

## **PROTOKÓŁ Z BADAŃ**

### **39-11431/T**

**Produkt:** Kocioł ciepłej wody użytkowej na paliwo stałe (pellet drzewny - C1) z automatycznym zasilaniem paliwa

**Oznaczenie typu:** EEl Pellets 8kW, EEl Pellets 10kW

**Klient:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Gizycko  
Poland

**Producent:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Gizycko  
Poland

**Osoba zatwierdzająca:** Inż. Stanislav Buchta

**Data wydania:** 2018-03-05

**Rozdzielnik:** 1 kopia dla Instytutu Badań Inżynieryjnych  
1 kopia dla Klienta

Niniejszy dokument może być powielany w całości bez pisemnej zgody Instytutu Badań Inżynieryjnych.

Kopie częściowe podlegają dopuszczeniu.

Wyniki badań i testów odnoszą się wyłącznie do badanych przedmiotów.

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Badania zostały wykonane na podstawie Zlecenia nr B-61427 z dnia 2018-01-25 (wpłynięcie dnia 2018-01-19) oraz Umowy nr B-61427/39

## **I Opis produktu, przeznaczenie i sposób zastosowania**

Kocioł ciepłej wody użytkowej na paliwo stałe (pellet drzewny - C1) typu EEI Pellets z automatycznym zasilaniem paliwa przeznaczony jest do ogrzewania domostw i podobnych obiektów. Kocioł opracowany jest do spalania pelletu drzewnego - C1. Zespół kotła zawiera korpus kotła, palnik kotła, podajnik paliwa, komorę paliwową (zbiornik paliwa). Korpus kotła wyposażony jest w automatyczny mechanizm oczyszczania kanałów spalania. Przedmiotowy kocioł wykonany jest ze stali i posiada cylindryczny kształt. Kocioł izolowany jest wełną mineralną.

Szczegółowe opisy poszczególnych zespołów urządzenia zawarte są w dokumentacji technicznej załączonej do Zleceń 39-10971/2 i 39-11431.

## **II Badana próbka**

Wersje wydajnościowe kotła będące przedmiotem badań:

(tabela 1)

| Wersja wydajnościowa kotła | Wydajność cieplna | Numer próbki      | Miejsce testu              |
|----------------------------|-------------------|-------------------|----------------------------|
| EEI Pellets 8 kW           | 8.3 kW            | 0211.17.17392.000 | SZU, Hudcova 424/56b, Brno |
| EEI Pellets 10 kW          | 10 kW             |                   |                            |

Inspekcja wzrokowa, badania i ocena były prowadzone przez Inż. Pavel Fojtů, Inżyniera Badawczego, na stacji badawczej należącej do SZU w Brnie, w 04/ 2017 i 03/2018

.

Badania były przeprowadzone przy użyciu urządzeń pomiarowych i badawczych posiadających ważną kalibrację.

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### **III. Urządzenia pomiarowe i testujące**

| Nr  | Opis                                                  | Numer inwentaryzacyjny | Kalibracja ważna do              | Dokładność                                 |
|-----|-------------------------------------------------------|------------------------|----------------------------------|--------------------------------------------|
| 1.  | Analizator produktów spalania, Horiba, typ ENDA 680 P | 022394                 | kalibracja przed każdym pomiarem | patrz CRM 190/16<br>patrz CRM 103000414644 |
| 2.  | Maszyna ważąca                                        | 022331                 | 05/2018                          | patrz KL 6051-KL-H0184-16                  |
| 3.  | Indukcyjny przepływomierz                             | 022389-C/1             | 10/2017                          | patrz KL 6015-KL-P0446-13                  |
| 4.  | Zestaw pomiarów temperatury                           | 022399-D/8             | 11/2017                          | patrz KL 140074                            |
| 5.  | Wilgociomierz, termometr                              | 116258                 | 12/2018                          | patrz KL 10280/2015                        |
| 6.  | Barometr                                              | 112541                 | 01/2019                          | patrz KL 6013-KL-K0001-14                  |
| 7.  | Ciągomierz                                            | MaR11-Tah              | 05/2017                          | patrz KL 6013-KL-C0349-15                  |
| 8.  | Stoper                                                | 990760                 | 11/2017                          | patrz KL 2955E-12                          |
| 9.  | Gravimat SHC 501                                      | 022328                 | 04/2018                          | patrz KL 150046-150050                     |
| 10. | Waga analityczna Sartorius                            | 021682                 | 06/2017                          | patrz KL 24/KA - 15                        |
| 11. | Termometr elektroniczny                               | 116557                 | 03/2019                          | patrz KL 160066                            |
| 12. | Electrometr                                           | 022389-A/4             | 05/2025                          | patrz KL 039/15/E                          |
| 13. | Indukcyjny wodomierz                                  | 116320                 | 04/2018                          | patrz KL Q 0254/2012                       |
| 14. | Urządzenie ważące                                     | 022151                 | 02/2019                          | patrz 6051-KL-H0120-17                     |
| 15. | Urządzenie ważące                                     | 022211                 | 02/2019                          | patrz 6051-KL-H0333-17                     |
| 16. | Miarka                                                | ME477                  | 10/2017                          | patrz KL 7331/2012                         |

