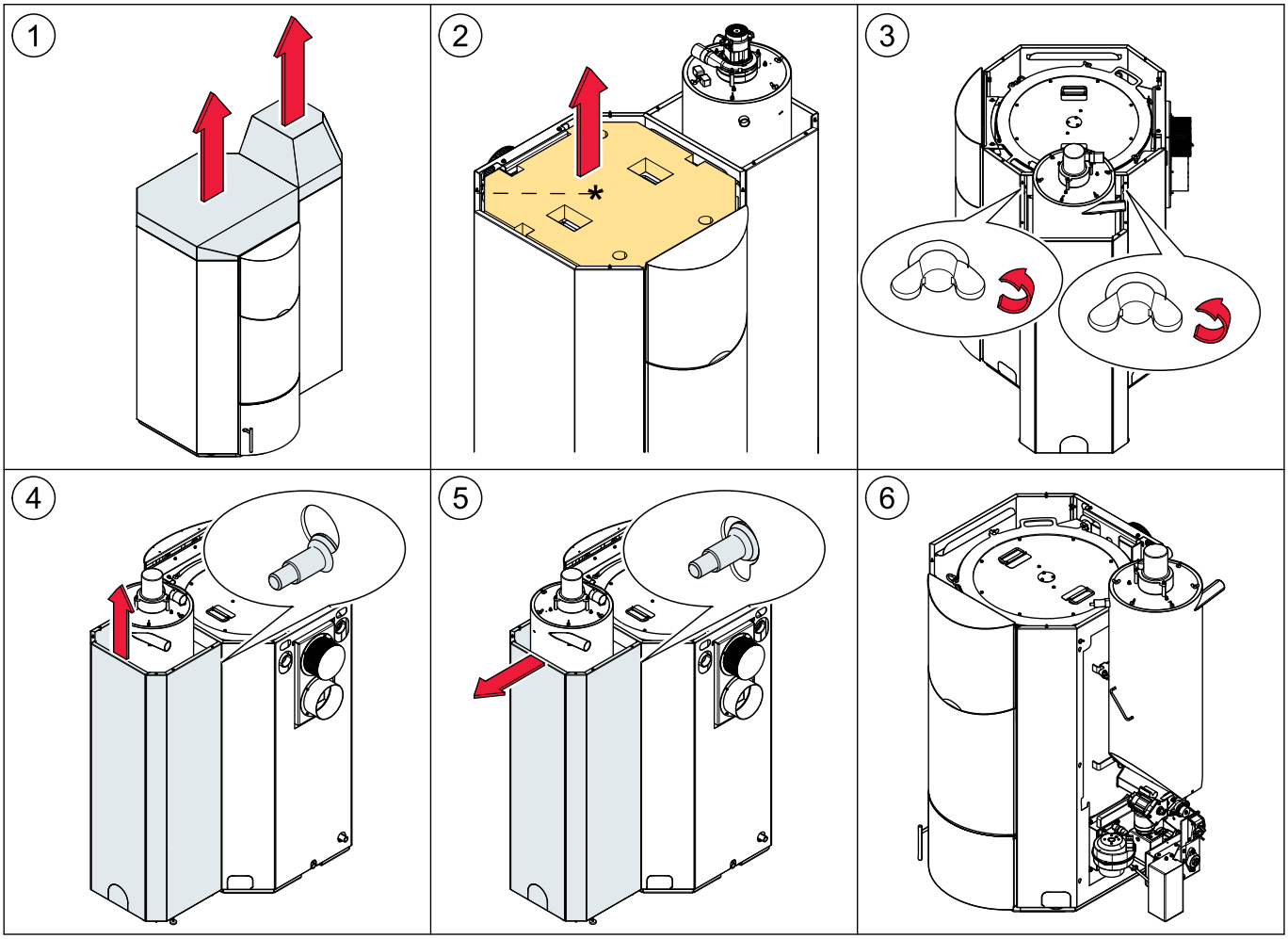
7.5 Removing the casing, the hopper and the burner

Dismantle the pellet boiler as far as necessary if site conditions require, so that the unit can be brought safely into the building.

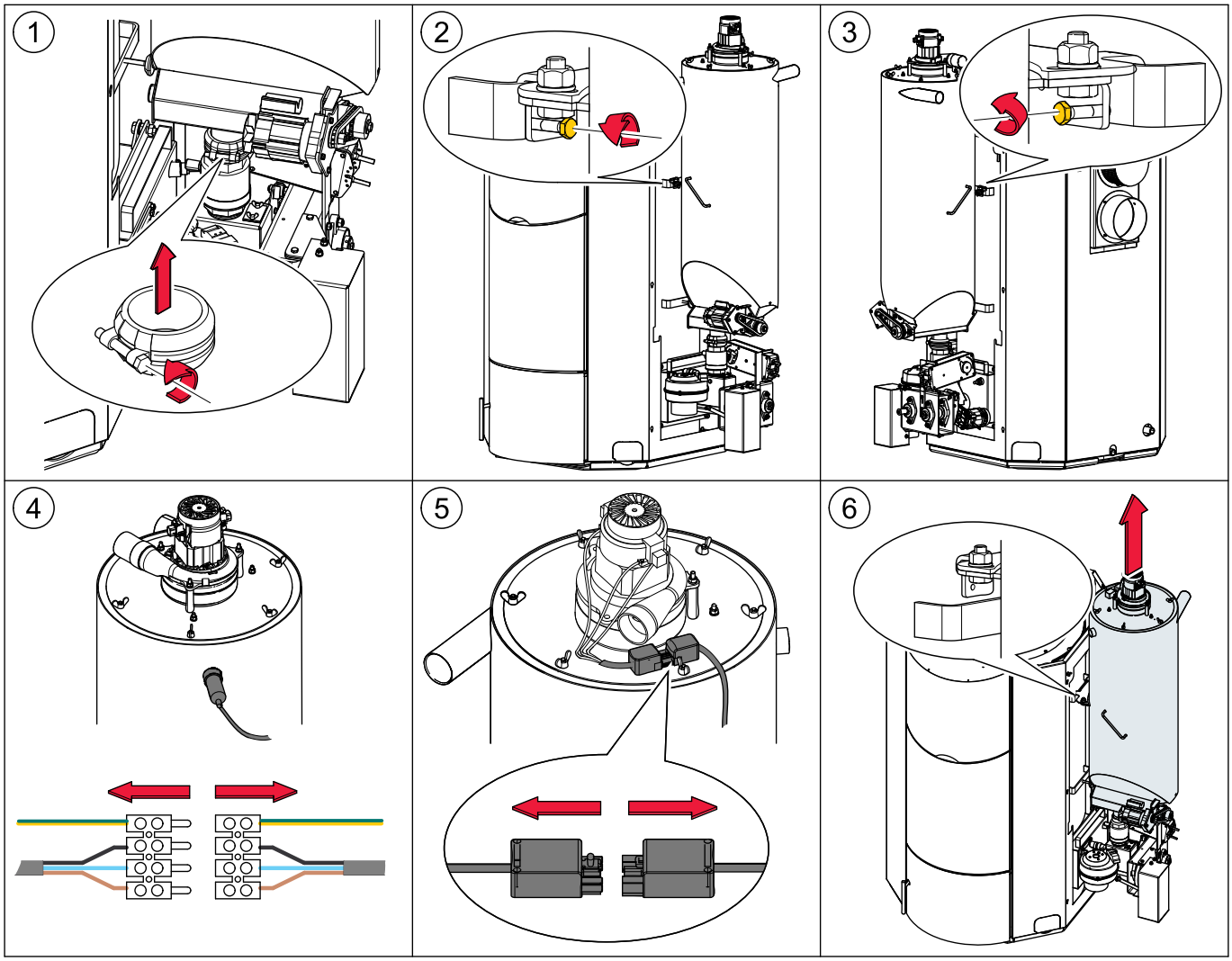
The complete dismantling of all components described here is divided into the following sections:

1. Dismantling the burner casing
2. Dismantling the hopper
3. Dismantling the burner
4. Dismantling the boiler door
5. Dismantling the boiler casing

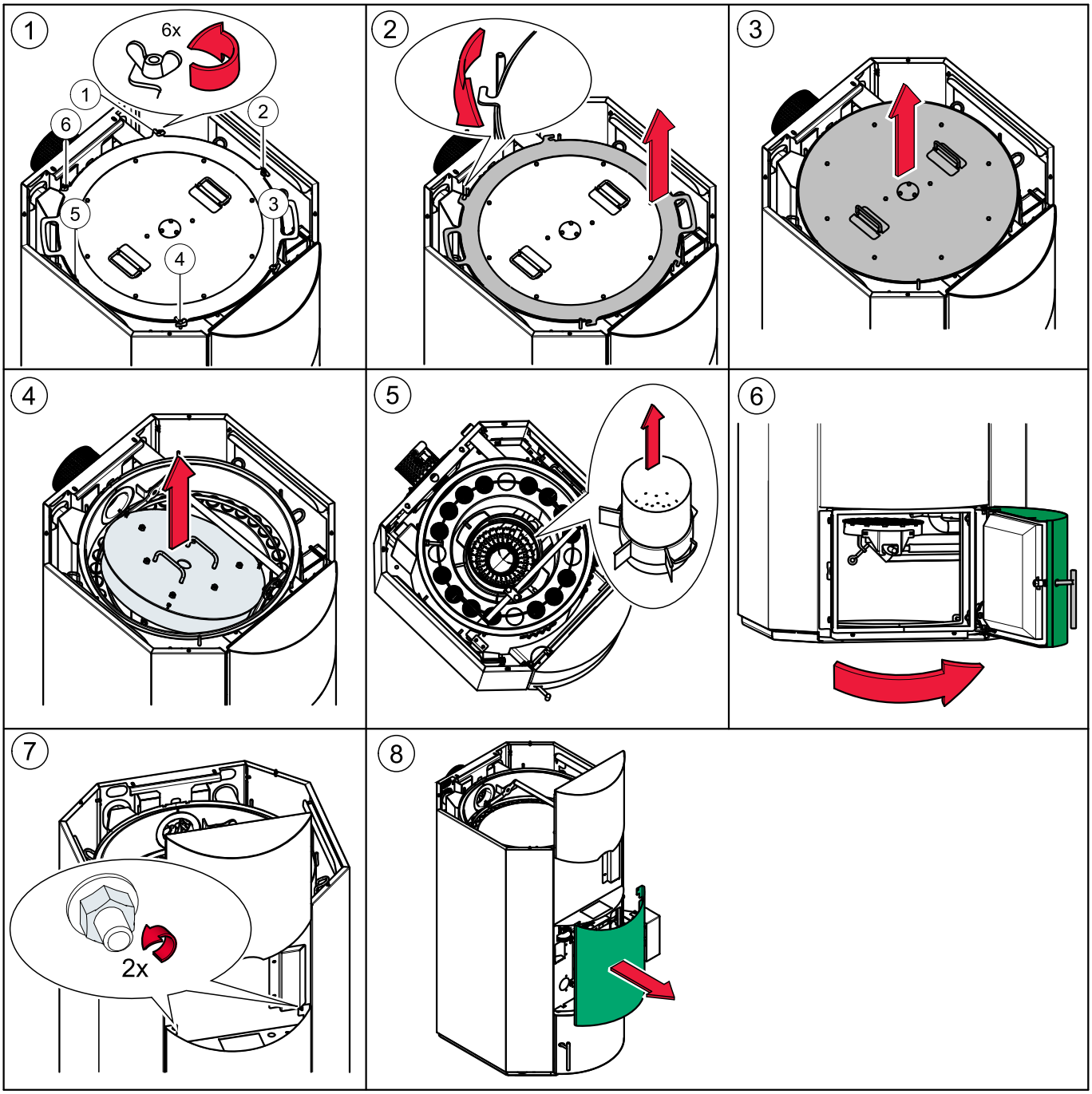
7.5.1 Dismantling the burner casing



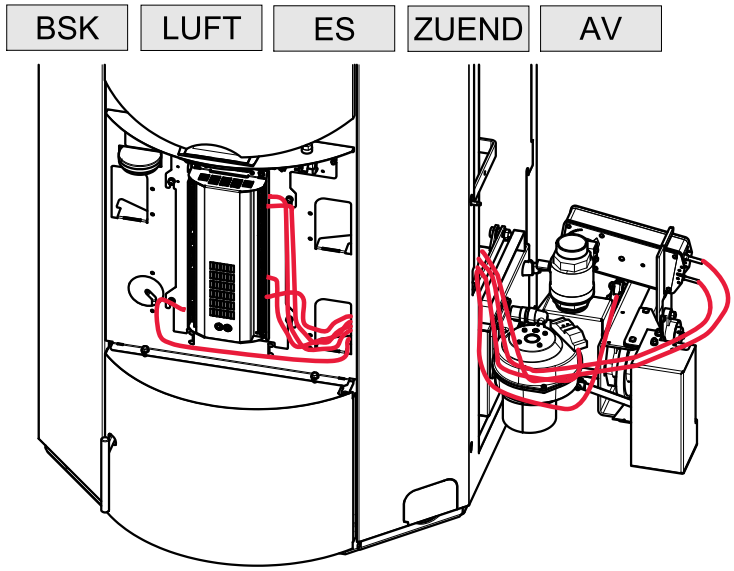
7.5.2 Dismantling the hopper



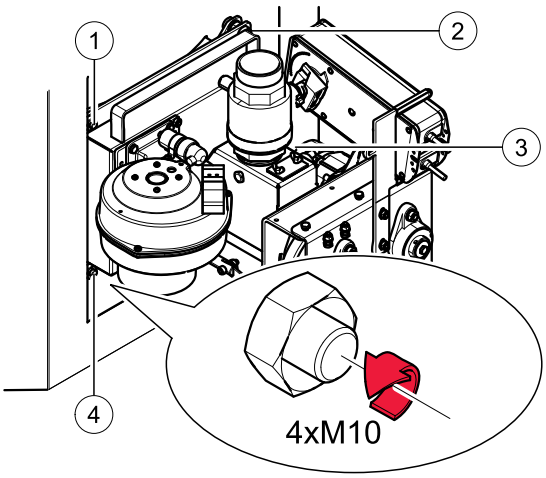
7.5.3 Dismantling the burner



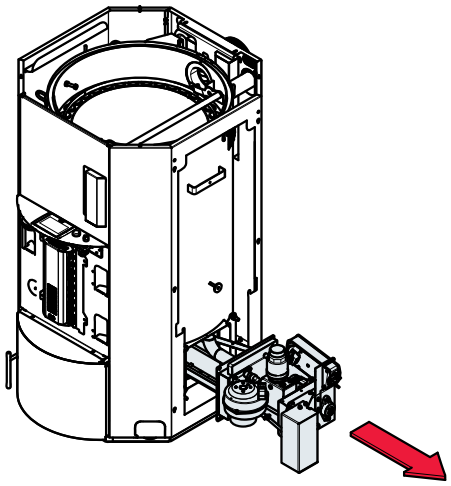
9



10

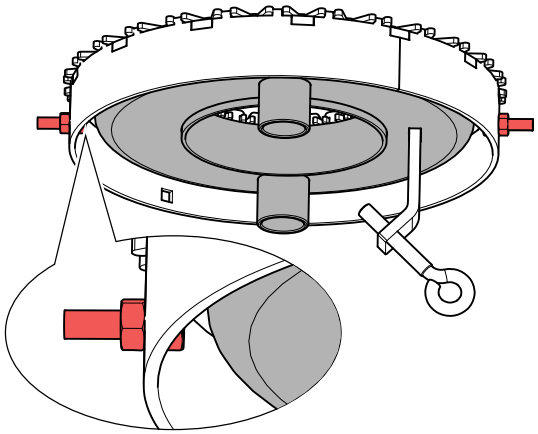
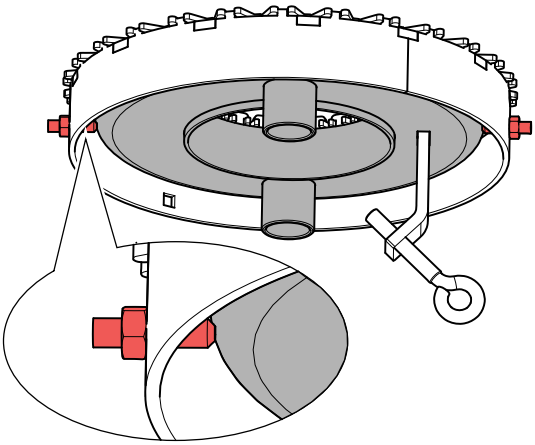


