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## Testing a pellet boiler - Mini Q (4 appendices)

### The assignment

Testing in accordance with European Standard EN 303-5 section 5.7-5.14.

### Item for testing

The boiler – a Mini Q with a Bioline 20 pellet burner, both manufactured by Ecotec värmesystem AB, Skene, Sweden, arrived at SP on 29th august 2007. The boiler was in new condition

### Technical description

The fuel is stored in an external hopper and fed to the burner by a feed screw and delivers the pellets through a tightly closed cell feeder to a small internal hopper in the burner. The pellet are fed forward by a internal feed screw into the burner pot. Combustion air is supplied by a fan. The burner is fitted with an electrical ignition that starts the burner when switched on from cold. The burner has an own temperature sensor in the electronics that is connected to a plunge pipe on the boiler. When the set temperature has been reached, the boiler reduces its output to a 'maintenance' level. When the temperature drops 2°C the burner goes back to normal operation. The pellet burner is designed with two different safety systems to prevent back burning. One of the safety system is a temperature limiter switch located on the internal feed screw and the other safety system is the tightly closed cell feeder.

The boiler has a water content of 55 litres. The boiler has 18 convection tubes. Nine of the tubes are fitted with turbulators.

### Informative material supplied

Manual:

- Operation and maintains manual pellet boiler Mini Q.
- Operation and maintains manual pellet burner Bioline 20

Drawings:

Drawing number	Date
<u>Boiler</u>	
KP 25.01.00	-
<u>Burner</u>	
A4-000	2003-04-07
A4-001	2003-03-27

### SP Technical Research Institute of Sweden

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### Test arrangement

The pellet boiler was connected to a test rig consisting of a circulation pump, flow meter, valves and heat exchanger, which enabled the circulation flow and the supply and return temperatures to be maintained at the desired values.

The chimney diameter was 130 mm, with a height of about 6 m above floor level.

### Test procedure

This test report relates only to the actual item tested.

Testing was carried out at/by SP's Energy Technology Department during September 2007, in accordance with European Standard EN 303-5, section 5.7-5.14 'Heating Boilers - Part 5 - Solid-fuel-fired Heating Boilers, Manually and Automatically Fired, with Nominal Output Powers up to 300 kW - Terminology, Requirements, Testing and Marking'.

The emission values were measured continuously during the test period.

The fuel used for the tests was 8 mm wood pellets (see appendix 3).

The following parameters were measured and/or calculated (as appropriate) every 15 second (mean value from measurement every 5 second):

- Flow and return temperatures
- Circulation flow rate through the boiler
- Ambient temperature
- Flue gas temperature
- Boiler temperature
- Draught
- CO<sub>2</sub> concentration
- CO concentration
- O<sub>2</sub> concentration
- THC concentration (Total Hydro Carbon)
- NO<sub>x</sub> concentration
- Heat output

Dust concentration was measured intermittently at nominal heat output.

The flow and return temperatures were measured directly at the boiler connections. The flue gas temperature was measured at a distance of about two chimney diameters from the connection of the flue gas duct.

## Results

The table below shows a summary of the results. For complete results see appendix 2.

	Unit	Nominal heat output	Minimum heat output
Efficiency	%	90	90
Dust concentration	mg/m <sup>3</sup> <sub>n</sub> dry gas at 10 % O <sub>2</sub>	34	-
Dust concentration	mg/m <sup>3</sup> <sub>n</sub> dry gas at 13 % O <sub>2</sub>	25	-
CO	mg/m <sup>3</sup> <sub>n</sub> dry gas at 10 % O <sub>2</sub>	159	429
CO	mg/m <sup>3</sup> <sub>n</sub> dry gas at 13 % O <sub>2</sub>	115	311
OGC	mg/m <sup>3</sup> <sub>n</sub> dry gas at 10 % O <sub>2</sub>	7	6
NO <sub>x</sub> (as NO <sub>2</sub> )	mg/m <sup>3</sup> <sub>n</sub> dry gas at 10 % O <sub>2</sub>	137	-

## Comments

The boiler – a Mini Q with a Bioline 20 pellet burner, both manufactured by Ecotec värmesystem AB, Skene, Sweden - complies with the Class 3 emission requirements for CO, OGC and dust in accordance with EN 303-5. The boiler also complies with the Class 3 requirements for efficiency.

**SP Sveriges Tekniska Forskningsinstitut**  
Energy Technology - Combustion and Aerosol Technology



Claes Tullin  
Technical Manager



Mathias Johansson  
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## Appendices

Appendix 1 Identification

Appendix 2 Results

Appendix 3 Test fuel specification

Appendix 4 Instrumentation and uncertainty of measurement

Appendix 1

**Identification**



Boiler

6201 - 00		Modell:	EcoTec värmesystem AB Sweden
	Typ: <i>A4</i>		
	Serienummer: <i>A4643115</i>		
	Anslutningsspänning: 220-240 V~ 50/60 Hz		
	Effekt: <i>15-20kW</i>	Tillv. år: <i>2006</i>	

Rating Plate burner

1-16-9001		EcoTec värmesystem AB Sweden	Hedbovägen 42 Box 2103 511 02 Skene, Sweden info@ecotec.net
	Typ: <b>MiniQ</b>		
	Serienummer:		Tillv. år:
	Vattenvolym: <b>55 liter</b>	Max övertryck: <b>1,5 bar</b>	Kvalitetsklass: <b>3</b>
	Max drifttemperatur: <b>95° C</b>	Max effekt: <b>20kW</b>	<b>CE</b>
	Godkännande: <b>EN 303-5</b>		

Rating plate boiler\*

\*The boiler didn't had any rating plate at arrival, the manufacturer sent one.