#### IV. Wyniki testów i oceny



| Nr | Wymóg                                                                                                          | Zastosowana norma, wymogi techniczne                                                           | Materiały źródłowe | Ocena Próby |
|----|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------|-------------|
| 1. | Próba wytrzymałości i szczelności zespołu pod ciśnieniem (T 001*)                                              | ČSN EN 303-5:2013<br>Art. 5.4, 5.4.1, 5.4.2                                                    | Str.<br>5          | +           |
| 2. | Próba spadku ciśnienia hydraulicznego (T 001 *)                                                                | ČSN EN 303-5:2013<br>Art. 4.2.4.9                                                              | Str.<br>6          | +           |
| 3. | Próba temperatury powierzchniowej (T 001*)                                                                     | ČSN EN 303-5:2013<br>Art. 5.12, 5.16.4, 4.3.6                                                  | Str.<br>7-9        | +           |
| 4. | Próba ciepła wyjściowego, wejściowego i wydajności (T 001*) Próba temperatury produktu spalania (T 001*)       | ČSN EN 303-5:2013<br>Art. 4.4.2, 4.4.3, 5.7, 5.8, 5.10<br>ČSN EN 303-5:2013<br>Art. 4.4.3      | Str.<br>10-14      | +           |
| 5. | Pobór energii elektrycznej (T 071*)                                                                            | ČSN EN 303-5:2013<br>Art. 5.8.5<br>ČSN EN 15456<br>Art. 5                                      | Str.<br>15-16      | +           |
| 6. | Próba wydajności spalania - emisje (T 001*)                                                                    | ČSN EN 303-5:2013<br>Art. 5.7.3, 5.7.4, 5.9, 5.10.4                                            | Str.<br>17 - 18    | +           |
| 7. | Próba ciepła wyjściowego, wejściowego i wydajności (T 001*)<br><br>Próba wydajności spalania - emisje (T 001*) | ČSN EN 303-5:2013<br>Załącznik C<br><br>Rozbieżność względem wersji austriackiej, C.2.2, C.2.3 | Str.<br>19 - 20    | +           |
|    |                                                                                                                | ČSN EN 303-5:2013 Załącznik C,<br><br>C.3 Rozbieżność względem wersji chorwackiej              | -                  | 0           |
|    |                                                                                                                | ČSN EN 303-5:2013 Załącznik C,<br><br>Rozbieżność względem wersji duńskiej, C.4.1, C.4.2       | Str.<br>21-22      | +           |

|    |                                                                                                                                                        |                                                                                                |                 |   |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------|---|
|    |                                                                                                                                                        | ČSN EN 303-5:2013 Załącznik C,<br>Rozbieżność względem wersji<br>niemieckiej, C.5.1, C.5.2     | Str.<br>23-24   | - |
|    |                                                                                                                                                        | ČSN EN 303-5:2013 Załącznik C<br>C.6 Rozbieżność względem wersji<br>szwajcarskiej              | Str.<br>25-26   | + |
|    |                                                                                                                                                        | ČSN EN 303-5:2013 Załącznik C<br>C.8 Rozbieżność względem wersji<br>włoskiej                   | -               | 0 |
| 8. | <b>Próba elementów sterowniczych,<br/>regulacyjnych i zabezpieczających<br/>(T 001*)</b><br><br><b>Próba wydajności spalania -<br/>emisje (T 001*)</b> | ČSN EN 303-5:2013<br>Art. 5.13, 5.14, 5.16.2, 5.16.3<br><br>ČSN EN 303-5:2013 Art. 5.9, 5.10.4 | Str.<br>27 - 29 | + |

Klasyfikacja:

- + Wymóg spełniony
- Wymóg nie spełniony
- 0 Nie dotyczy

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|                                                                                                                                                  |                                  |   |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---|--|
|                                                                                                                                                  |                                  | + |  |
| <b>Badania podczas produkcji</b><br>Každý kotel powinien zostać zbadany podczas produkcji, przy ciśnieniu próby wynoszącym minimalnie 1,43 x PS. | ČSN EN 303- 5:2013<br>Art. 5.4.2 | + |  |

**Data badania:** 2017-04-27

|                              |             |                     |                         |
|------------------------------|-------------|---------------------|-------------------------|
| <b>Warunki środowiskowe:</b> | 26.2 °C     | 25.1 %              | 98.31 kPa               |
|                              | temperatura | wilgotność względna | ciśnienie barometryczne |

| Maksymalne ciśnienie robocze [MPa] | Zalecane ciśnienie badania [MPa] | Zadane ciśnienie badania [MPa] | Medium badawcze | Doba zkoušky [min] |
|------------------------------------|----------------------------------|--------------------------------|-----------------|--------------------|
| 0.2                                | 0.4                              | 0.4                            | woda            | 30                 |

**Ocena po badaniu:** Podczas próby nie stwierdzono wystąpienia jakichkolwiek wycieków lub zauważalnego, nieodwracalnego odkształcenia.

|                        |        |                                       |
|------------------------|--------|---------------------------------------|
| Akredytowany nr próby: | T 001* | Tytuł próby:                          |
|                        |        | Próba spadku ciśnienia hydraulicznego |