11

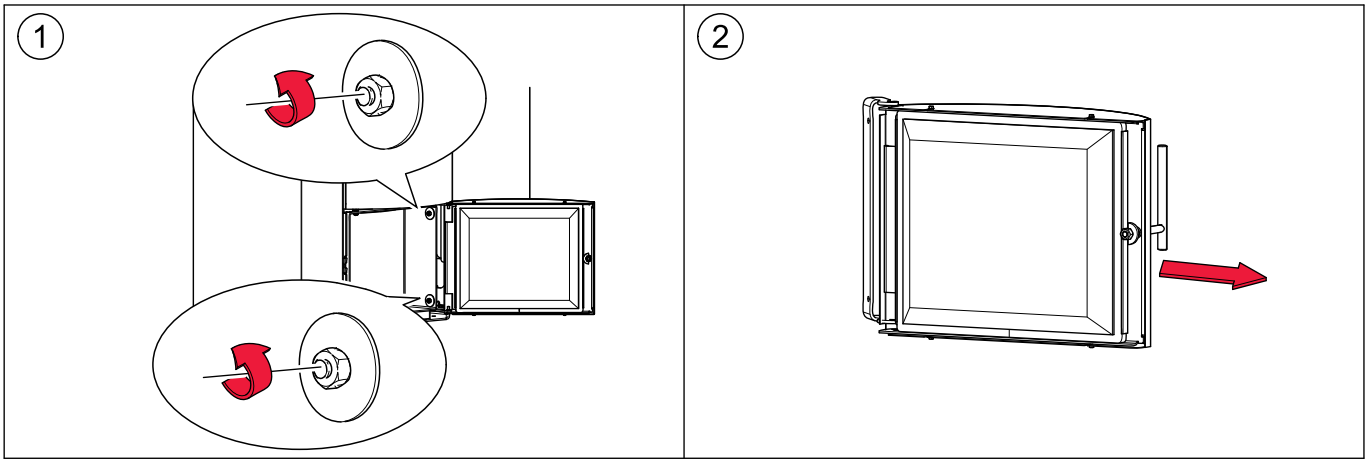


Multi segmented burner plate

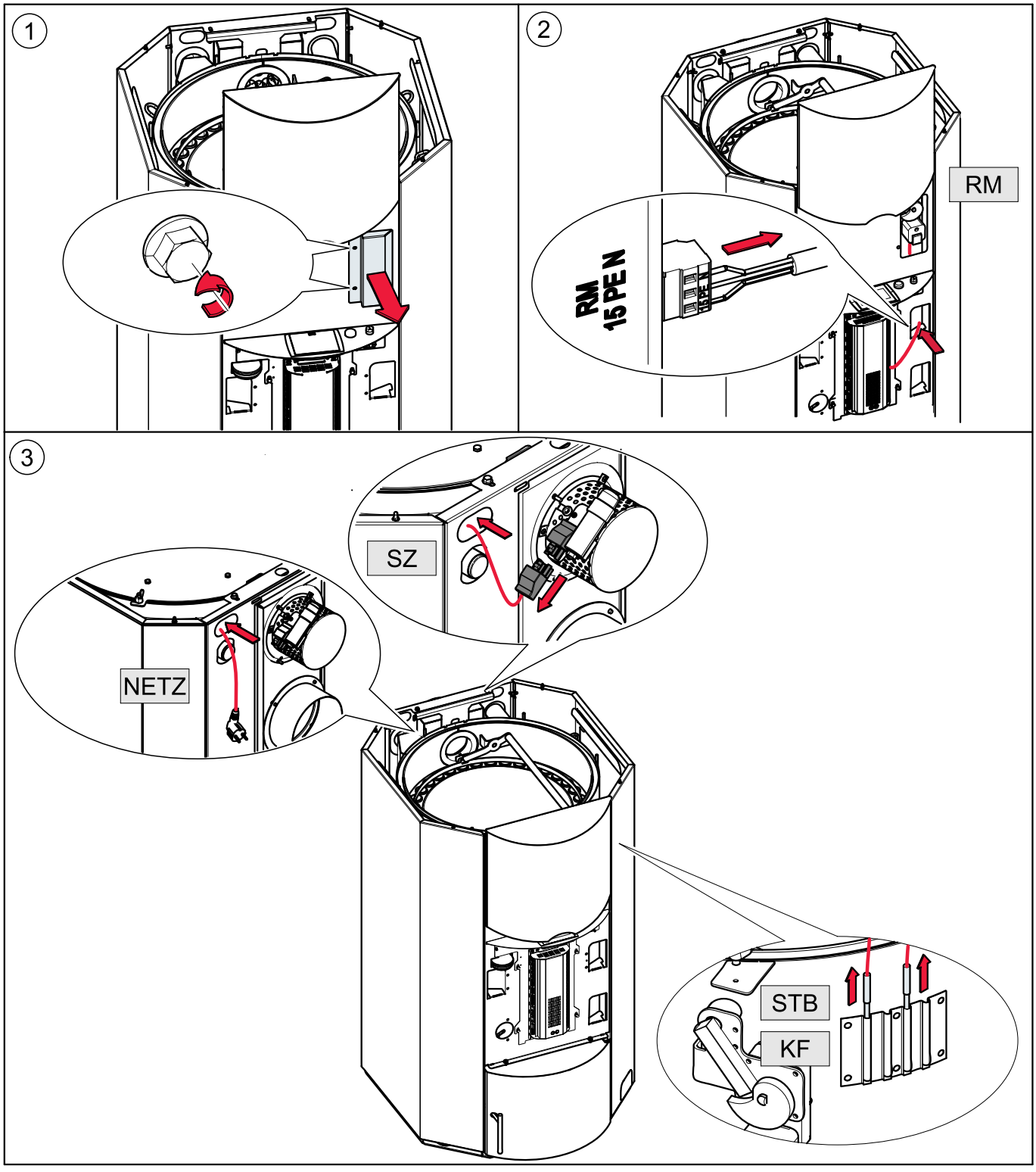
There are 2 mounting variations:

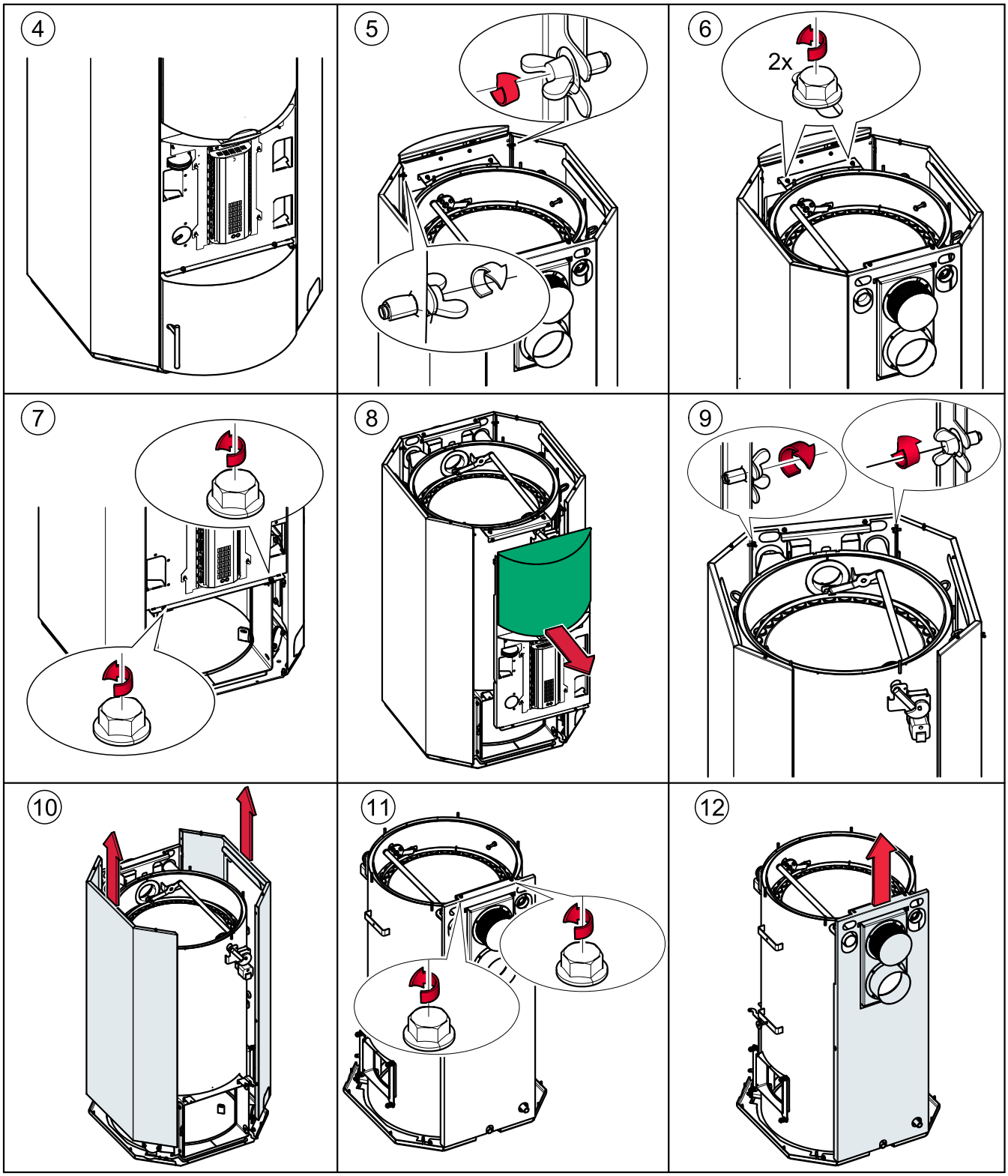
With burner plate cleaning system: Bolts loosened	**Without Burner plate cleaning system**: Bolts tightened
	
NOTICE Damage to property The **safety screws** for rotating the Multi segmented burner plate must be loosened/removed when exchanging the Multi segmented burner plate.	**NOTICE** Damage to property The **safety screws** for rotating the Multi segmented burner plate may not be loosened/removed when mounting.

7.5.4 Dismantling the boiler door



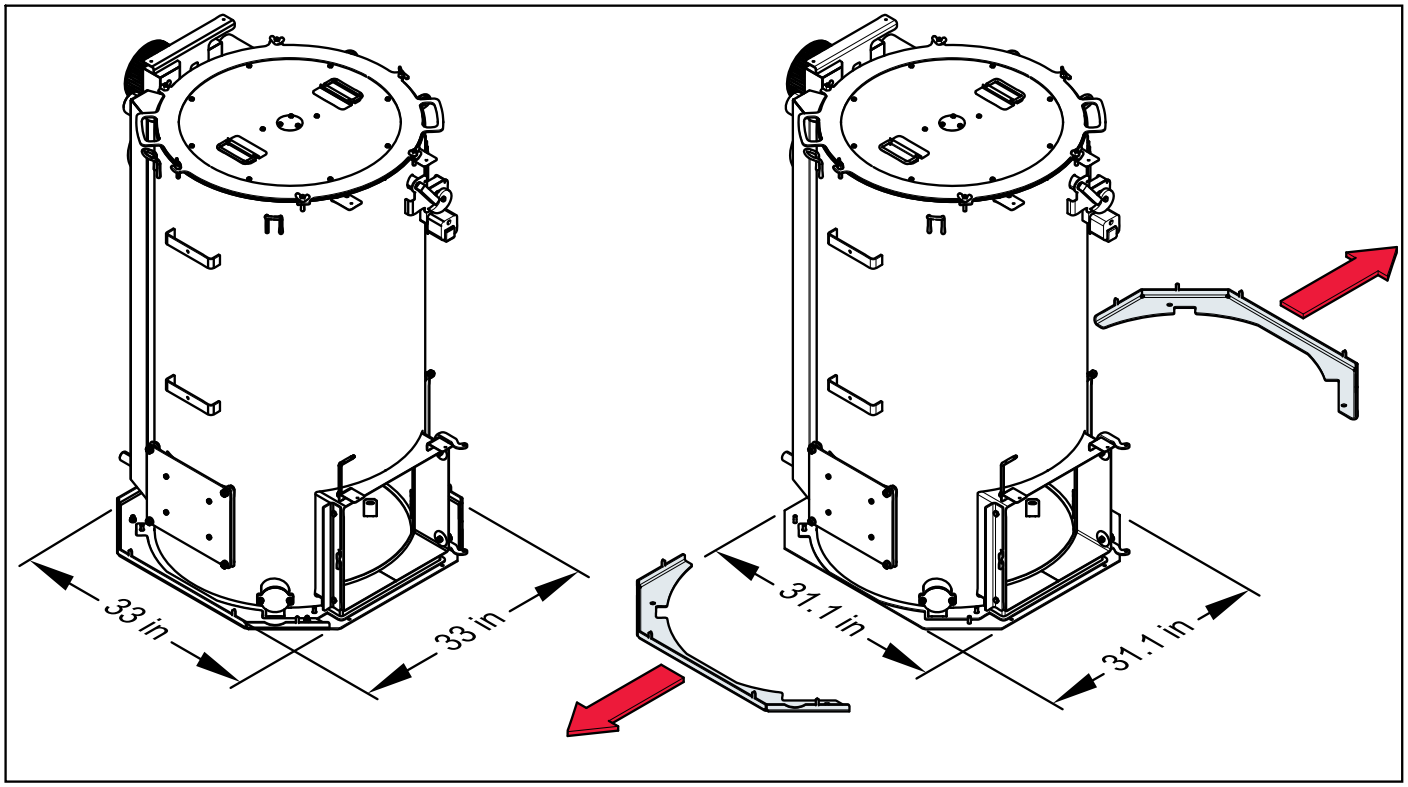
7.5.5 Dismantling the boiler casing




4
5
6
2x
7
8
9
10
11
12

7.5.6 Deassembling the base plate

The base plate consists of three parts. Two parts on the left and the right side can be deassembled.



Note:
31.1 inch is the minimum width of the boiler.

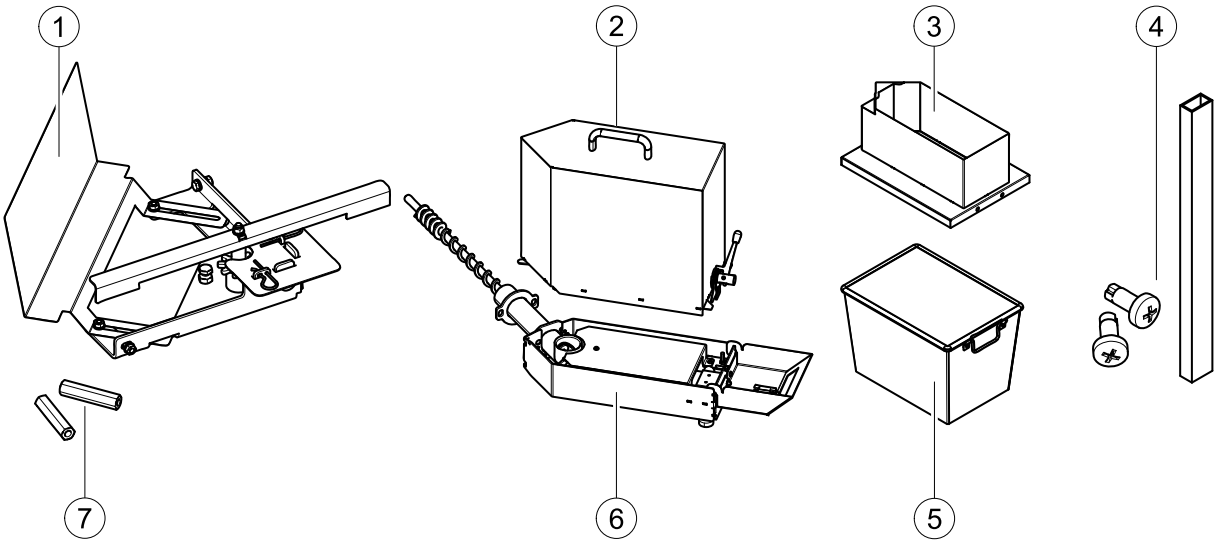
8 External de-ashing / automatic ash compaction system

We offer an automatic external de-ashing system.

1. Description of de-ashing system
2. How the de-ashing system works
3. Installating the de-ashing system
4. Emptying the de-ashing system

8.1 Description of de-ashing system

The de-ashing system compresses the ash and conveys it from the ash chamber into the ash box. The ash box enables the ash to be easily disposed off without creating dust.



1	Turnstile with agitator, door plate and mounting bolts	5	Ash container
2	Ash box with single-hand lever	6	Sub-assembly with extractor auger and cable
3	Mounting frame	7	Extended nuts to secure the sub-assembly
4	Cable duct with mounting bolts	8	1 pack of bio-bags

Note:
All components for the de-ashing system are packaged in a separate box which is shipped together with the boiler. Open the box and check that all parts are available before starting work.

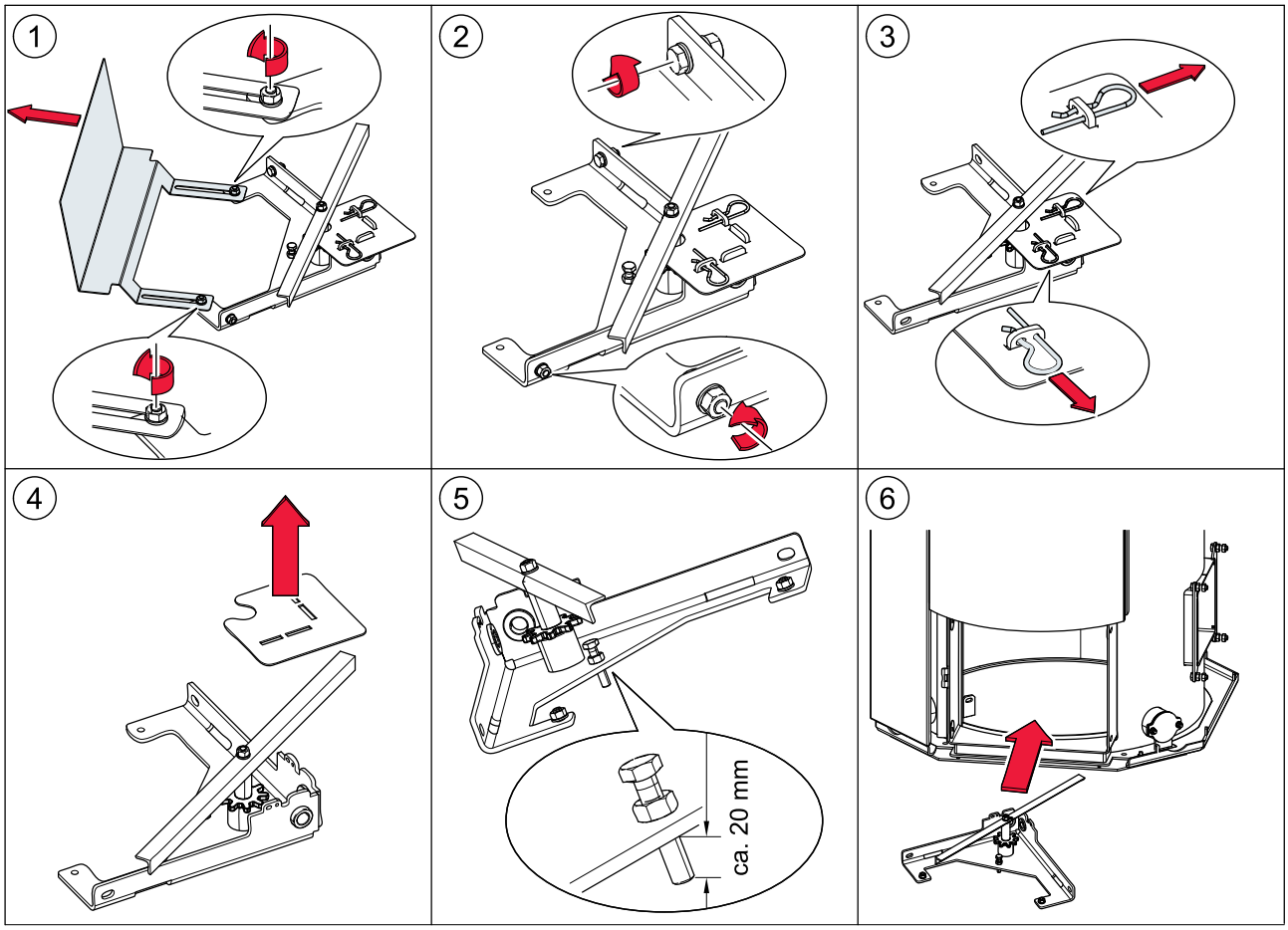
8.2 Installing the de-ashing system

We recommend installing the de-ashing system after the boiler has been brought in, but before the boiler casing is fitted. The de-ashing system has to be installed before the burner casing is assembled.