Metoda badawcza: ČSN EN 303-5:2013  
Art. 4.2.4.9

Zbadana próbka: EEI Pellets 8kW, EEI Pellets 10kW

Zastosowane urządzenia pomiarowe: Rozdział III - Urządzenia pomiarowe i badawcze

**Wyniki oceny:**

| Wymóg                                                                                                                                                                                                                                                                                                                                                                                                                | Wskazanie<br>wymogu            | Ocena | Uwaga |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------|-------|
| <b>Wytrzymałość kotła po stronie wody</b><br><br>Wytrzymałości po stronie wody muszą zostać określone dla tych przepływów, które odpowiadają nominalnej wydajności cieplnej, przy dwóch deltach temperaturowych rzędu 10K i 20K pomiędzy złączami przepływowymi i powrotnymi kotła. Wyniki należy wykazać w milibarach dla każdego rozmiaru kotła oraz powinny one odpowiadać wartościom wskazanym przez producenta. | ČSN EN 303-5:2013 Art. 4.2.4.9 | +     |       |

Uwaga: + Spełnia

- Nie spełnia

0 Nie dotyczy

x Nie badano

**Wyniki pomiaru:** EEI Pellets 8 kW

| nr         | Q                                  | $\Delta P$ |
|------------|------------------------------------|------------|
| [-]        | [m <sup>3</sup> ·h <sup>-1</sup> ] | [mbar]     |
| delta 20 K | 0.357                              | 4.84       |
| delta 10 K | 0.714                              | 5.23       |

Uwaga: Data i warunki badania - patrz test nr T 001\* (test mocy zasilania, powrotu i sprawności).

**Wyniki pomiaru:** EEI Pellets 10 kW

| nr         | Q                                  | $\Delta P$ |
|------------|------------------------------------|------------|
| [-]        | [m <sup>3</sup> ·h <sup>-1</sup> ] | [mbar]     |
| delta 20 K | 0.430                              | 4.90       |
| delta 10 K | 0.860                              | 5.45       |

Uwaga: Data i warunki badania - patrz test nr T 001\* (test mocy zasilania, powrotu i sprawności).

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                      |   |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---|--|
| -45 K dla porcelany i podobnych materiałów;<br>-60 K dla plastików i podobnych materiałów;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |   |  |
| <b>Odporność na przewodność termiczną</b><br><br>Pomiar temperatury powinien być wykonany na powierzchni urządzenia zasilającego, w pobliżu linii paliwa, lecz przy zachowaniu maksymalnej odległości wynoszącej mniej niż 1 m względem kierunku zasilania od ścianki wewnętrznej komory spalania.<br><br>W przypadku kotłów z wbudowanym lejem, pomiar temperatury powinien być wykonany na powierzchni urządzenia zasilającego, w pobliżu wbudowanego leja, przy zachowaniu maksymalnej odległości wynoszącej mniej niż 1 m względem kierunku zasilania od ścianki wewnętrznej komory spalania. Ponadto, należy zmierzyć również najwyższą temperaturę powierzchniową leja. | ČSN EN 303-5:2013<br><br>Art. 5.16.4 | + |  |

| Średnie temperatury ścianek, drzwi i osłon kotła (°C): |                     |            |
|--------------------------------------------------------|---------------------|------------|
| Typ kotła                                              | EEI Pellets 8 kW    |            |
| Typ paliwa                                             | Pellet drzewny - C1 |            |
| Wydajność cieplna                                      | Nominalna           | Minimalna  |
| Data testu                                             | 2017-04-27          | 2017-04-26 |
| temperatura otoczenia (°C)                             | 26.6                | 26.3       |
| wilgotność (%)                                         | 26.0                | 26.1       |
| ciśnienie powietrza (kPa)                              | 98.27               | 97.75      |
| Ściana przednia                                        | 32.0                | 29.5       |
| Ściana tylna                                           | 33.4                | 32.9       |
| Ściana prawa                                           | 36.3                | 35.3       |
| Ściana lewa                                            | 35.5                | 32.7       |
| Ściana górna                                           | 38.2                | 33.9       |
| Ściana dolna                                           | 39.7                | 33.4       |
| Temperatury elementów sterowniczych (°C):              |                     |            |
| Elektryczny panel sterujący (tworzywo sztuczne)        | 35.0                |            |
| Ogranicznik temperatury - STB (tworzywo sztuczne)      | 41.0                |            |
| Rączka drzwi górnych (tworzywo sztuczne)               | 69.0                |            |
| Rączka drzwi środkowych (tworzywo sztuczne)            | 78.0                |            |
| Rączka drzwi dolnych (tworzywo sztuczne)               | 66.0                |            |
| Rączka drzwi przednich (tworzywo sztuczne)             | 33.0                |            |

Niepewność pomiarowa: 2 °C dla temperatur w zakresie (0 + 200) °C

"Powyżej wskazane rozszerzone niepewności pomiarowe liczone są jako czynnik niepewności pomiarowej oraz współczynnika rozszerzenia, k=2, odpowiednio do pewności pokrycia rzędu 95% względem klasyfikacji

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standardowej. Niepewności nie odzwierciedlają wpływu poboru próbek oraz niehomogeniczności. Niepewność standardowa została określona zgodnie z Dokumentem EA 4-02."