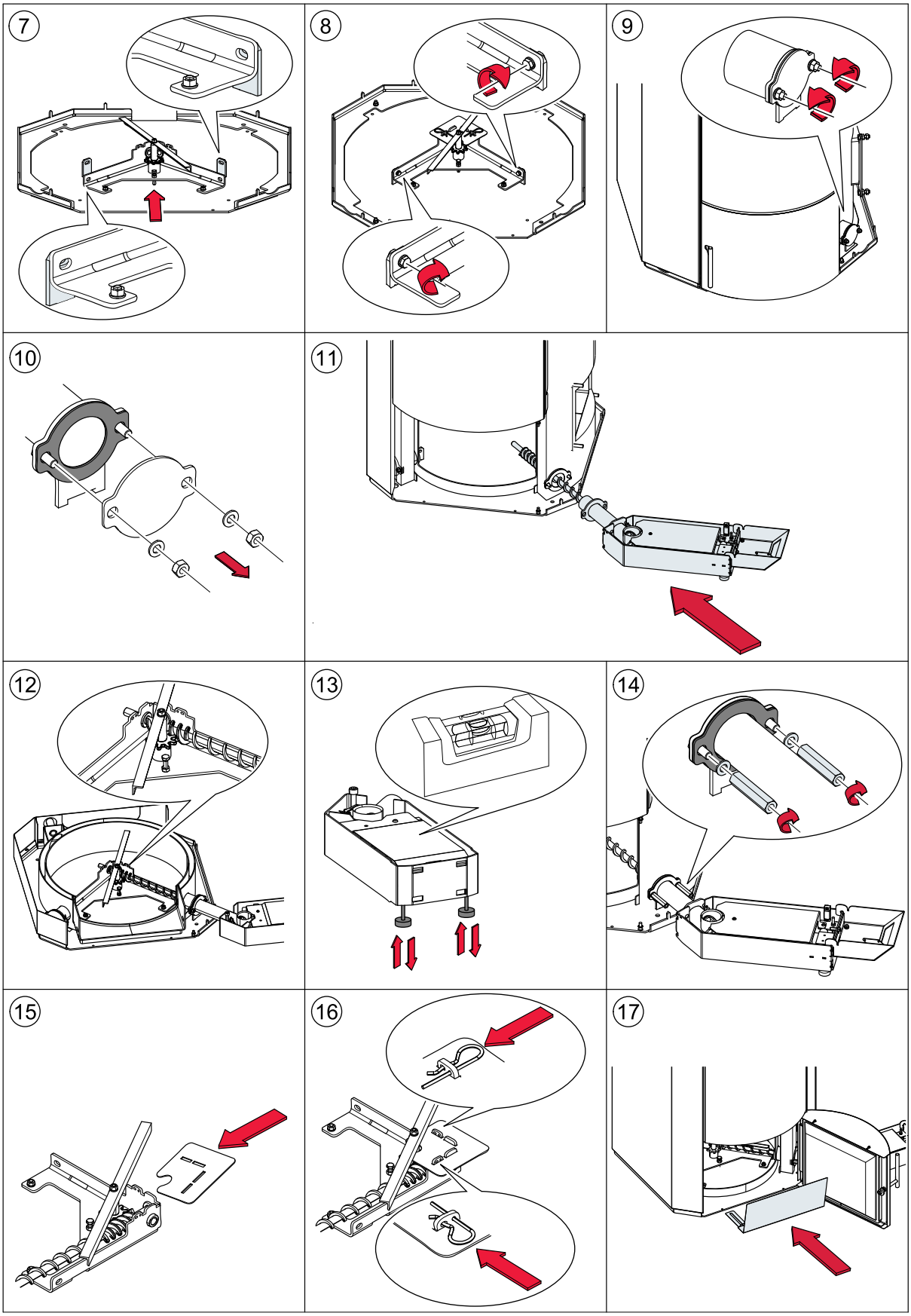
Installation of the de-ashing system is divided into the following steps:

1. Bringing in and installing the de-ashing system on the base plate
2. Installing the de-ashing auger, fitting the sub-assembly and mounting the door plate
3. Installing the burner side casing with cut-out and electrical connection
4. Assembling the pellet boiler and activating the ash box

8.2.1 Bringing in and installing de-ashing system on the base plate

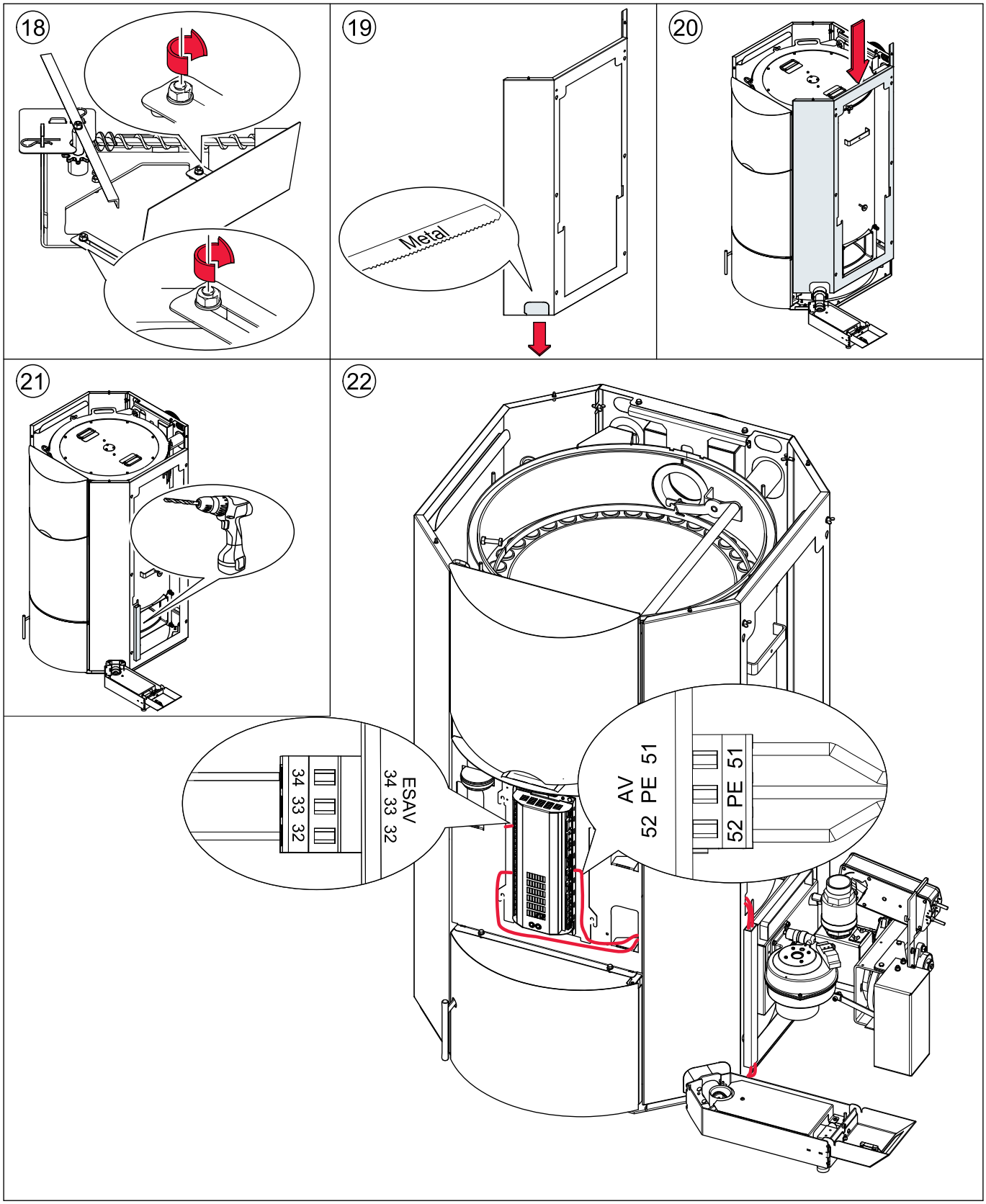


8.2.2 Installing the de-ashing auger, fitting the sub-assembly and mounting the door plate

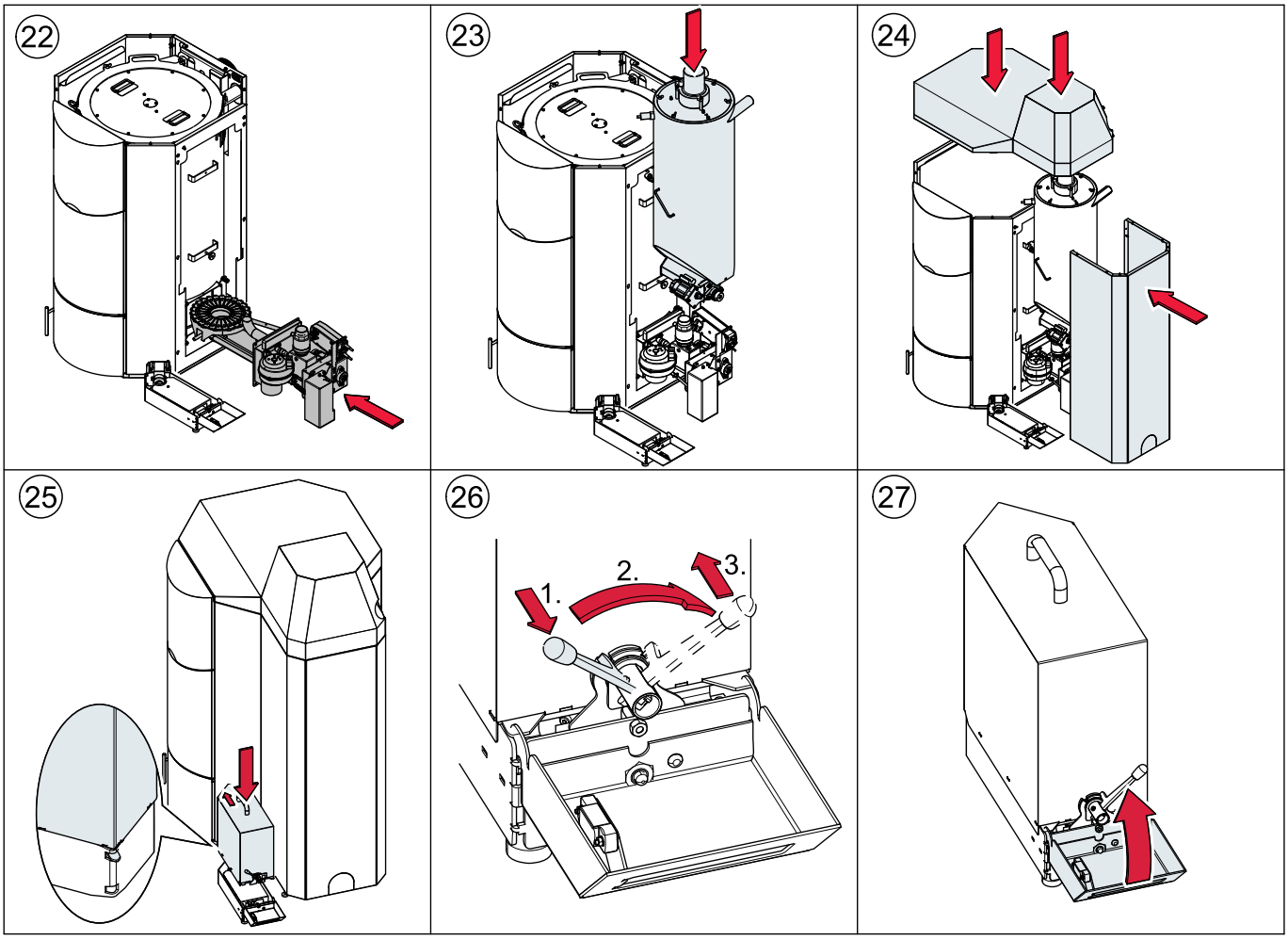


Note:
PICTURE 7: Do not tighten the screws firmly. Tighten the screws firmly only after working step in picture 11.

8.2.3 Installing the burner side casing with cut-out and electrical connection



8.2.4 Assembling the pellet boiler and activating the ash box



Note:
Refer to the section on bringing the pellet boiler into the boiler room for detailed instructions on assembling the hopper, burner and casing components.

Activating the ash box

1. Switch ON the boiler
2. In the boiler-menu , after entering the code, you can activate the function **Ashbox**.
3. Set up the number from **0** to **1**
4. Ashbox is now active

9 Connecting up the hydronics

The hydronic connections are located on the rear side of the boiler.

DANGER

Risk of explosion
The boiler can only be connected and operated after the hydronic system is complete, with all safeties and purged of air.

NOTICE

Water damage, damage to pellet boiler
The hydronic system can only be installed by an experienced heating professional. Check the entire installation for leaks before firing the boiler.

1. **Return water temperature control**

   The device to increase the return temperature is already integrated into the boiler. You do not need to make any adjustments to this.

2. **Hydronic schematics**

   If you have questions about piping a heating system, refer to the our hydronic schematics when connecting the boiler.

   Our hydronic schematics are available from your sales partner or from our website.

3. **Connections**

   The connections between the pellet boiler and the hydronic system must be disconnectable.

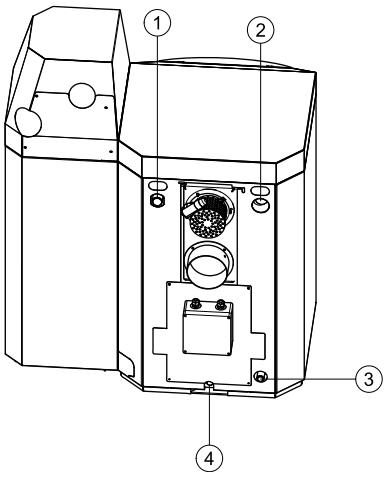
4. **Drain connection**

   When you install the pellet boiler, remove the plug from the drain connection (4) and fit a 1/2″ diameter shut-off valve.

5. **Thermometer connection**

   Installing a thermometer at location (3) (submersion sleeve 3.94 in long) enables you to measure the temperature of the return water after the return water temperature control.

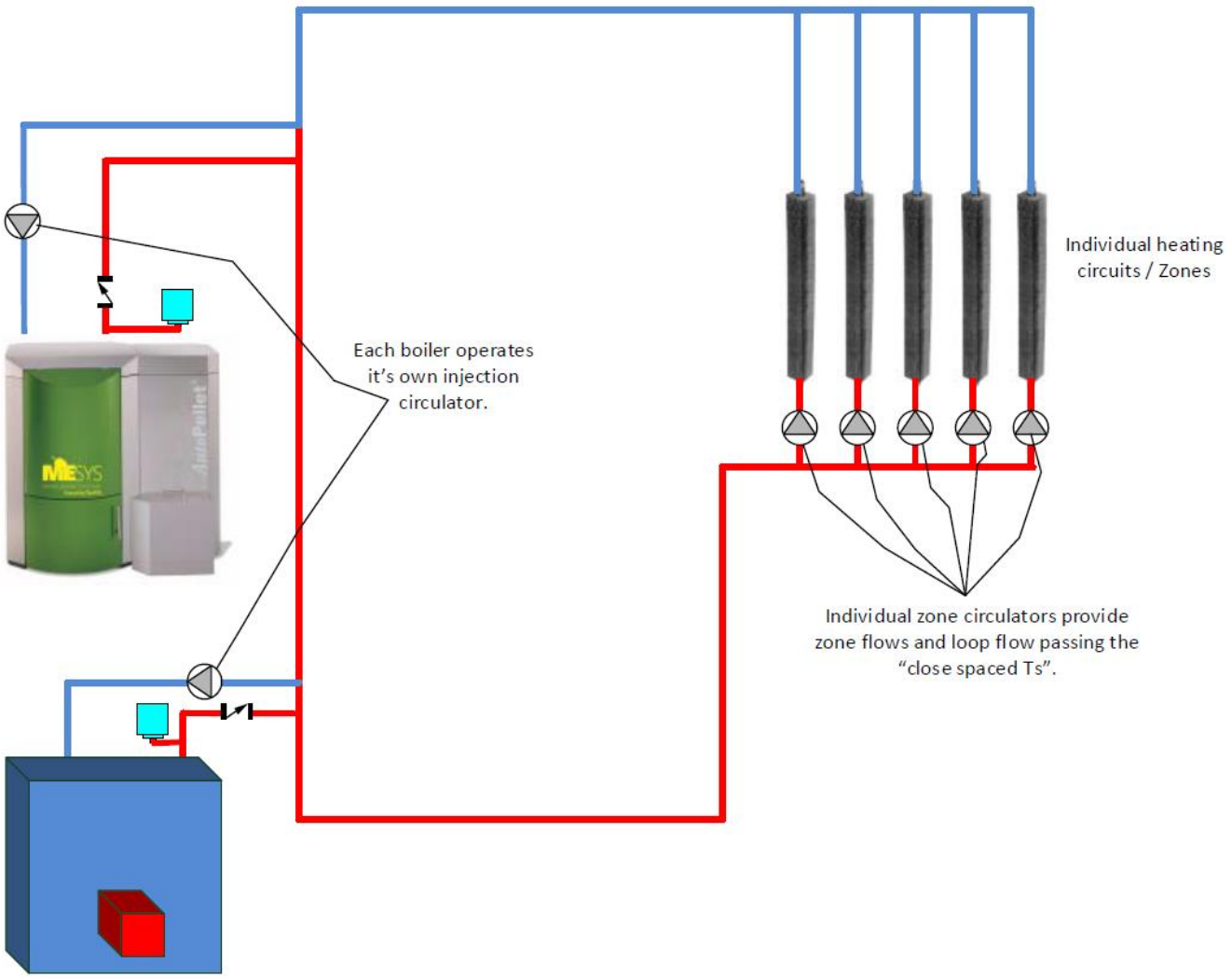
   Whether this is installed or not, after setting up the pellet boiler you need to remove the cap and fit a 1/2″ diameter closure plug at location (3).



1	Flow out	3	Thermometer connection
2	Flow return	4	Drain connection

9.1 Hydronic connecting diagrams

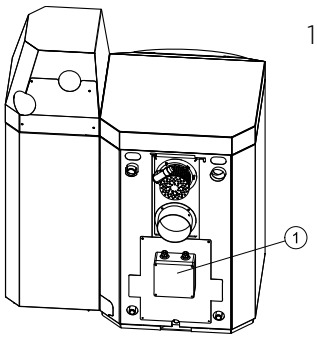
AutoPellet and existing gas or oil fired boiler, modified "primary - secondary" allows heat to come from either source without external changes.



10 Connecting to the power supply

10.1 Terminal box

The terminal box serves as the connection point for the power supply, low water cut off, circulator pump, cold start contacts, bus connection, power vent, and outdoor sensor if used. There is also a low power 220 volt connection point.



1..... Terminal box

10.1.1 Wiring diagram - terminal box

The wiring diagrams for the terminal box provide detailed technical information for professionals and are packed within the terminal box along with other helpful schematics for interconnecting the boiler with circulator controls.

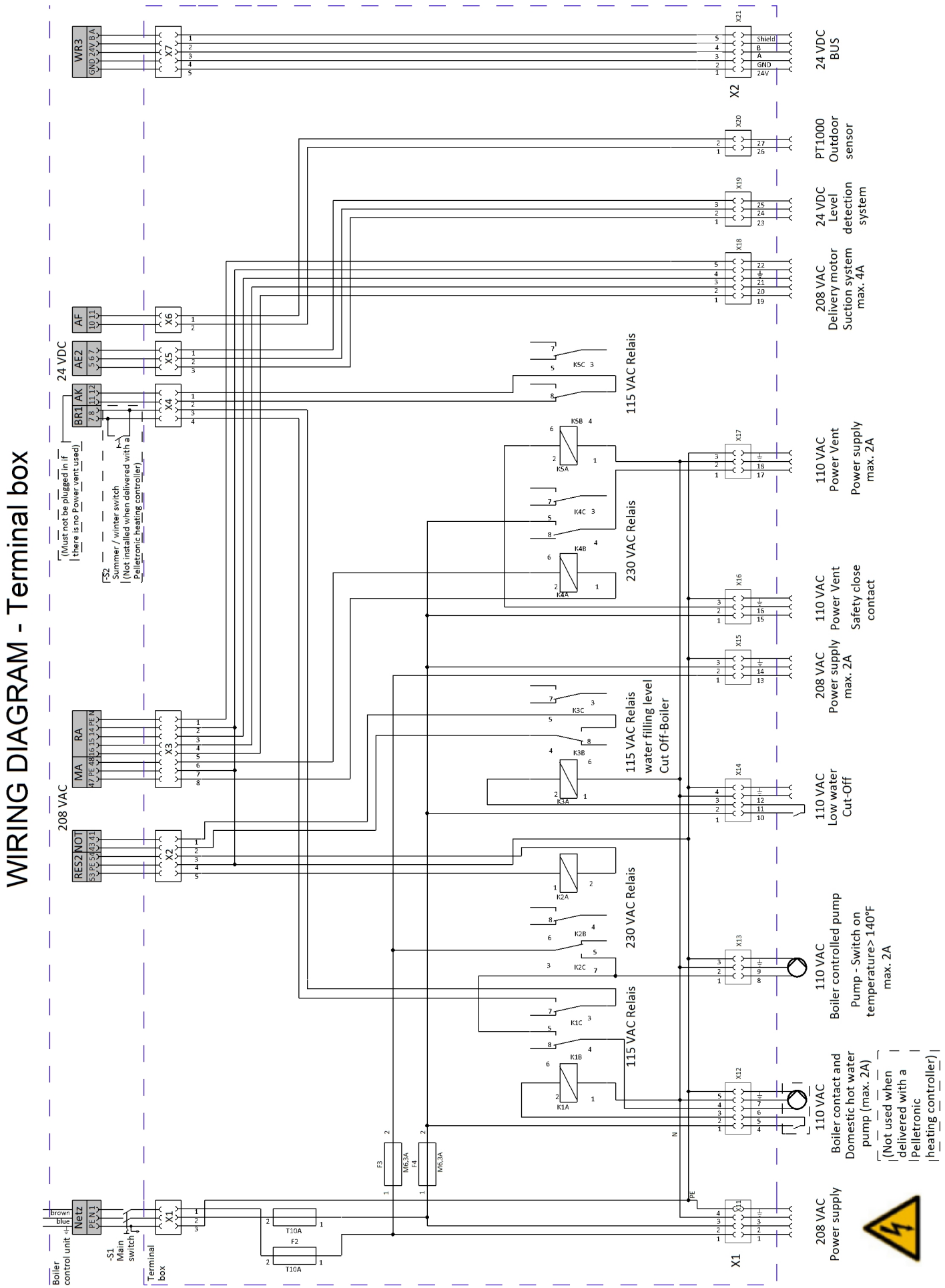
DANGER

Risk of electric shock
Only an authorised installer may connect the pellet boiler to the power supply.
Always disconnect / de-energize the power supply before working on the boiler.

General information for the electrician

- USA and Canada 208 to 240 VAC, single phase, 60 Hz, 15 amp dedicated circuit. To operate the boiler during prolonged power failures, the heating system, including controls and circulators, must be conected to a generator which produces clean, true 60 cycle power. Minimum suggested generator size, 2500W.
- **Lightening protection:** As there is no possible complete protection against lightening, we suggest installing a voltage spike suppression system for the building where the boiler is located or in the same panel as the boiler is powered from.
- **Electrical connection:**
  USA and Canada 208 to 240 VAC, single phase, 60 Hz, 15 amp dedicated circuit.

	Wiring Plan
Terminal	Specification
1	Hot wire L1 - Power supply 208 VAC
2	Hot wire L2 - Power supply 208 VAC
3	Neutral wire - Power supply 208 VAC
⏚	Ground wire - Power supply
4	Hot wire - Boiler contact
5	Hot wire - Boiler contact
6	Hot wire - Domestic hot water pump
7	Neutral wire - Domestic hot water pump
⏚	Ground wire - Domestic hot water pump
8	Hot wire - Boiler controlled pump
9	Neutral wire - Boiler controlled pump
⏚	Ground wire - Boiler controlled pump
10	Hot wire - Power supply - Low water Cut-Off
11	Hot wire - Burner circuit - Low water Cut-Off
12	Neutral wire - Low water Cut-Off
⏚	Ground wire - Low water Cut-Off
13	Hot wire L1 - Power supply
14	Hot wire L2 - Power supply
⏚	Ground wire - Power supply
15	Hot wire - Power vent - Safety close contact
16	Hot wire - Power vent - Safety close contact
⏚	Ground wire - Power vent
17	Hot wire - Power vent - Power supply 110VAC
18	Neutral wire - Power vent - Power supply 110VAC
⏚	Ground wire - Power vent - Power supply 110VAC
19	Hot wire L1 - Delivery motor
20	Hot wire L2 - Delivery motor - Suction system
21	Hot wire L3 - Delivery motor - Suction system
⏚	Ground wire - Delivery motor - Suction system
22	Neutral wire - Delivery motor - Suction system
23	Hot wire - Level detection system
24	Hot wire - Level detection system
25	Hot wire - Level detection system
26	Hot wire - Outdoor sensor
27	Hot wire - Outdoor sensor
24V	24V
GND	GND
A	A
B	B
Shield	Shield


WIRING DIAGRAM - Terminal box
Boiler control unit
Terminal box
-S1 Main switch
Netz
brown
blue
PE N 1
X1
T10A
F2
T10A
F3
M6.3A
F4
M6.3A
208 VAC
MA
RA
47 PE 48 16 15 14 PE N
RES2 NOT
53 PE 54 43 41
X2
X3
24 VDC
AF
AE2
BR1 AK
78 11 12
X4
X5
X6
WR3
GND 24V B A
X7
(Must not be plugged in if there is no Power vent used)
-S2 Summer / winter switch (Not installed when delivered with a Pelletronic heating controller)
K5C
K5B
K5A
K4C
K4B
K4A
K3C
K3B
K3A
K2A
K2B
K2C
K1C
K1B
K1A
115 VAC Relais
230 VAC Relais
115 VAC Relais water filling level Cut Off-Boiler
230 VAC Relais
115 VAC Relais
X21
Shield
B
A
GND
24V
X2
24 VDC BUS
X20
27
26
PT1000 Outdoor sensor
X19
25
24
23
24 VDC Level detection system
X18
22
21
20
19
208 VAC Delivery motor Suction system max. 4A
X17
18
17
110 VAC Power Vent Power supply max. 2A
X16
16
15
110 VAC Power Vent Safety close contact
X15
14
13
208 VAC Power supply max. 2A
X14
12
11
10
110 VAC Low water Cut-Off
X13
9
8
110 VAC Boiler controlled pump Pump - Switch on temperature> 140°F max. 2A
X12
7
6
5
4
110 VAC Boiler contact and Domestic hot water pump (max. 2A)
(Not used when delivered with a Pelletronic heating controller)
X11
208 VAC Power supply
X1
N
PE

10.2 Plugs on the boiler control unit

The designation of the plugs must correspond with the labeling of plug-in positions.

Designation of plug-in position		Voltage	Name of sensors, motors and pumps
X1A	3 2 GND 1	24 Volt	Operating display
X1B	3 2 GND 1	24 Volt	Heating / zone controller
X2	5 4	24 Volt	Power supply display
R1	46 45	24 Volt	Not used
R2	44 43	24 Volt	Not used
AF	42 41	24 Volt	Not used
KF	8 9	24 Volt	Boiler sensor
UP	2 3 4	24 Volt	Negative draft measuring
AE2	5 6 7	24 Volt	Level detection system
AE1	10 9 8	24 Volt	Not used
FRT	12 13	24 Volt	Combustion chamber temperature sensor
RGF	14 15	24 Volt	Flue gas temperature sensor (optional)
PWM	16 17	24 Volt	PWM for speed controlled high-efficiency pump
Analog IN	18 19	24 Volt	Not used
BR1	7 8	24 Volt	Burner / "cold start" contact
AK	11 12	24 Volt	Existing boiler (optional)
ESAV	32 33 34	24 Volt	Ash box RPM feedback
DE 1	37 36 35	24 Volt	Not used
DE 2	40 39 38	24 Volt	Not used
KAPZW	26 25 24	24 Volt	Capacitive sensor – hopper
KAPRA	5 4 3	24 Volt	Capacitive sensor – burner
BSK	6 5 4 3 2 1	24 Volt	Ball valve / Flame return gate
X21	PE L N	230 Volt	Power supply
VAK	50 PE 49	230 Volt	Vacuum turbine
ZUEND	N PE 22	230 Volt	Ignition
AV	52 PE 51	230 Volt	Motor ashbox
RES 2	53 PE 54	230 Volt	Not used
MA	48 PE 47	230 Volt	Magnetic valve (Cleaning nozzle, heat exchanger)
RM	15 PE N	230 Volt	Motor for boiler flame tube cleaning device
SM	19 20	230 Volt	Relay fault signal (optional)
SZ	17 PE N	230 Volt	Flue gas fan
UW	13 PE N	230 Volt	Boiler controlled pump
STB	17 PE 19	230 Volt	Safety temperature / Over-temp sensor
NOT	43 41	230 Volt	Connection to low water protection / Emergency stop heating
RA1	N PE 14 15 16	230 Volt	Fuel transport system
RES1	50 PE 49	230 Volt	Motor hopper – PES 36–56 only

ZW	N PE 26 25 24	230 Volt	Vibration motor
ES	1 2 3 N PE 6	230 Volt	Burner motor
LUFT	N PE 11	230 Volt	Burner fan

10.3 Cable routing

Reroute cables after dismantling the casing or other system components.

DANGER

Electric shock
Isolate the entire heating system from the power supply before starting work on the pellet boiler.

Note the following points to ensure the cables are routed securely:

Cables must not be routed:

- over moving parts,
- over hot parts,
- or over sharp edges.

Cables must be:

- routed in the cable ducts provided and
- through cable leadthroughs,
- tied together,
- and secured with cable ties at the points provided.
- Power cables must be routed in the right-hand duct and sensor cables must be routed in the left-hand duct.

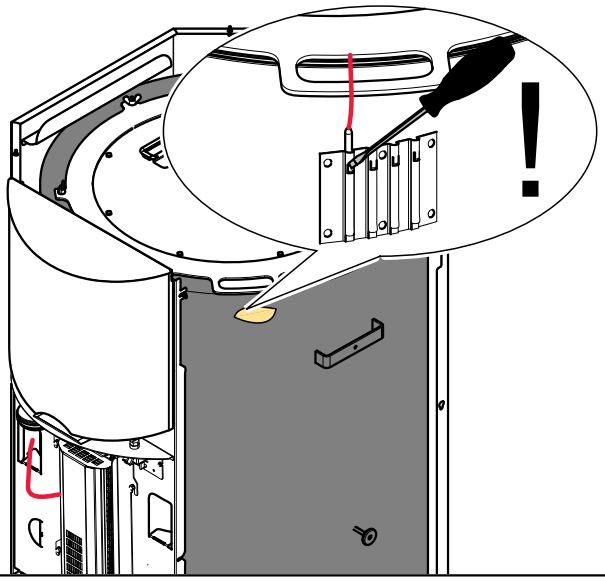
DANGER

Electric shock
Check cables for damage.
Replace any cables that are damaged.

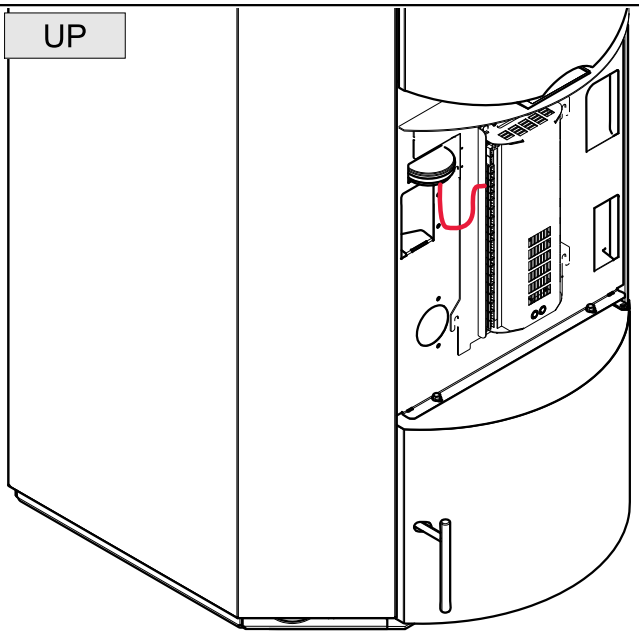
NOTICE

Damage to the boiler controller
Before fitting the casing components, make sure that the cable plug connector codes match the socket codes.