**Ocena po badaniu:** Specyfikowane wartości wzrostu temperatury nie zostały przekroczone.

| Średnie temperatury ścianek, drzwi i osłon kotła (°C): |                     |            |
|--------------------------------------------------------|---------------------|------------|
| Typ kotła                                              | EEI Pellets 10 kW   |            |
| Typ paliwa                                             | Pellet drzewny - C1 |            |
| Wydajność cieplna                                      | Nominalna           | Minimalna  |
| Data testu                                             | 2017-04-27          | 2017-04-26 |
| temperatura otoczenia (°C)                             | 26.6                | 26.3       |
| wilgotność (%)                                         | 25.1                | 26.1       |
| ciśnienie powietrza (kPa)                              | 98.31               | 97.75      |
| Ściana przednia                                        | 34.5                | 29.5       |
| Ściana tylna                                           | 32.7                | 32.9       |
| Ściana prawa                                           | 38.8                | 35.3       |
| Ściana lewa                                            | 36.2                | 32.7       |
| Ściana górna                                           | 37.7                | 33.9       |
| Ściana dolna                                           | 37.9                | 33.4       |
| Temperatury elementów sterowniczych (°C):              |                     |            |
| Elektryczny panel sterujący (tworzywo sztuczne)        | 37.0                |            |
| Ogranicznik temperatury - STB (tworzywo sztuczne)      | 44.0                |            |
| Rączka drzwi górnych (tworzywo sztuczne)               | 70.0                |            |
| Rączka drzwi środkowych (tworzywo sztuczne)            | 78.0                |            |
| Rączka drzwi dolnych (tworzywo sztuczne)               | 69.0                |            |
| Rączka drzwi przednich (tworzywo sztuczne)             | 34.0                |            |

Niepewność pomiarowa: 2 °C dla temperatur w zakresie (0 + 200) °C

"Powyżej wskazane rozszerzone niepewności pomiarowe liczone są jako czynnik niepewności pomiarowej oraz współczynnika rozszerzenia, k=2, odpowiednio do pewności pokrycia rzędu 95% względem klasyfikacji

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standardowej. Niepewności nie odzwierciedlają wpływu poboru próbek oraz niehomogeniczności. Niepewność standardowa została określona zgodnie z Dokumentem EA 4-02.”

**Ocena po badaniu:** Specyfikowane wartości wzrostu temperatury nie zostały przekroczone.

|                        |        |                                                                                                                         |
|------------------------|--------|-------------------------------------------------------------------------------------------------------------------------|
| Akredytowany nr próby: | T 001* | Tytuł próby:<br><b>Próba ciepła wyjściowego, wejściowego i wydajności</b><br><b>Próba temperatury produktu spalania</b> |
|------------------------|--------|-------------------------------------------------------------------------------------------------------------------------|

Metoda badawcza: ČSN EN 303-5:2013 Art. 4.4.2, 4.4.3, 5.7 to 5.10

Zbadana próbka: EEI Pellets 8 kW, EEI Pellets 10kW

Zastosowane urządzenia pomiarowe: Rozdział III - Urządzenia pomiarowe i badawcze

**Wyniki badań:**

***Średnie wartości mierzone i obliczeniowe (paliwa stałe):***

|                                                                   |                     |            |
|-------------------------------------------------------------------|---------------------|------------|
| Próba:                                                            | I.                  | II.        |
| Typ kotła:                                                        | EEI Pellets 8 kW    |            |
| Data badania:                                                     | 2017-04-25          | 2017-04-24 |
| Zbadana wydajność:                                                | Nominalna           | Minimalna  |
| Typ paliwa:                                                       | Pellet drzewny - C1 |            |
| Czas spalania, zasilanie (automatyczne)                           | Minimum 6 godzin    |            |
| Nominalna wydajność cieplna (specyfikowana przez producenta) [kW] | 8.3                 | 8.3        |
| Temperatura gazów spalinowych [°C]                                | 89.2                | 68.3       |
| Dodana masa paliwa [kg/h]                                         | 1.860               | 0.590      |
| Temperatura wody na wlocie [°C]                                   | 55.1                | 62.7       |
| Temperatura wody na wylocie [°C]                                  | 72.7                | 70.4       |
| Temperatura wody chłodzącej [°C]                                  | 11.9                | 12.4       |
| Prędkość przepływu wody chłodzącej [ m3/h ]                       | 0.4101              | 0.2830     |
| Ciąg [Pa]                                                         | 9.8                 | 7.5        |
| Temperatura otoczenia [°C]                                        | 26.6                | 26.3       |
| Wilgotność względna [%]                                           | 26.0                | 26.1       |

|                         |       |                  |
|-------------------------|-------|------------------|
|                         |       |                  |
| Ciśnienie barometryczne | [kPa] | 98.27      97.75 |

**Analiza produktów spalania:**

|                                     |       |       |
|-------------------------------------|-------|-------|
| Próba (czas spalania):              | I     | II    |
| Tlen O <sub>2</sub> [%]             | 8.11  | 14.04 |
| Dwutlenek węgla CO <sub>2</sub> [%] | 12.10 | 6.57  |
| Tlenek węgla CO [ppm]               | 134   | 229   |
| Wyższe węglowodory - THC/OGC [ppm]  | 2     | 7     |
| Tlenki wodoru NO <sub>x</sub> [ppm] | 89    | 47    |
| Tlenki siarki SO <sub>2</sub> [ppm] | 0     | 3     |