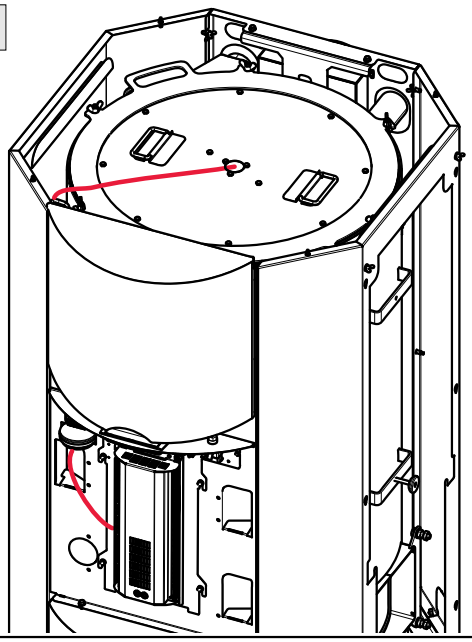
KF



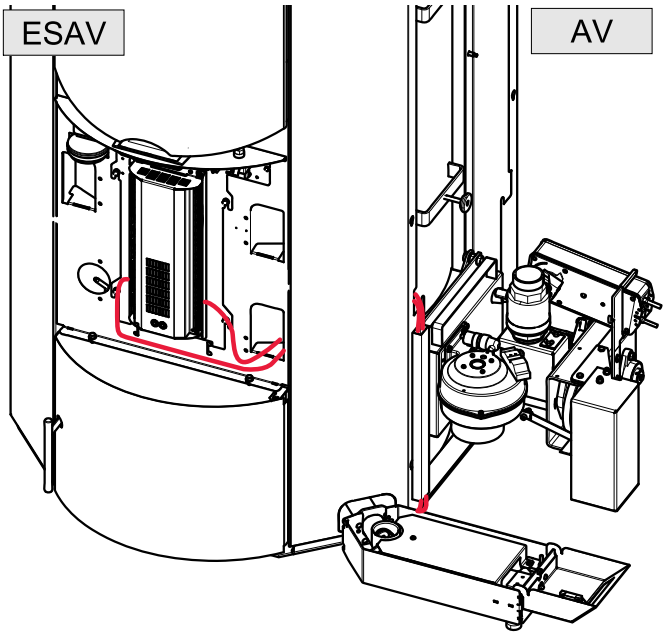
UP



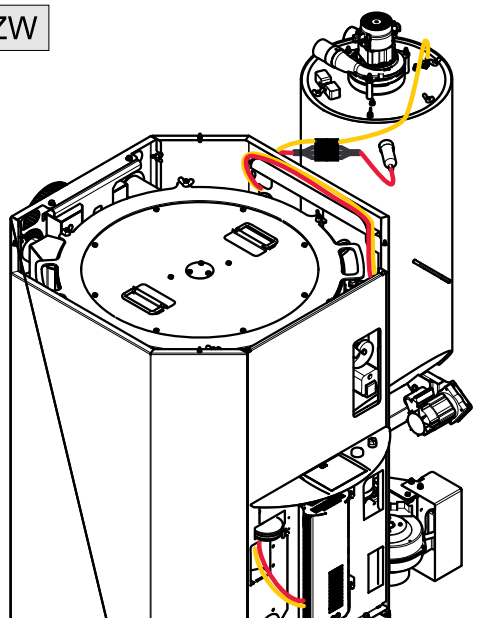
FRT

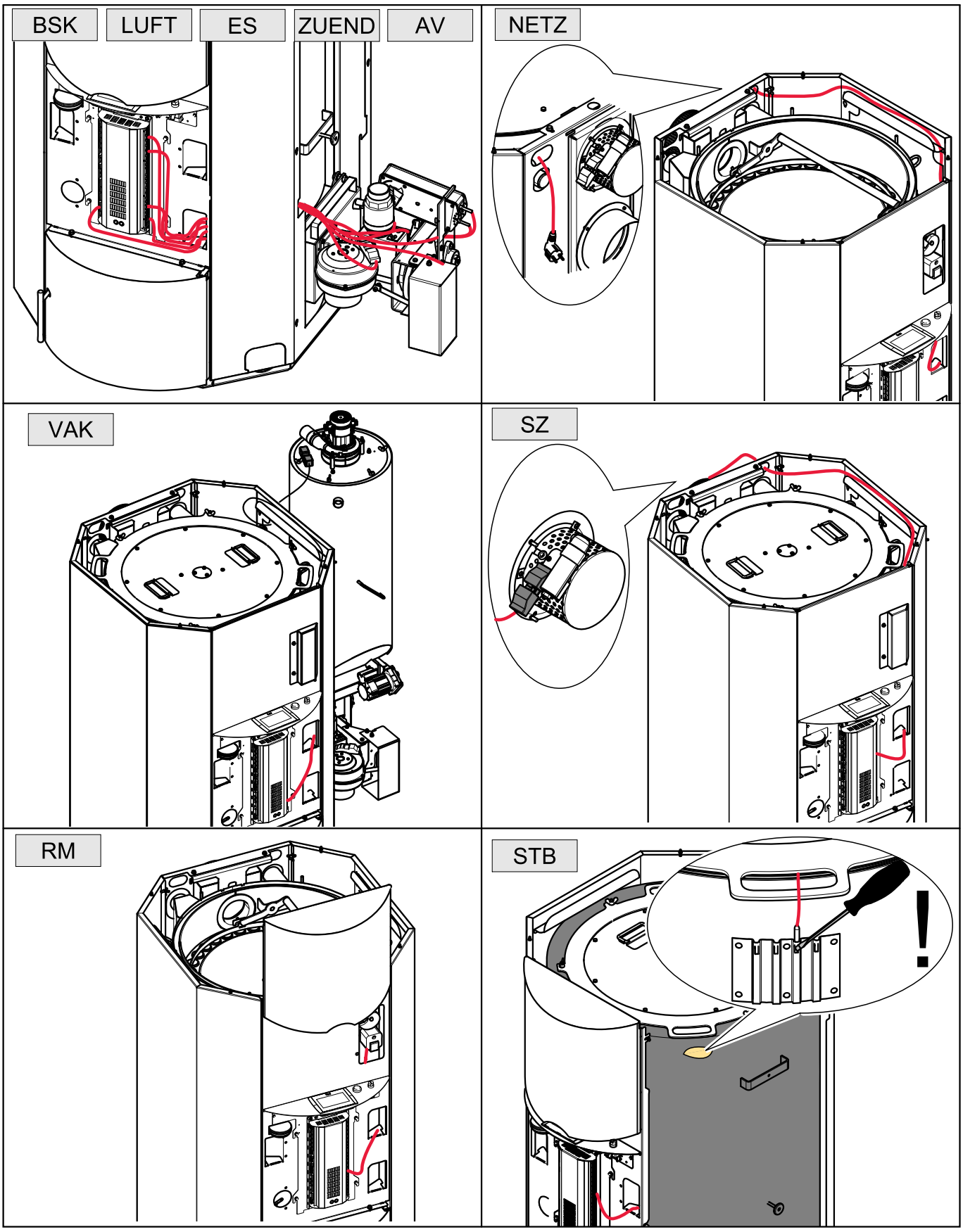


ESAV AV



KAPZW



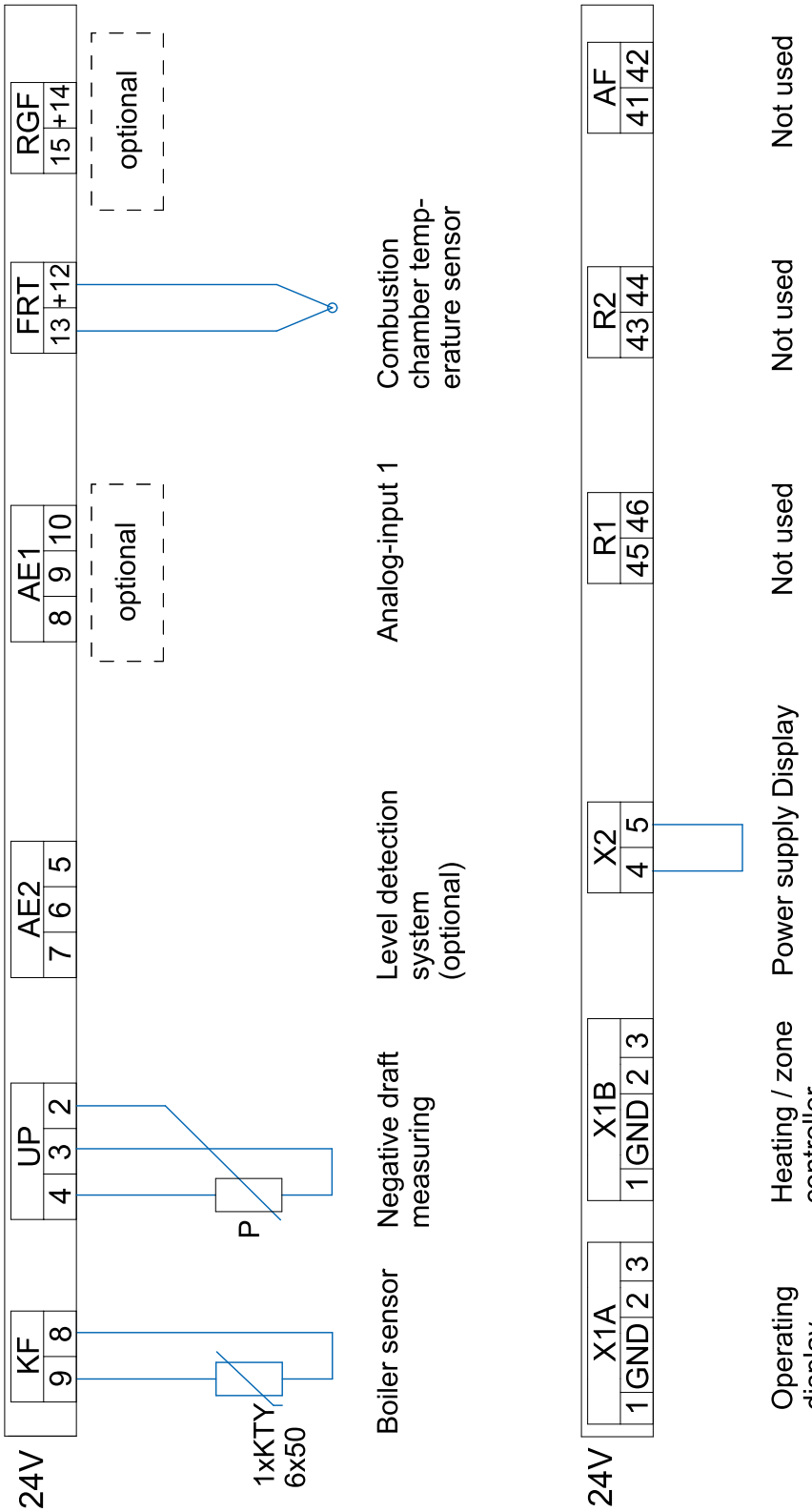

BSK
LUFT
ES
ZUEND
AV
NETZ
VAK
SZ
RM
STB
!

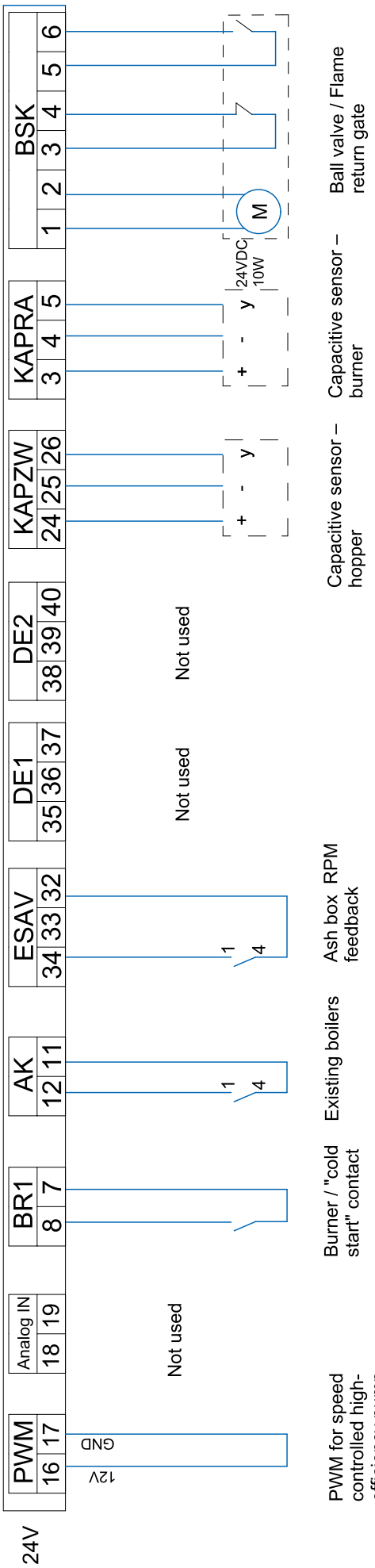
10.4 Wiring diagrams

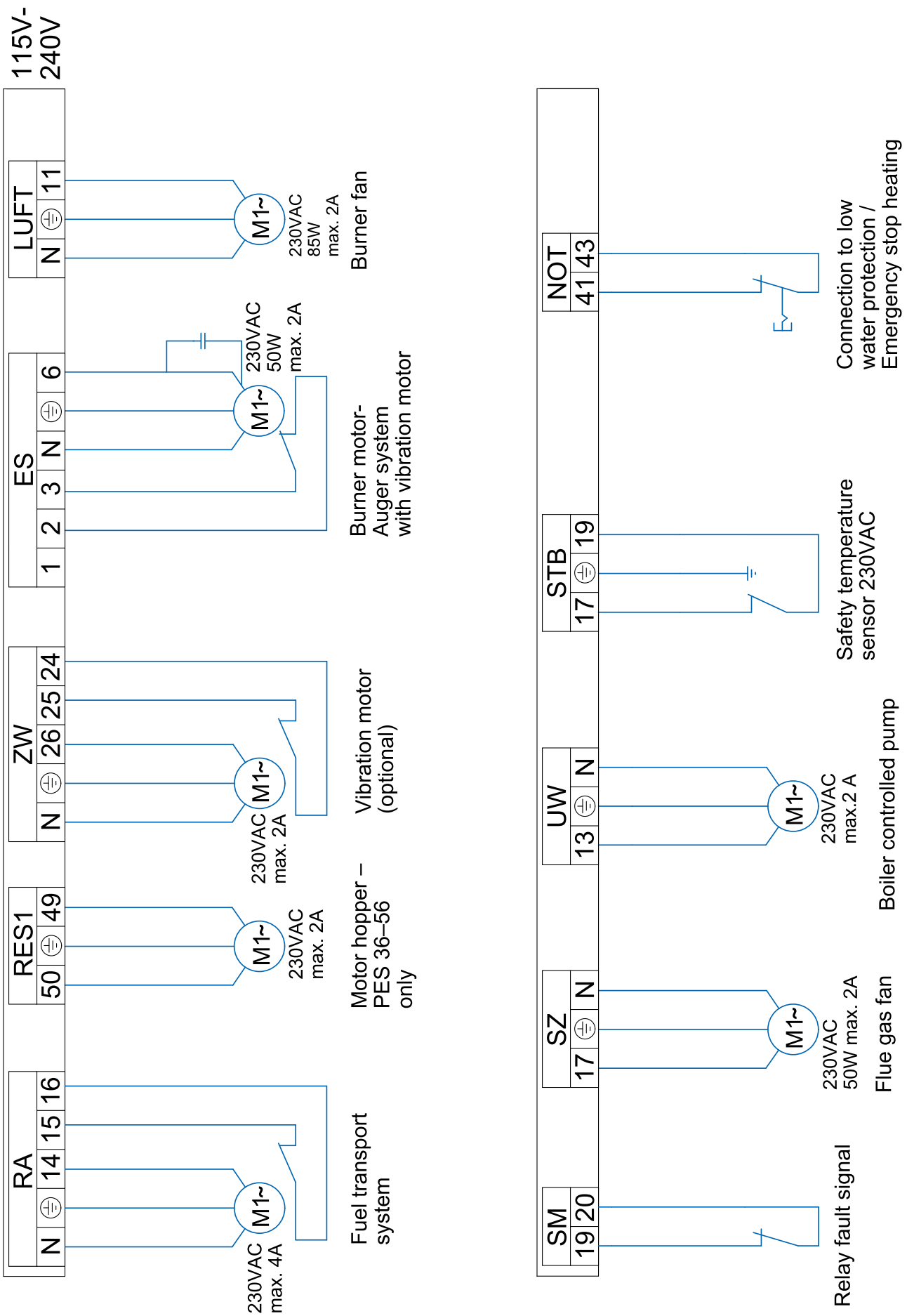
The wiring diagrams for the boiler control unit provide detailed technical information for electricians.

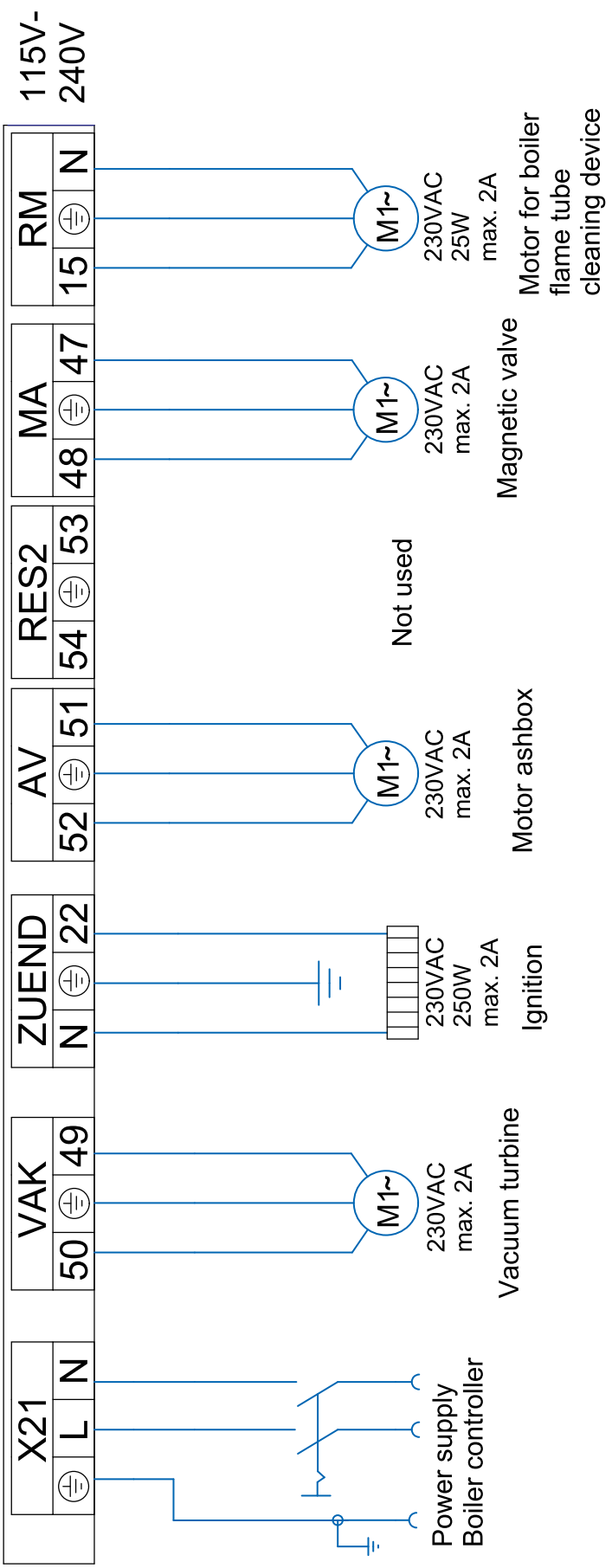
DANGER

Electric shock
Only an authorised installer may connect the pellet boiler to the power supply.
Isolate the entire heating system from the power supply before starting work on the pellet boiler.




24V
PWM
16 17
12V
GND
Analog IN
18 19
Not used
BR1
8 7
Burner / "cold start" contact
AK
12 11
Existing boilers
1
4
ESAV
34 33 32
Ash box RPM feedback
1
4
DE1
35 36 37
Not used
DE2
38 39 40
Not used
KAPZW
24 25 26
+ - y
Capacitive sensor – hopper
KAPRA
3 4 5
+ - y
Capacitive sensor – burner
24VDC 10W
M
BSK
1 2 3 4 5 6
Ball valve / Flame return gate
PWM for speed controlled high-efficiency pump


115V-
240V
RA
N
14
15
16
RES1
50
49
ZW
N
26
25
24
ES
1
2
3
N
6
LUFT
N
11
M1~
230VAC
max. 4A
Fuel transport
system
230VAC
max. 2A
Motor hopper –
PES 36–56
only
230VAC
max. 2A
Vibration motor
(optional)
230VAC
50W
max. 2A
Burner motor-
Auger system
with vibration motor
230VAC
85W
max. 2A
Burner fan
SM
19
20
SZ
17
N
UW
13
N
STB
17
19
NOT
41
43
230VAC
50W max. 2A
Flue gas fan
230VAC
max.2 A
Boiler controlled pump
Safety temperature
sensor 230VAC
Connection to low
water protection /
Emergency stop heating
Relay fault signal

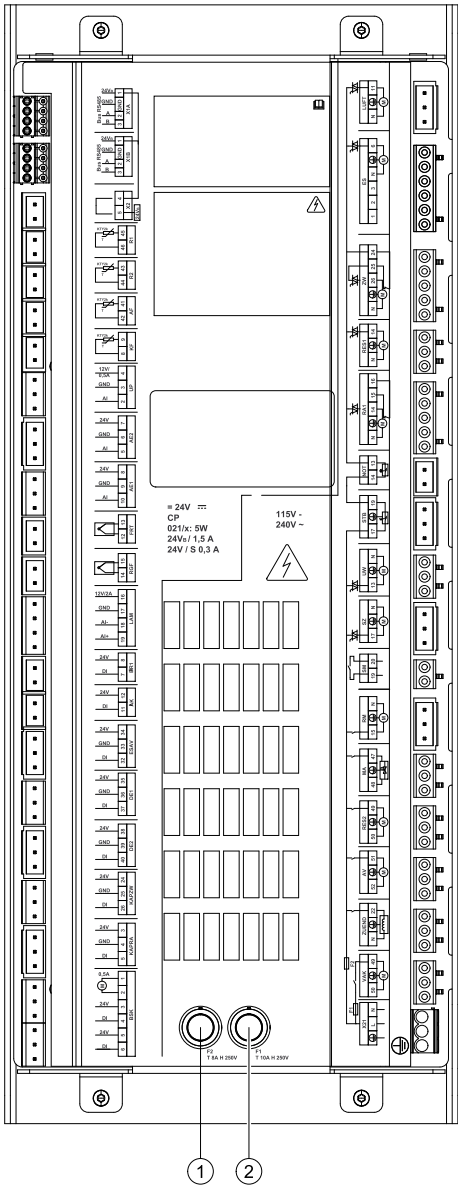

115V-
240V
X21
L
N
VAK
50
49
ZUEND
N
22
AV
52
51
RES2
54
53
MA
48
47
RM
15
N
Power supply
Boiler controller
M1~
230VAC
max. 2A
Vacuum turbine
230VAC
250W
max. 2A
Ignition
M1~
230VAC
max. 2A
Motor ashbox
Not used
M1~
230VAC
max. 2A
Magnetic valve
M1~
230VAC
25W
max. 2A
Motor for boiler
flame tube
cleaning device

10.5 Fuses - boiler controller

The control unit is protected against short circuits by fuses which are in the control panel (under the front boiler panel). There are also fuses in the terminal box at the rear of the boiler. At the rear panel, there are 4 fuses. Two 6.3 amp for outputs there, and two 10 amp also for the main controller.

NOTICE

Damage of property
Should it become necessary to replace a fuse, it is critically important to replace the fuse only with a fuse having the same exact ratings.



1	F1: Fuse T8A
2	F2: Fuse T10A

10.6 Operating the AutoPellet

The operation of the system is described in the **manual for the End User**.

11 Starting up for the first time

After bringing in the boiler, connecting up the hydronics and power supply, the unit can be started up for the first time.

NOTICE

Air tight property of combustion chamber
To ensure correct combustion and overall operation, all fittings to the combustion chamber must be correctly assembled to be completely air-tight.

Note:
The boiler may only be commissioned (first start-up) by an authorized installer.

Before starting up the pellet boiler, the following settings must be made in the sequence specified below:

1. Adjust power rating
2. Settings in the boiler control unit
3. Output test - test all motors
4. Settings in heating controller (if installed)
5. Start the pellet boiler

Use the checklist enclosed to document the start-up procedure.

NOTICE

Property damage
The allowed temperature of the boiler controller is 40 to 122°F.

11.1 Adjusting power rating

On Autopellet boilers the effective heat exchanger area can be changed within a finite range. This involves opening or closing the heat exchanger tubes. The output power of the boiler is adjusted with this change in conjunction with a parameter change within the controller. If the condition as shipped is different from the power rating required, then the service technician must adjust the power rating, including the correct setting of the heat exchanger area, before starting up for the first time.

11.1.1 Installing the turbulators and closure plugs

The heat exchanger in the pellet boiler has between 12 and 36 heat exchanger tubes, depending on the size of the boiler. Springs are installed inside the heat exchanger tubes to clean the tubes as well as act as turbulators.

Increasing the boiler power rating

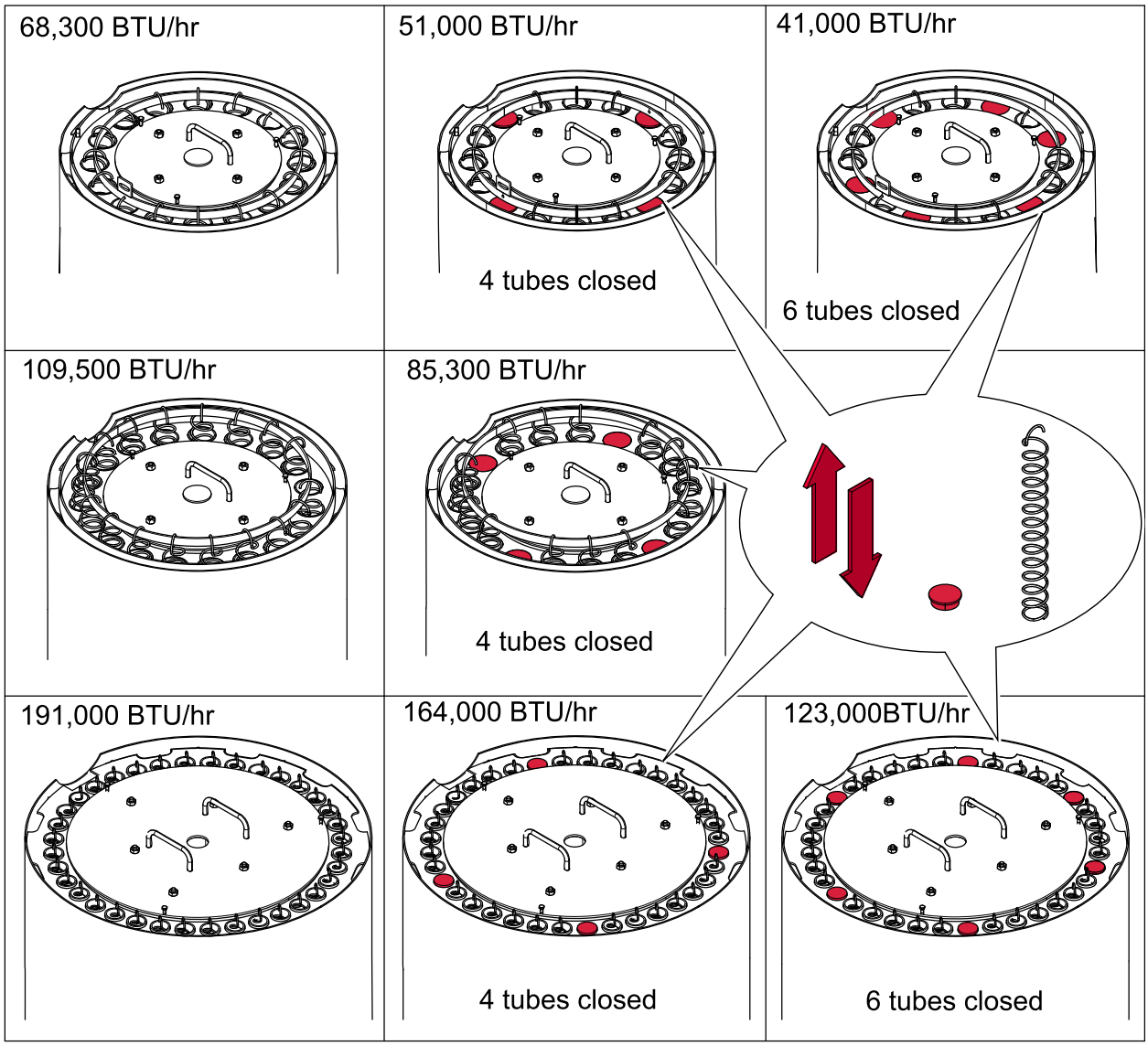
1. Remove the closure plugs from the ends of the heat exchanger tubes.
2. Insert the turbulators supplied into the heat exchanger tubes.
3. Hook the turbulators onto the ring of the cleaning system.

Reducing the boiler power rating

1. Unhook the turbulators from the ring of the cleaning system.
2. Remove the cleaning springs/turbulators from the heat exchanger tubes.
3. Close off the heat exchanger tubes using the closure plugs supplied.

Number of cleaning springs (tubulators) to be removed/installed:

Final boiler power setting	No. of springs	**Full power setting of boiler**	No. of springs	
41,000 BTU/h	10	68,300 BTU/h	16	Remove 6 turbulators
51,000 BTU/h	12	68,300 BTU/h	16	Remove 4 turbulators
68,300 BTU/h	16	68,300 BTU/h	16	No adjustment required
85,300 BTU/h	16	109,500 BTU/h	20	Remove 4 turbulators
109,500 BTU/h	20	109,500 BTU/h	20	No adjustment required
123,000 BTU/h	30	191,000 BTU/h	36	Remove 6 turbulators
164,000 BTU/h	32	191,000 BTU/h	36	Remove 2 turbulators
191,000 BTU/h	36	191,000 BTU/h	36	No adjustment required



12 Appendix

12.1 Checklist for checking the heating system

The checklist is intended to help authorised specialists perform and document a comprehensive check on the heating system.

Name and adress of the customer	**Heating device**
Name:	Type of boiler:
Street:	Rated power:
Place:	Year of build:
Name and adress of installer	Manufacturer`s serial number:
Name:	Type of heating controller:
Street:	Type of accumulator:
Place:	Solar device:

NOTICE

Damage to property
Use the checklist to check the heating system before starting up for the first time.

CHECKLIST		Yes	Comment
Textile tank			
Textile tank	Are the tie members installed?		
	Are all legs straightened vertical?		
Delivery unit	Is the slot for the emercency gate valve closed with an adhesive tape?		
Filling coupling	Are the filling couplings correctly installed?		
	Are the plugs at the filling couplings?		
	Are the safety labels placed? (Caution – Switch off the heating systembefore entering)		
	Are the couplings correctly grounded?		
Ventilation	Is the storage room / building properly ventilated with minimum 27 square inches to the outside?		
Caution label	Is the label "Wood pellets storage room" placed on the door to the storage room?		
Vibration plate	Check the electrical connection of the vibration motor and the capacitive sensor		
If auger delivery system is installed			
Drive unit	Is the direction of rotation correct?		
	Is a demounting possible?		
Spiral hose	Is the pitch to the burner > 45°?		
Sound insulation	Is the rock wool insulation fix at the wall pass through?		
Pellet boiler			

Adjusting power rating	Is the power rating corrrectly adjusted?		
Burner plate	Is the screw fixing the burner plate, tightened?		
Flame tube	Is the flame tube placed correctly?		
Combustion chamber cover	Are the adjusting screws for the increasing of the flue gas temperature adjusted correctly?		
Flue gas connection	Is a chimney draft regulator, barometric damper implemented?		
Make-up air / ventilation	Does the boiler room have required make-up air?		
Nameplate	Is the nameplate placed on the boiler?		
Electric installation and regulation			
Power supply	Check the electrical connection? (terminal box)		
	Check the ratings of the fuses.		
Settings-Boiler control unit	Are the settings of the boiler control unit according to the installation manual?		
Settings-Heating controller (if used)	Set the parameters, the heating circuit program and domestic hot water program.		
Boiler sensor	Securing location and connection		
Hydronic Connection			
Circuit pumps	Check the switch on temperature (min. 140°F) for boiler controlled pump (Parameter P 281).		
Low Water Cut Off	Is a low water cut off installed? (terminal box)		
	Test low water device		
Boiler connection	Is the pellet boiler correctly connected		
	Is the hydronic system free of air?		
	Is the system filled up with water? Check the pressure.		
Safety systems			
Fire protection - ball valve	Check the function?		
Safety temp. sensor	Check the installation and explain the function. Securing location and connection		
Negativ draft control	Check the function.		
Safety valve	Is a safety valve installed?		
Emergency stop switch	Is there an emergency stop switch?		
Fire extinguisher	Is there a fire extinguisher?		
Instruction			
Heating-up	Explanation of functions, malfunctions and maintenance to the customer.		
Heating controller	Explanation of the heating controller.		

Operating manual	Explanation of the operating and maintenance regulations to the customer.		
Maintenance contract	Notice to the legal regulations;		

Date:_____

Signature authorizied installer: **Signature customer:**

_____ _____

The customer confirmes that the installer has shown how to operate the boiler, empty the ash box and how to tell if the storage room or FleXILO is requiring more pellets as well as the need to empty the storage unit yearly.

12.2 Appendix G of CAN/CSA-B365–M91

Functioning of safety and operating controls
This Annex is not a mandatory part of this Standard, but is written in mandatory language to accommodate its adaption by anyone wishing to do so.

The safety and operating controls shall function within the limits specified by the manufacturer for the type of equipment. The following test shall be performed:

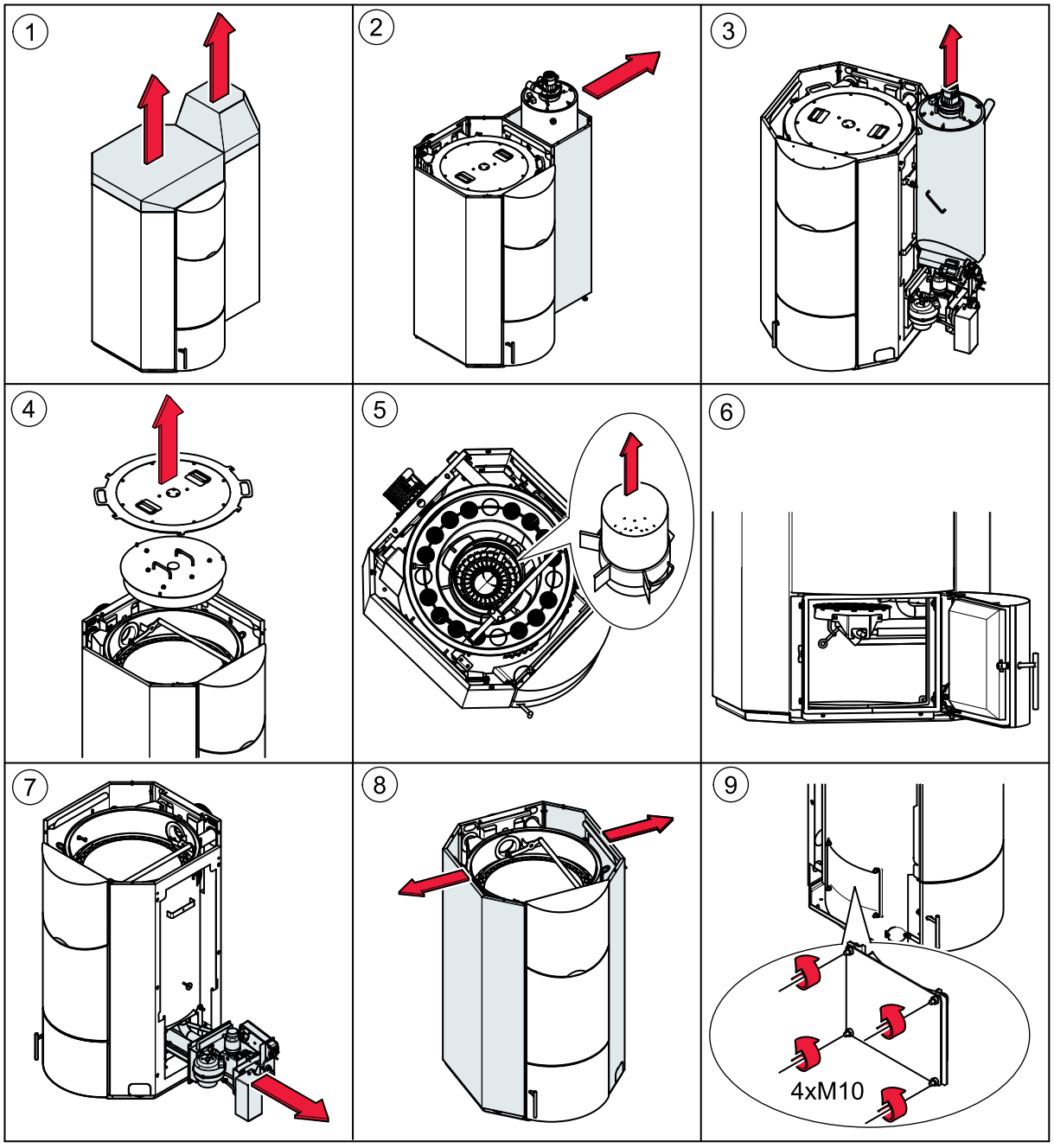
1. Check the operation of the automatic fuel_feeding interrupt device at each entrance to the floor space within which the fuel-feeding device is installed.
2. Check that when the low water level control on steam and hot water boilers is operated to indicate a low water level, the automatic fuel-feed is interrupted.
3. Check that when the excessive pressure control on steam and hot water boilers is operated as in an excessive pressure situation, the automatic fuel-feed is interrupted.
4. Check that when the excessive water temperature control on steam and hot water boilers is operated to indicate excessive water temperature, the automatic fuel-feed is interrupted and, if appropiate, that one or more zone control valves open.
5. Check that if the temperature exceeds 200°F in a furnace supply plenum on hot air furnaces, the automatic fuel-feed is interrupted.
6. Check that if there is a failure of the fan providing combustion air, the automatic fuel-feed is interrupted.
7. Check that if there is a failure of the combustion air supply control mechanism to remain fully open, the automatic fuel-feed is interrupted.
8. Check that when the hot water circulating pump manual disconnect switch is opened, the automatic fuel-feed is interrupted.
9. Check that if there is a shutdown or failure of the mechanical flue-gas exhauster, the automatic fuel-feed is interrupted.
10. Check that if there is a failure in the flue gas flow, the automatic fuel-feed is interrupted, or the combustion air supply is shut off in manually fuelled appliances.
11. Check for the proper operation of the minimum fire maintenance controls and system or, if applicable, of the automatic ignition system.
12. Check for the proper operation of the controls used for normal automatic fuel-feeding.
13. Check the operation of any other controls supplied on the appliance by the manufacturer, or required by the authority having jurisdiction.