**Pomocnicze wartości procesu spalania (paliwa stałe):**

|                                                                           |         |         |
|---------------------------------------------------------------------------|---------|---------|
| Próba (czas spalania):                                                    | I.      | II.     |
| Stechiometryczna objętość tlenu [m <sup>3</sup> /kg]                      | 0.947   | 0.948   |
| Stechiometryczna objętość powietrza [m <sup>3</sup> /kg]                  | 4.510   | 4.513   |
| Objętość stochiometryczna suchych produktów spalania [m <sup>3</sup> /kg] | 4.443   | 4.446   |
| Maksymalna zawartość CO <sub>2</sub> [%]                                  | 19.79   | 19.79   |
| Stechiometryczna wielokrotność powietrza [-]                              | 1.62    | 2.98    |
| Objętość suchych produktów spalania, rzeczywista [m <sup>3</sup> /kg]     | 7.259   | 13.340  |
| Zawartość H <sub>2</sub> O w powietrzu spalania [m <sup>3</sup> /kg]      | 0.068   | 0.124   |
| Zawartość H <sub>2</sub> O w produktach spalania [m <sup>3</sup> /kg]     | 0.820   | 0.877   |
| Przepływ masowy gazów spalinowych [kg/s]                                  | 0.00542 | 0.00301 |

**Wartości obliczeniowe - przegląd wartości termicznych**

| Próba (czas spalania):                           | I.          | II.         |
|--------------------------------------------------|-------------|-------------|
| Strata ciepła jawnego produktów spalania [%]     | 4.0         | 4.6         |
| Strata niecałkowitego spalania - gaz [%]         | 0.1         | 0.2         |
| Strata niecałkowitego spalania - mechaniczne [%] | 0.1         | 0.0         |
| Strata odpływu ciepła do środowiska [%]          | 3.3         | 7.3         |
| Strata całkowita [%]                             | 7.4         | 12.2        |
| Wydajność - metoda pośrednia [%]                 | 92.6        | 87.8        |
| Dodana masa paliwa - rzeczywista [kg/h ]         | 1.867       | 0.592       |
| Ciepło wejściowe [kW]                            | 9.0         | 2.8         |
| <b>Wydajność cieplna [kW]</b>                    | <b>8.3</b>  | <b>2.5</b>  |
| Niepewność określenia wydajności cieplnej [kW]   | 0.4         | 0.1         |
| <b>Wydajność - metoda bezpośrednia [%]</b>       | <b>92.2</b> | <b>87.5</b> |
| Wydajność / wydajność nominalna [%]              | 99.6        | 30.0        |



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Przy wydajności nominalnej, spalając **Pellet drzewny - C1**, wydajność kotła spełnia wymogi według **Klasy 5** zgodnie z ČSN EN 303-5:2013, Rys. 1.

Zmierzona wydajność cieplna zawiera się w tolerancji  $\pm 8\%$ ;

Klasa Kotła 5;

**Ocena po badaniu:**

Przy wydajności nominalnej, temperatura produktu spalania wynosi mniej niż 160 K powyżej temperatury otoczenia;

Przy spalaniu pelletu drzewnego - C1, okres spalania wynosi ponad 6 godzin;

Minimalna wydajność cieplna wynosi 30% wydajności nominalnej.

**Wyniki badań:**

***Średnie wartości mierzone i obliczeniowe (paliwa stałe):***

|                                                                   |                            |            |
|-------------------------------------------------------------------|----------------------------|------------|
| Próba:                                                            | I.                         | II.        |
| Typ kotła:                                                        | EEI Pellets 10 kW          |            |
| Data badania:                                                     | 2017-04-25                 | 2017-04-24 |
| Zbadana wydajność:                                                | Nominalna                  | Minimalna  |
| Typ paliwa:                                                       | <b>Pellet drzewny - C1</b> |            |
| Czas spalania, zasilanie (automatyczne)                           | Minimum 6 godzin           |            |
| Nominalna wydajność cieplna (specyfikowana przez producenta) [kW] | 10                         | 10         |
| Temperatura gazów spalinowych [°C]                                | 100.0                      | 68.3       |
| Dodana masa paliwa [kg/h]                                         | 2.200                      | 0.590      |
| Temperatura wody na wlocie [°C]                                   | 56.5                       | 62.7       |
| Temperatura wody na wylocie [°C]                                  | 73.4                       | 70.4       |
| Temperatura wody chłodzącej [°C]                                  | 12.1                       | 12.4       |
| Prędkość przepływu wody chłodzącej [ m3/h ]                       | 0.5008                     | 0.2830     |
| Ciąg [Pa]                                                         | 11.4                       | 7.5        |
| Temperatura otoczenia [°C]                                        | 26.2                       | 26.3       |

|                         |       |       |       |
|-------------------------|-------|-------|-------|
| Wilgotność względna     | [%]   | 25.1  | 26.1  |
| Ciśnienie barometryczne | [kPa] | 98.31 | 97.75 |

**Analiza produktów spalania:**

| Próba (czas spalania):          |       | I     | II    |
|---------------------------------|-------|-------|-------|
| Tlen O <sub>2</sub>             | [%]   | 8.30  | 14.04 |
| Dwutlenek węgla CO <sub>2</sub> | [%]   | 12.04 | 6.57  |
| Tlenek węgla CO                 | [ppm] | 66    | 229   |
| Wyższe węglowodory - THC/OGC    | [ppm] | 1     | 7     |
| Tlenki wodoru NO <sub>x</sub>   | [ppm] | 99    | 47    |
| Tlenki siarki SO <sub>2</sub>   | [ppm] | 0     | 3     |