12.3 Modifying the burner

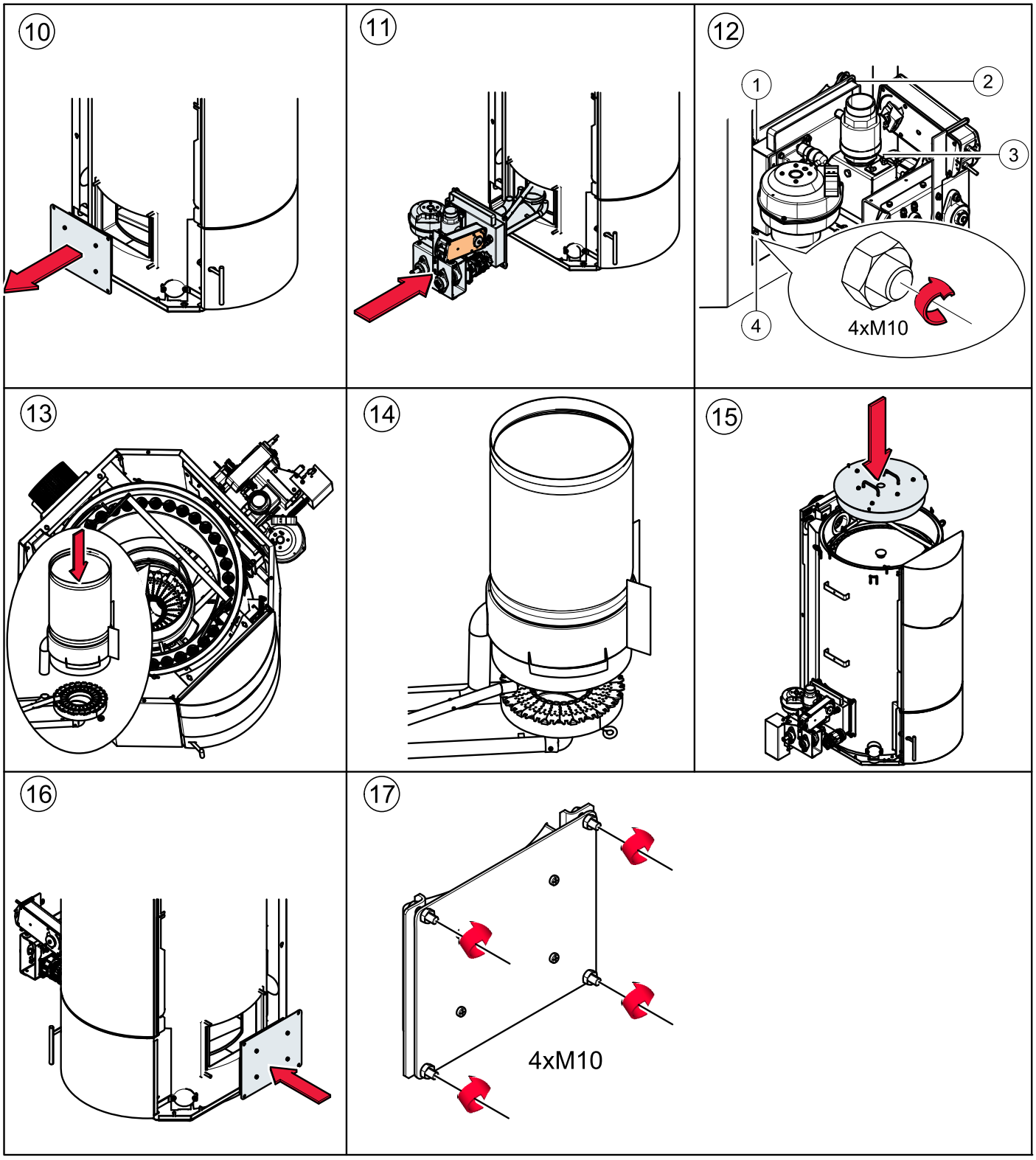
The pellet boiler is configured symmetrically. If required, you can remove the burner from the right-hand side (as shipped) and reinstall it on the left.

1. Dismantle the casing, hopper, combustion chamber lid, flame tube, burner and burner plug.
2. Modify the burner on the left.
3. Route cables through cutouts to the boiler controller and connect up the plug.

12.3.1 Dismantling the casing, hopper, combustion chamber lid, flame tube and burner

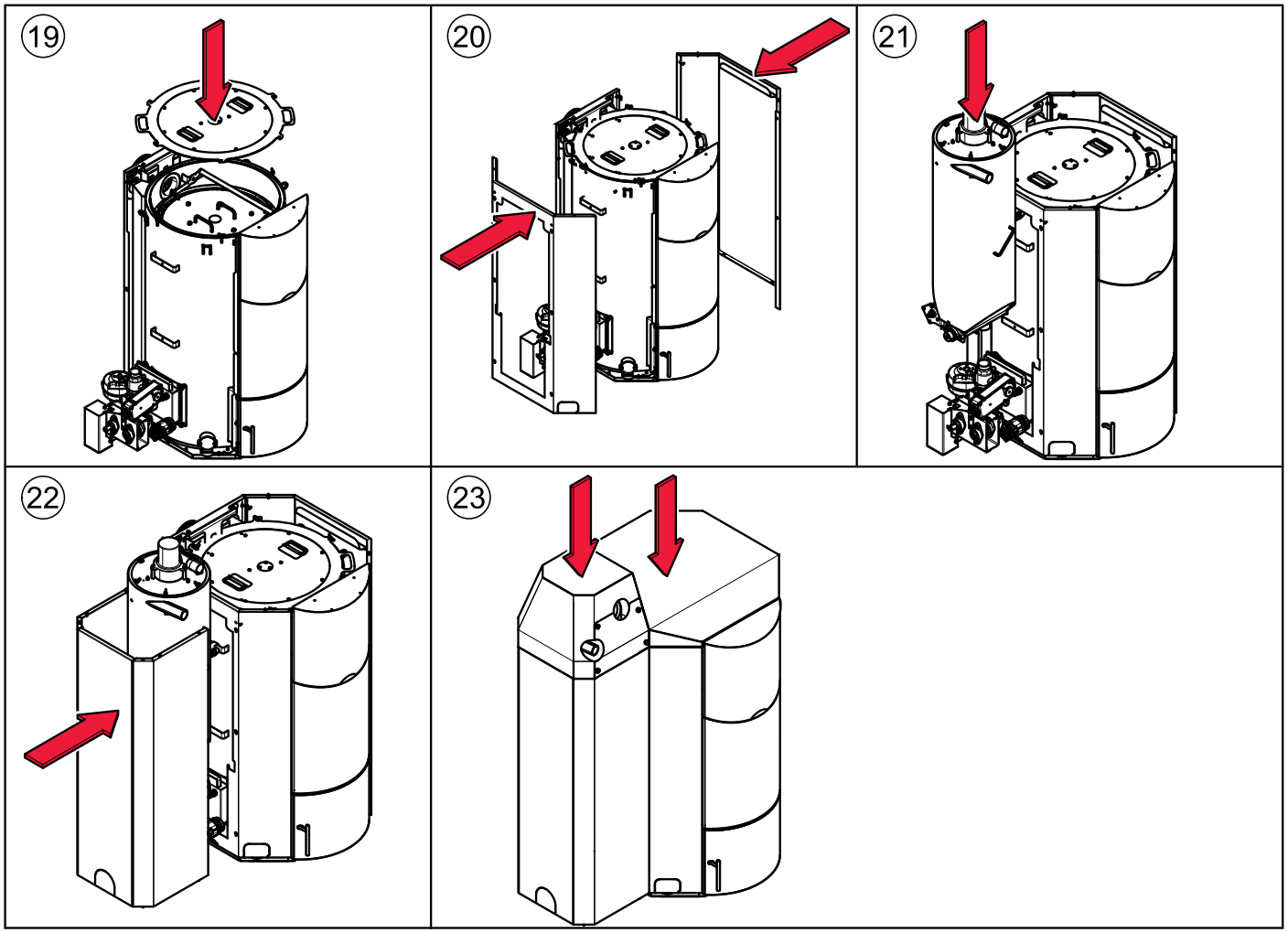


12.3.2 Modify the burner on the left



Note:
Do not tighten too firm, otherwise the dummy cover could become leakly.

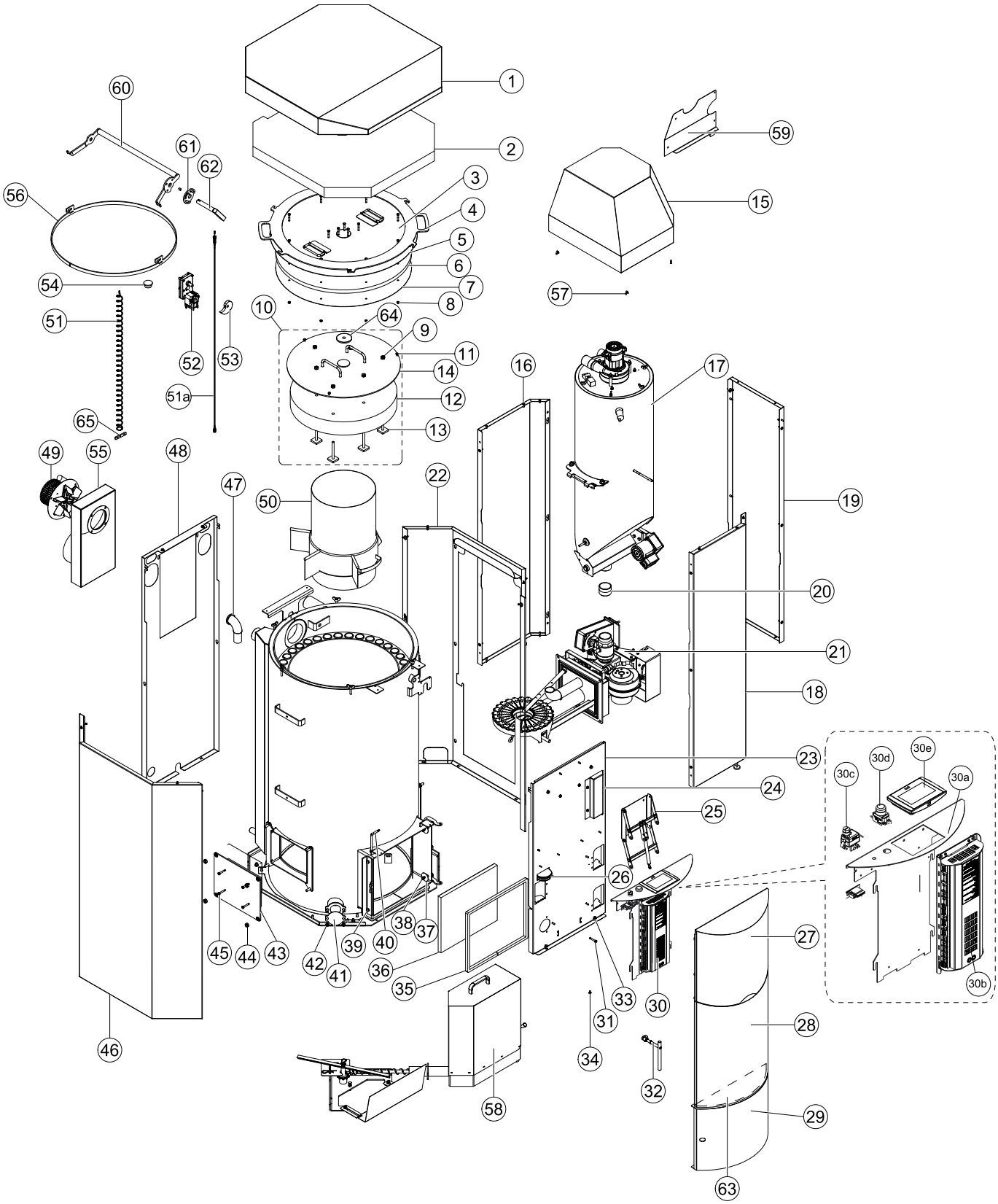
12.3.3 Reassembling the pellet boiler after modifying the burner



12.4 Parts list

12.4.1 AutoPellet PES 36-56

Pos.	Article number	Pos.	Article number	Pos.	Article number
1	PE356	25a	PE348	43	PE188
2	PE408	25b	PE349	44	121234 / 121029
3	121259	25c	PE359	45	121379
4	PE199-1	26	24155 / 24157 / 121198 / 24315	46	PE352
5	PE199	27	PE3501.1	47	PE295
6	PE411	28	PE120 (B, G, R)	48	PE357
7	PE431	29	PE121 (B, G, R)	49	E1249
8	121347	30	E1412	50	B174
9	121373	30a	PE564	51	PE363
10	PE374	30b	E1411	52	E1204
11	121034	30c	E1380	52a	E1186
12	PE410	30d	E1238	53	PE142
13	PE466	30e	E1073	54	PE296
14	PE374.1	31	121379	55	PE540
15	PE260	32	PE191	56	PE486
16	121381	33	121378	57	121380
17	041916	34	121377	58	PEASCH RE – LI / 36 – 56
18	PE353	35	PE160	59	PE467 / 121327
19	PE355	36	PE176	60	PE485
20	121123	37	121375	61	PE488
21	B0056E	38	121039	62	PE487
22	PE351	39	121042	63	PE419
23	PE354	40	24169	64	PE264.1
24	PE358	41	PE416		
25	PE379	42	121039 / 121038		


1
2
3
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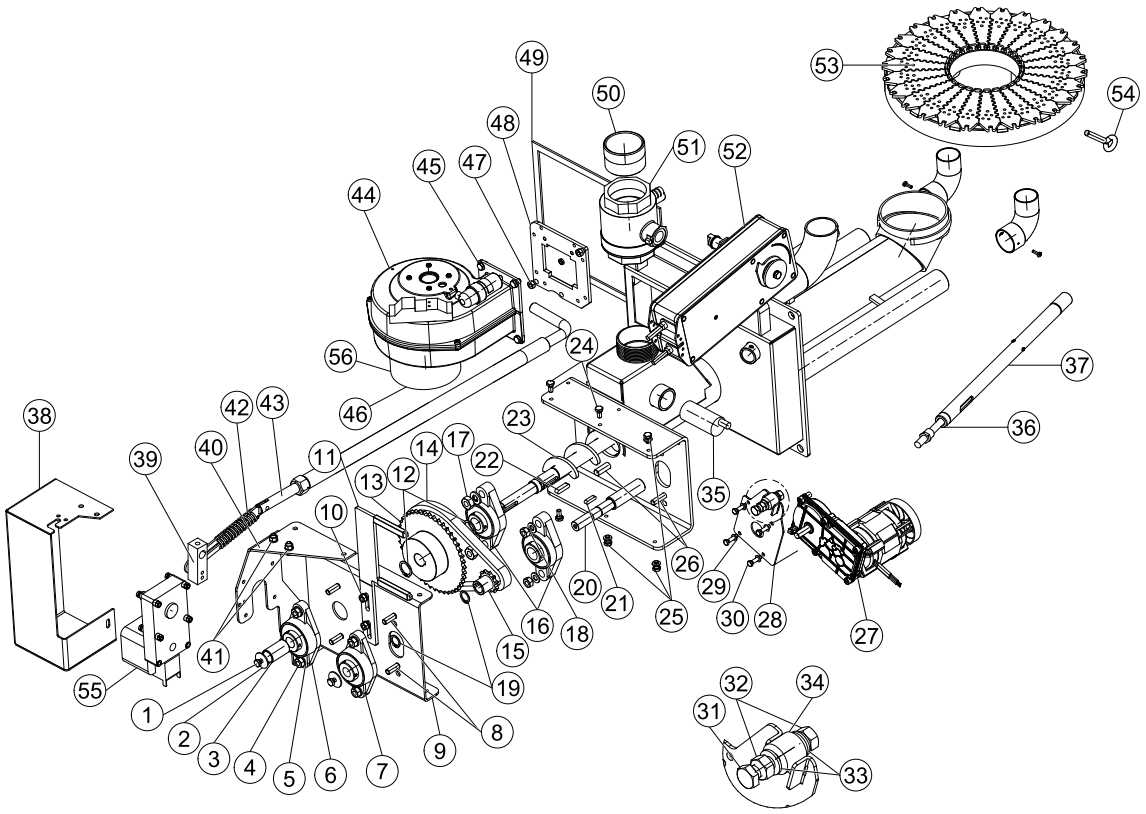
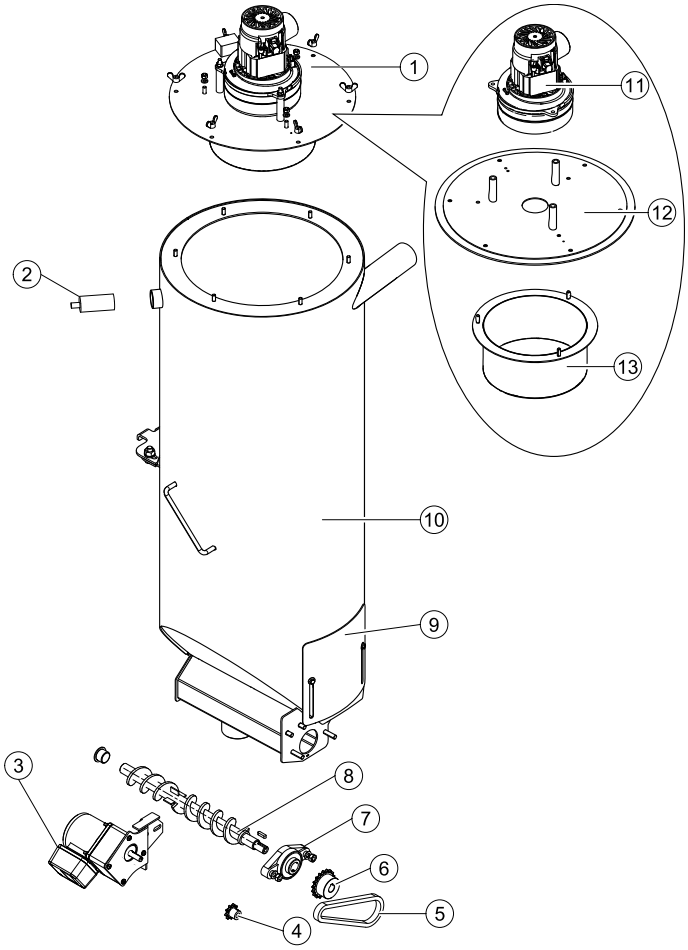
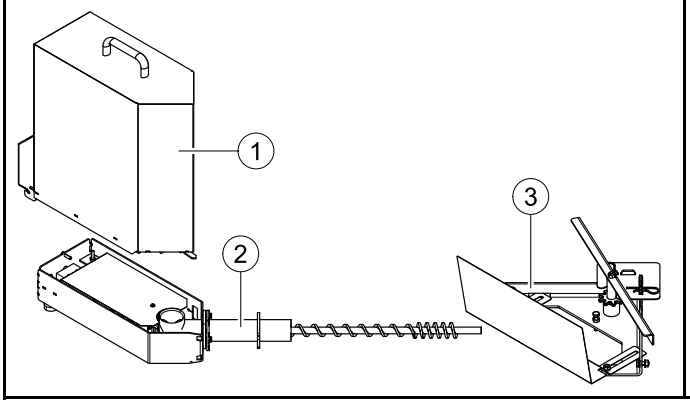
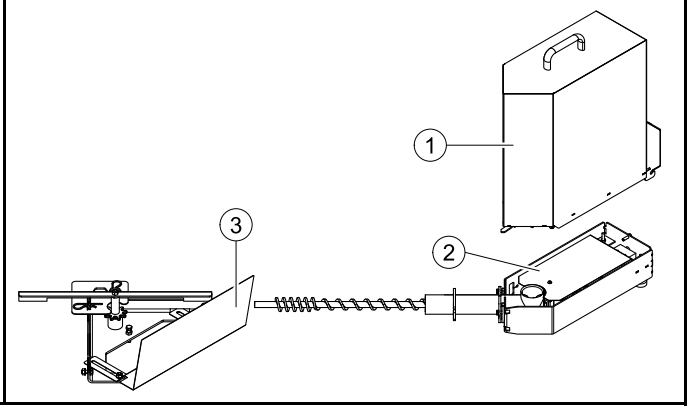
B0036 – Burner					
1	121041	20	B172	39	B183
2	121058	21	121197	40	B181
3	B150	22	121023	41	121034 / 121037 / 121082
4	121039	23	B190	42	B184 / B216
5	121038	24	121041	43	B185
6	121011	25	121037	44	E1005
7	121195	26	121079	45	121041
8	121051	27	E1306 / E1002.1	46	B202
9	B179	28	B191	47	121082
10	121082 / 121037	29	121026	48	B148
11	B129	30	121040	49	B152
12	121075	31	121185	50	B132
13	121193	32	121039	51	B144
14	121194	33	121038	52	E1413E
15	121192	34	B113	53	B213
16	121010	35	E1059	54	121284
17	121083 / 121029	36	E1004	55	E1204 / E1304
18	121039 / 121038	37	B176	56	B180
19	121196	38	B182		



041916 – Hopper			
1	E1368	6	121213
2	E1138	7	121010
3	E1197	8	SZB56
4	121241	9	041911
5	121240	10	041910



PEASCHRE56

PEASCHLI 56- Ashbox	PEASCHRE 56- Ashbox
	

1	PE442	3	PE373		PE436
2a	PE440	4	PE453		121296
2b	PE437		PE347		PE292

12.5 Technical data

Boiler – Type		PE(S) 12	PE(S) 15	PE(S) 20	PE(S) 25	PE(S) 32	PES 36	PES 48	PES 56
Boiler-rated power	BTU/hr	41,000	51,000	68,300	85,300	109,500	123,000	164,000	191,000
	kW	12	15	20	25	32	36	48	56
Boiler-partial load	BTU/hr	11.601	17.061	20.473	27.297	34.121	37.534	51.182	58.006
	kW	3,4	5	6	8	10	11	15	17
Measurements									
Width - total (B)	**Inch**	44 1/2	44 1/2	44 1/2	46 3/4	46 3/4	51	51	51
	mm	1.130	1.130	1.130	1.186	1.186	1.297	1.297	1.297
Width - boiler (C)	**Inch**	27 1/2	27 1/2	27 1/2	29 3/4	29 3/4	34	34	34
	mm	700	700	700	756	756	862	862	862
Height - boiler (H)	**Inch**	43	43	43	51	51	61	61	61
	mm	1.100	1.100	1.100	1.300	1.300	1.555	1.555	1.555
Height - vacuum system execu-tion (D)	**Inch**	55	55	55	63	63	73	73	73
	mm	1.400	1.400	1.400	1.600	1.600	1.855	1.855	1.855
Height - filling unit (F)	**Inch**	12	12	12	12	12	12	12	12
	mm	300	300	300	300	300	300	300	300
Depth - boiler (T)	**Inch**	32	32	32	34 1/4	34 1/4	39	39	39
	mm	814	814	814	870	870	990	990	990
Depth - burner casing (V)	**Inch**	20	20	20	20	20	20	20	20
	mm	508	508	508	508	508	508	508	508
Flow/return - dimensions	**Inch**	1	1	1	5/4	5/4	2	2	2
Flow/return - height of con-nection (A)	**Inch**	35 3/4	35 3/4	35 3/4	43 3/4	43 3/4	52	52	52
	mm	905	905	905	1.110	1.110	1.320	1.320	1.320
Flue size - diameter	**Inch**	5	5	5	6	6	7	7	7
	mm	130	130	130	150	150	180	180	180
Flue - height of connection (E)	**Inch**	25 1/2	25 1/2	25 1/2	33 1/4	33 1/4	41	41	41
	mm	645	645	645	844	844	1.040	1.040	1.040
Overall Weight	**Lb**	631	631	631	756	756	1.120	1.120	1.120
	kg	286	286	286	343	343	508	508	508
Boiler Body Weight	**Lb**	529	529	529	664	664	930	930	930
	kg	240	240	240	301	301	422	422	422
Efficiency rated power	**%**	85,4	85,6	85,5	84,9	84,5	85,3	85,4	85,9
Efficiency partial power	**%**	85,1	84,3	84,2	84,2	84,3	84,1	84,1	84,1
Water capacity	**Gal**	15,0	15,0	15,0	23,6	23,6	30,6	30,6	30,6
	l	66,0	66,0	66,0	104,0	104,0	135,0	135,0	135,0
Flue gas area									

Boiler – Type		PE(S) 12	PE(S) 15	PE(S) 20	PE(S) 25	PE(S) 32	PES 36	PES 48	PES 56
Fire vault temperature	°F	1652 - 2012							
	°C	900 - 1100							
Fire vault pressure	Inch WC	-0.14							
	mbar	-.35							
Flue gas temperature rated power (Flue gas temperature can be adjusted)	°F	320							
	°C	160							
Flue gas temperature partial load (Flue gas temperature can be adjusted)	°F	212							
	°C	100							
Flue gas inertia current rated power	Lb/hr	49,60	62,17	82,89	99,43	115,96	149,25	198,85	231,92
	kg/h	22,50	28,20	37,60	45,10	52,60	67,70	90,20	105,20
Flue gas inertia current partial load	Lb/hr	14,11	20,72	24,91	29,76	35,71	45,64	62,17	70,33
	kg/h	6,40	9,40	11,30	13,50	16,20	20,70	28,20	31,90
Flue gas volume rated power	Cft/hr	918	1.232	1.642	1.971	2.627	2.956	3.941	4.598
	m^3/h	26	35	47	56	74	84	112	130
Flue gas volume partial load at flue gas temperature	Cft/hr	240	353	424	509	607	777	1.059	1.204
	m^3/h	7	10	12	14	17	22	30	34
Chimney diameter	according to chimney calculation								
Chimney construction	steel or ceramic lined, withstand humidity								
Electrical connection	USA and Canada	208 to 240 VAC, single phase, 60 Hz, 15 amp dedicated circuit.							
Water area									
Water resistance at 10K	In WC	38,22	60,22	88,32	114,02	150,95	15,62	20,84	24,29
	mbar	95,20	150,00	220,00	284,00	376,00	38,90	51,90	60,50
Water resistance at 20K	In WC	9,72	15,26	22,08	28,91	38,14	4,18	5,58	6,50
	mbar	24,20	38,00	55,00	72,00	95,00	10,40	13,90	16,20
Boiler temperature	°F	149 - 194							
	°C	65 - 90							
Boiler input temperature minimum	°F	131							
	°C	55							
Operating pressure maximum	psi	50							
	bar	3							
Test pressure	psi	67							
	bar	4,60							

Boiler – Type		**PE(S) 12**	**PE(S) 15**	**PE(S) 20**	**PE(S) 25**	**PE(S) 32**	**PES 36**	**PES 48**	**PES 56**
Flue gas volume rated power at flue gas temperature	**Cft/hr**	1.010,0	1.327,8	1.772,8	2.231,9	2.874,6	3.217,2	4.262,5	4.944,1
	m^3/h	28,6	37,6	50,2	63,2	81,4	91,1	120,7	140,0
Flue gas volume partial load at flue gas temperature	**Cft/hr**	243,7	384,9	459,1	614,5	769,9	847,6	1.165,4	1.313,7
	m^3/h	6,9	10,9	13,0	17,4	21,8	24,0	33,0	37,2
Fuel	**USA**	According to PFI Premium Standards or EnPlus -A1 pellets							
	Europe	According to EN14961–2 Standards (A1 Class)							
Colorific value	**BTU/lbs**	> 7.200							
	MJ/kg	>16,5							
Bulk density	**Lb/cft**	> 40,00							
	kg/m^3	>600							
Water content	**Mass%**	<10							
Ash content	**Mass%**	<1							
Lenght	**Inch**	1 1/4 – 1 1/2							
	mm	3,15 – 40							
Diameter	**Inch**	1/4 – 5/16							
	mm	6,00 – 8,00							
Fine material	**Mass%**	<0.5							
	Mass%	<1%							
Ash melting point	**°F**	> 2.200							
	°C	> 1.200							
Contents	**USA**	untreated wood							
	Europe	stemwood or chemically untreated wood							
Components									
Internal ash pan volume	**Gal**	5,68			6,81		-		
	lb	25			30		-		
External ash box volume	**Gal**	4,54					5,675		
	lb	20					25		
Main Drive	**W**	40							
Drive Motor	**W**	250/370							
Suction Turbine	**W**	1200							
Combustion Air Blower	**W**	83							
Suction Fan Blower	**W**	32							
Electrical Ignition	**W**	250							
Cleaning Motor	**W**	40							

Boiler – Type		PE(S) 12	PE(S) 15	PE(S) 20	PE(S) 25	PE(S) 32	PES 36	PES 48	PES 56
Motor External Ash Box	**W**	40							
Fire protection motor	**W**	5							

The data are values of the test measurement and can vary from locally measured values

WB Federal Institute of Agricultural Engineering Wieselburg
Address: A-3250 Wieselburg, Rottenhauserstraße 1; Tel.: +43-7416-52175-0

Note:
Test reports are available

12.6 Pellet boiler cautionary markings

Labeling 60x30

 BEFORE OPENING TURN OFF THE MAIN SWITCH	TO START THE SYSTEM PRESS THE GREEN ON/OFF BUTTON	THE CONTAINER CAN BE TAKEN DOWN ONLY BY LOOSENING **THE YELLOW LOCKING SCREW** 
CAUTION DO NOT ALTER THIS EQUIPMENT IN ANY WAY LOSS OF WARRANTY	**CAUTION** POWER SOURCE NOT CONTROLLED BY SUCTION TURBINES MAIN DISCONNECT	**CAUTION** POWER ORGINATED FROM A SOURCE OF POWER OTHER THAN THIS MOTOR
CAUTION DO NOT REMOVE THE SNAP RING! LOSS OF WARRANTY	**CAUTION** FOR USE WITH WOOD PELLET FUEL ONLY LOSS OF WARRANTY	**CAUTION** VACUUM SUCTION SYSTEMS: REMOVE THE PROTECTIVE CAP FROM THE BALL VALVE

Labeling 99x34

DANGER TO AVOID INJURY FROM MOVING PARTS, SHUT OFF THE MAIN CONTROLLER BEFORE REMOVING THIS COVER	**CONTACT** LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA
DANGER **KEEP** VIEWING AND ASH REMOVAL DOORS TIGHTLY CLOSED DURING OPERATION!	**CAUTION** DO NOT CONNECT THIS UNIT TO A CHIMNEY FUEL SERVING ANOTHER APPLIANCE. **SEE LOCAL RESTRICTIONS!**
CAUTION INSTALL AND USE ONLY IN ACCORDANCE WITH INSTALLATION- AND OPERATING INSTRUCTIONS! REFER TO OWNERS MANUAL	**FORWARD** **WATER QUALITY ACC. TO VDI 2035 STANDARD** (THE MEDIUM HAS TO BE FREE FROM AIR AND MUD)
DANGER **MOVING PARTS CAUSE INJURY! DO NOT OPERATE WITH REMOVED COVERING!**	**RETURN** **WATER QUALITY ACC. TO VDI 2035 STANDARD** (THE MEDIUM HAS TO BE FREE FROM AIR AND MUD)

Labeling 105x74

IN THE CASE OF A"RUN-AWAY" FIRE:

- NEVER PUT YOUR SELF AT RISK OF FATAL INJURY. YOUR SAFETY MUST ALWAYS TAKE HIGHEST PRIORITY!
- SWITCH OFF THE HEATING SYSTEM
- EXIT THE BUILDING AND CALL YOUR SERVICE CONTRACTOR AND LOCAL FIRE DEPARTMENT

⚠ CAUTION

HOT SURFACES

- DO NOT TOUCH DURING OPERATION!
- KEEP CHILDREN AWAY
- KEEP CLOTHING AND COMBUSTIBLE MATERIALS AWAY FROM MARKED CLEARANCES.
- MAXIMUM DRAFT MARKED ON NAMEPLATE

⚠ CAUTION

IN THE CASE OF A CONNECTING BOILER CONTACT A SERVICE TECHNICIAN FOR COMPLIANCE INFORMATION BEFORE CONNECTING!
MAY BE CONNECTED TO AN EXISTING BOILER SYSTEM

THE FOLLOWING UNIT IS APPROVED FOR CONNECTING WITH THE AUTOPELLET SYSTEM:

MODEL NUMBER CONNECTED UNIT: _____
ITEM NUMBER CONNECTED UNIT:_____

⚠ WARNING

RISK OF FIRE!

- DO NOT OPERATE WHILE FLUE DRAFT EXCEEDS -.11 INCHES WC!
- DO NOT OPERATE WITH DOORS OPEN!
- DO NOT STORE FUEL OR OTHER COMBUSTIBLE MATERIAL WITHIN MARKED INSTALLATION CLEARANCES!
- INSPECT AND CLEAN FLUE AND CHIMNEY REGULARLY!
- DO NOT USE CHEMICALS TO START UNIT FIRING
- DO NOT BURN GARBAGE, GASOLINE, FUEL OILS OR OTHER FLAMMABLE LIQUIDS OR MATERIALS

⚠ DANGER

HOT SURFACES AND MOVING PARTS MAY CAUSE INJURY!

RISK OF FIRE OR EXPLOSION – DO NOT BURN GARBAGE, GASOLINE, FUEL OILS OR OTHER FLAMMABLE LIQUIDS OR MATERIALS

⚠ CAUTION

UNSAFE TO ADJUST FLUE DRAFT HIGHER THAN .11 INCHES WATER COLUMN

- MIN DRAFT @ LOW FIRE -.02 INCHES WC
- MIN DRAFT @ HIGH FIRE -.04 INCHES WC
- MAX DRAFT -.11 INCHES WC

⚠ CAUTION

THE HEAT EXCHANGER, FLUE PIPE AND CHIMNEY MUST BE CLEANED REGURARLY TO REMOVE ACCUMULATED CREOSOTE AND ASH, ENSURE THAT THE HEAT EXCHANGER, FLUE PIPE, AND CHIMNEY ARE CLEANED AT THE END OF THE HEATING SEASON TO MINIMIZE CORROSION DURING THE SUMMER MONTHS, THE APPLIANCE FLUE PIPE AND CHIMNEY MUST BE IN GOOD CONDITION.
THESE INSTRUCTIONS ALSO APPLY TO A DRAFT INDUCER IF USED.

LOSS OF ELECTRICAL POWER

NO DANGER
PELLET BOILER COOLS DOWN AUTOMATICALLY

INSPECT AND **CLEAN**
EXHAUST VENTING SYSTEM FREQUENTLY

Tested & Listed By O-TL Portland Oregon USA
C US
OMNI-Test Laboratories, Inc.
Report No. 0444PB004S

MESys

Maine Energy Systems, LLC
8 Airport Road, Bethel, Maine 04217
Voice: 207.824.6749 Fax: 207.824.4816

Type: Pellematic56	**S/N:** XUT xx	**CATALOG No.:** PES56
Date of manuf.: 02/2018	**Rated heat power:** 191000BTU/hr	
Tested to: UL 2523-2013. CSA B366.1-2011 EN303-5		
Manufactured By: MESys LLC, Bethel, Maine	**FUEL:** WOOD PELLETS	
U.S. ENVIRONMENTAL PROTECTION AGENCY certified to comply with the 2020 particulate emissions standard using wood pellets.		
This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owners manual.		
Particulate Emissions, 0.045lb./million btu - 0.904grams/hr. **CO emissions**, 0.027grams/min. **Annual Efficiency,** (HHV) 86.3%		
Water Capacity: 30.6 Gallons	**Operating Temp:** 194 °F	
Max Operating Pressure: 3 BAR / 43.5 PSI / 1204 inches WC		
Chimney	Approved factory built stainless steel or tile-lined masonry	
MAX DRAFT: 0.11 inches WC **MIN DRAFT: 0.04 inches WC**		
Diameter: 7 INCH	**Electrical Rating:** 220 V, 60 Hz, 14 A, 1760 W	
FLOORING: COMBUSTIBLE FLOORS CAN BE USED WITH A NON-COMBUSTIBLE SHIELD. MINIMUM CLEARANCES ARE 18IN/457MM IN THE FRONT AND 8IN / 203MM ON EACH SIDE.		

PARTS	**Fan Flue Gas:** E1249A	**Controller Display:** E1330
Motor Ash Box: E1302	**Motor Flame Return Protection:** E1413A	
Motor Cleaning Device: E1054	**Motor Hopper:** E1197	
Motor Burner Plate Cleaning: E1204	**Suction Turbine:** E1205	
Motor Burner Screw: E1306	**Low Water Cut Off:** Safgard 550SV	
Controller Board: E1412	**Pressure-Relief Valve:** Watts Co335M1	
Motor Auger Screw: FKAEM 150 / FKAE-S	**Fan Burner:** E1005S	

Author & Manufacturer

MAINE ENERGY SYSTEMS LLC
8 Airport Road — P.O. Box 547 Bethel
Maine 04217

E-Mail: info@maineenergysystems.com
www.maineenergysystems.com