**Pomocnicze wartości procesu spalania (paliwa stałe):**

| Próba (czas spalania):                               |                      | I.      | II.     |
|------------------------------------------------------|----------------------|---------|---------|
| Stechiometryczna objętość tlenu                      | [m <sup>3</sup> /kg] | 0.947   | 0.948   |
| Stechiometryczna objętość powietrza                  | [m <sup>3</sup> /kg] | 4.510   | 4.513   |
| Objętość stochiometryczna suchych produktów spalania | [m <sup>3</sup> /kg] | 4.443   | 4.446   |
| Maksymalna zawartość CO <sub>2</sub>                 | [%]                  | 19.79   | 19.79   |
| Stechiometryczna wielokrotność powietrza             | [-]                  | 1.62    | 2.98    |
| Objętość suchych produktów spalania, rzeczywista     | [m <sup>3</sup> /kg] | 7.301   | 13.340  |
| Zawartość H <sub>2</sub> O w powietrzu spalania      | [m <sup>3</sup> /kg] | 0.065   | 0.124   |
| Zawartość H <sub>2</sub> O w produktach spalania     | [m <sup>3</sup> /kg] | 0.817   | 0.877   |
| Przepływ masowy gazów spalinowych                    | [kg/s]               | 0.00644 | 0.00301 |

**Wartości obliczeniowe - przegląd wartości termicznych**

| Próba (czas spalania):                           | I.          | II.         |
|--------------------------------------------------|-------------|-------------|
| Strata ciepła jawnego produktów spalania [%]     | 4.7         | 4.6         |
| Strata niecałkowitego spalania - gaz [%]         | 0.0         | 0.2         |
| Strata niecałkowitego spalania - mechaniczne [%] | 0.1         | 0.0         |
| Strata odpływu ciepła do środowiska [%]          | 3.1         | 7.3         |
| Strata całkowita [%]                             | 8.0         | 12.2        |
| Wydajność - metoda pośrednia [%]                 | 92.6        | 87.8        |
| Dodana masa paliwa - rzeczywista [kg/h ]         | 2.209       | 0.592       |
| Ciepło wejściowe [kW]                            | 10.6        | 2.8         |
| <b>Wydajność cieplna [kW]</b>                    | <b>9.7</b>  | <b>2.5</b>  |
| Niepewność określenia wydajności cieplnej [kW]   | 0.4         | 0.1         |
| <b>Wydajność - metoda bezpośrednia [%]</b>       | <b>91.6</b> | <b>87.5</b> |
| Wydajność / wydajność nominalna [%]              | 97.2        | 24.9        |

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Przy wydajności nominalnej, spalając **Pellet drzewny - C1**, wydajność kotła spełnia wymogi według **Klasy 5** zgodnie z ČSN EN 303-5:2013, Rys. 1.

Zmierzona wydajność cieplna zawiera się w tolerancji  $\pm 8\%$ ;

Klasa Kotła 5;

**Ocena po badaniu:**

Przy wydajności nominalnej, temperatura produktu spalania wynosi mniej niż 160 K powyżej temperatury otoczenia;

Przy spalaniu pelletu drzewnego - C1, okres spalania wynosi ponad 6 godzin;

Minimalna wydajność cieplna wynosi 30% wydajności nominalnej.

**Analiza paliwa**

| Typ paliwa                                                                     | Pellet drzewny - C1 |           |         |            |
|--------------------------------------------------------------------------------|---------------------|-----------|---------|------------|
| Wskaźnik analityczny                                                           | Symbol              | Jednostka | Wartość | Niepewność |
| Wyższe ciepło spalania                                                         | $Q_s$               | [MJ/kg]   | 18.76   | 0.22       |
| Niższe ciepło spalania                                                         | $Q_d$               | [MJ/kg]   | 17.28   | 0.22       |
| Całkowicie woda, w stanie pierwotnym                                           | $w_t^r$             | [% masy]  | 5.92    | 0.01       |
| Popiół                                                                         | A                   | [% masy]  | 0.33    | 0.002      |
| Węgiel                                                                         | C                   | [% masy]  | 47.59   | 0.24       |
| Wodór                                                                          | H                   | [% masy]  | 6.12    | 0.20       |
| Azot                                                                           | N                   | [% masy]  | 0.05    | 0.14       |
| Siarka                                                                         | S                   | [% masy]  | 0.007   | 0.004      |
| Chlor                                                                          | Cl                  | [% masy]  | 0.014   | 0.003      |
| Tlen - obliczenie dla 100%                                                     | O                   | [% masy]  | 39.97   |            |
| Współczynnik konwersji $f_{emis}$ dla emisji w [mg/m <sup>3</sup> ] na [mg/MJ] | $f_{emis}$          | [-]       | 0.25780 |            |

*Uwaga:* Próbkę w stanie pierwotnym

**Niepewność pomiarowa:** Wskazana w Wynikach pomiarów

"Powyżej wskazane rozszerzone niepewności pomiarowe liczone są jako czynnik niepewności pomiarowej oraz współczynnika rozszerzenia,  $k=2$ , odpowiednio do pewności pokrycia rzędu 95% - dla klasyfikacji standardowej.

Akredytowany nr próby: **T 071\*** Tytuł próby: **Pobór energii elektrycznej**

Metoda badawcza: ČSN EN 303-5:2013

Art. 5.8.5

Zbadana próbka: EEI Pellets 8 kW, EEI Pellets 10kW

Zastosowane urządzenia pomiarowe: Rozdział III - Urządzenia pomiarowe i badawcze

**Wyniki badań:**

| Wymóg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Wskazanie wymogu                    | Ocena po badaniu | Uwaga |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------|-------|
| <b>Pobór energii elektrycznej</b><br><br>W trakcie badań, pobór energii elektrycznej należy ustalić według EN 15456.<br><br>Wartości maksymalnego poboru, w stanie spoczynku, nominalnej wydajności cieplnej i minimalnej wydajności cieplnej należy wskazać w protokole z badań. W przypadku kotłów z układami automatycznego zasilania (linia paliwa), pobór energii elektrycznej kotła i linii paliwa należy ustalić i wykazać odrębnie.<br><br>Średni pobór energii elektrycznej w stanie spoczynku należy mierzyć przez minimum 10 minut i wykazać w watach. W przypadku, gdy czynności obsługowe wpływają na pobór energii elektrycznej, może być konieczne wydłużenie czasu. | ČSN EN 303-5:2013<br><br>Art. 5.8.5 | +                |       |

**Wyniki badań:**

|                                                 |       |
|-------------------------------------------------|-------|
| EEI Pellets                                     | 8kW   |
| Maksymalny pobór mocy                           | 485 W |
| Pobór mocy przy nominalnej wydajności grzewczej | 56 W  |
| Pobór mocy przy minimalnej wydajności grzewczej | 20W   |
| Pobór mocy w trybie STAND BY                    | 2 W   |
| Maksymalny pobór mocy dla układu zapłonowego    | 345W  |

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|                                                             |       |
|-------------------------------------------------------------|-------|
| Maksymalny pobór mocy dla zasilania paliwa (linia paliwowa) | 110 W |
|-------------------------------------------------------------|-------|

Uwaga: Data i warunki badania - patrz test nr T 001\* (test mocy zasilania, powrotu i sprawności).

---

**Wyniki badań:**

|                                                             |       |
|-------------------------------------------------------------|-------|
| EEl Pellets                                                 | 10kW  |
| Maksymalny pobór mocy                                       | 485 W |
| Pobór mocy przy nominalnej wydajności grzewczej             | 68 W  |
| Pobór mocy przy minimalnej wydajności grzewczej             | 20W   |
| Pobór mocy w trybie STAND BY                                | 2 W   |
| Maksymalny pobór mocy dla układu zapłonowego                | 345W  |
| Maksymalny pobór mocy dla zasilania paliwa (linia paliwowa) | 110 W |

Uwaga: Data i warunki badania - patrz test nr T 001\* (test mocy zasilania, powrotu i sprawności).

Akredytowany nr      **T 001\***      Tytuł      **Próba wydajności spalania - emisje**  
 próby:      próby:

Metoda badawcza:      ČSN EN 303-5:2013  
 Art. 5.7.3, 5.7.4, 5.9, 5.10.4

Zbadana próbka:      EEI Pellets 8 kW, EEI Pellets 10 kW

Zastosowane urządzenia pomiarowe:      Rozdział III - Urządzenia pomiarowe i badawcze

| Wymóg                                                                                                                                                                                                                                                                                                                                                                                                            | Wskazanie wymogu             | Ocena po badaniu | Uwagi |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------|-------|--|
| <b>Limity emisyjne</b><br>Spalanie powinno być typu niskoemisyjnego. Wymóg uznaje się za spełniony w przypadku, gdy wartości emisji wykazane w Tabeli 6 nie są przekraczane w przypadku pracy przy nominalnej wydajności grzewczej lub - w razie kotłów z regulowanym zakresem wydajności grzewczej - przy pracy przy nominalnej wydajności grzewczej i minimalnej wydajności grzewczej, według 5.7, 5.9 i 5.10. | ČSN EN 303-5:2013 Art. 4.4.7 | +                |       |  |

Tabela 6

| Zasilanie    | Paliwo      | Nominalna wydajność cieplna | Limity emisyjne   |       |       |         |       |       |       |       |       |
|--------------|-------------|-----------------------------|-------------------|-------|-------|---------|-------|-------|-------|-------|-------|
|              |             |                             | CO                |       |       | OGC/THC |       |       | Pył   |       |       |
|              |             |                             | mg/m³ przy 10% O₂ |       |       |         |       |       |       |       |       |
|              |             | kW                          | Klasa             | Klasa | Klasa | Klasa   | Klasa | Klasa | Klasa | Klasa | Klasa |
|              |             |                             | 3                 | 4     | 5     | 3       | 4     | 5     | 3     | 4     | 5     |
| Manualne     | Biogeniczne | ≤50                         | 5000              | 1200  | 700   | 150     | 50    | 30    | 150   | 75    | 60    |
|              |             | > 50 ≤150                   | 2500              |       |       | 100     |       |       |       |       |       |
|              |             | > 150 ≤500                  | 1200              |       |       | 100     |       |       |       |       |       |
|              | Kopalne     | ≤50                         | 5000              |       |       | 150     |       |       | 125   |       |       |
|              |             | > 50 ≤150                   | 2500              |       |       | 100     |       |       |       |       |       |
|              |             | > 150 ≤500                  | 1200              |       |       | 100     |       |       |       |       |       |
| Automatyczna | Biogeniczne | ≤50                         | 3000              | 1000  | 500   | 100     | 30    | 20    | 150   | 60    | 40    |



|  |         |             |      |  |  |     |  |  |     |  |  |
|--|---------|-------------|------|--|--|-----|--|--|-----|--|--|
|  |         |             |      |  |  |     |  |  |     |  |  |
|  |         | > 50 ≤ 150  | 2500 |  |  | 80  |  |  |     |  |  |
|  |         | > 150 ≤ 500 | 1200 |  |  | 80  |  |  |     |  |  |
|  | Kopalne | ≤ 50        | 3000 |  |  | 100 |  |  |     |  |  |
|  |         | > 50 ≤ 150  | 2500 |  |  | 80  |  |  | 125 |  |  |
|  |         | > 150 ≤ 500 | 1200 |  |  | 80  |  |  |     |  |  |

UWAGA 1: Wartości pyłów w niniejszej Tabeli oparte są na doświadczeniu metody filtrowania grawimetrycznego. Stosowana metoda musi być wykazana w protokole z badań. Emisja cząstek stałych mierzona według wskazanej Normy Europejskiej nie obejmuje kondensowalnych związków organicznych, które mogą tworzyć dodatkowe cząstki stałe po wymieszaniu gazu spalinowego z powietrzem otoczenia. Przedstawione wartości nie są zatem bezpośrednio odnoszalne do wartości mierzonych metodami wykorzystującymi tunel rozcieńczający. Nie mogą one być też bezpośrednio przełożone na stężenia cząstek stałych w powietrzu otoczenia.

UWAGA 2: Dodatkowe metody badawcze oraz limity emisyjne obowiązujące w niektórych krajach podano w Rozbieżnościach A w Załączniku C.

<sup>a</sup> Odnosi się do suchego wylotowego gazu spalinowego, 0 °C, 1013 mbar.

<sup>b</sup> Kotły klasy 3 na paliwa typu E według 1.2.1 lub paliwa typu e według 1.2.3 w przedstawionej Tabeli, oraz klasyfikowane jako paliwa E i e nie muszą spełniać wymogów związanych z emisją pyłów. Wartość rzeczywista powinna zostać wykazana w dokumentacji technicznej i nie powinna przekraczać 200 mg/m<sup>3</sup> przy 10 % O<sub>2</sub>.

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**Wyniki pomiaru:** EEI Pellets 8 kW - Pellet drzewny - C1

| Wydajność<br>grzewcza<br>kotła | Wartości średnie      |                        |             |                      |                          |                                 |                                          |                                 |                                         |                              |
|--------------------------------|-----------------------|------------------------|-------------|----------------------|--------------------------|---------------------------------|------------------------------------------|---------------------------------|-----------------------------------------|------------------------------|
|                                | Wartości zmierzone    |                        |             |                      |                          |                                 | Wartości przeliczone O <sub>2</sub> =10% |                                 |                                         |                              |
|                                | O <sub>2</sub><br>[%] | CO <sub>2</sub><br>[%] | CO<br>[ppm] | OGC/TH<br>C<br>[ppm] | NO <sub>x</sub><br>[ppm] | Dust<br>[mg/m <sup>3</sup><br>] | CO<br>[mg/m <sup>3</sup> ]               | OGC/THC<br>[mg/m <sup>3</sup> ] | NO <sub>x</sub><br>[mg/m <sup>3</sup> ] | Dust<br>[mg/m <sup>3</sup> ] |
| Nominalna                      | 8.11                  | 12.10                  | 134         | 2                    | 89                       | 42                              | 143                                      | 3                               | 156                                     | 36                           |
| Minimalna                      | 14.04                 | 6.57                   | 229         | 7                    | 47                       | 21                              | 453                                      | 18                              | 152                                     | 33                           |

**Ocena po badaniu:**

EEI Pellets 8 kW - Pellet drzewny - C1 spełnia, przy nominalnej i minimalnej wydajności grzewczej, wymogi emisyjne według **Klasy 5**, zgodnie z ČSN EN 303-5:2013 Tabela 6.

| Wydajność<br>grzewcza<br>kotła | Wartości średnie      |                        |             |                      |                          |                                 |                                          |                                 |                                         |                              |
|--------------------------------|-----------------------|------------------------|-------------|----------------------|--------------------------|---------------------------------|------------------------------------------|---------------------------------|-----------------------------------------|------------------------------|
|                                | Wartości zmierzone    |                        |             |                      |                          |                                 | Wartości przeliczone O <sub>2</sub> =10% |                                 |                                         |                              |
|                                | O <sub>2</sub><br>[%] | CO <sub>2</sub><br>[%] | CO<br>[ppm] | OGC/TH<br>C<br>[ppm] | NO <sub>x</sub><br>[ppm] | Dust<br>[mg/m <sup>3</sup><br>] | CO<br>[mg/m <sup>3</sup> ]               | OGC/THC<br>[mg/m <sup>3</sup> ] | NO <sub>x</sub><br>[mg/m <sup>3</sup> ] | Dust<br>[mg/m <sup>3</sup> ] |
| Nominalna                      | 8.30                  | 12.04                  | 66          | 1                    | 99                       | 42                              | 72                                       | 2                               | 176                                     | 37                           |
| Minimalna                      | 14.04                 | 6.57                   | 229         | 7                    | 47                       | 21                              | 453                                      | 18                              | 152                                     | 33                           |

**Ocena po badaniu:**

EEI Pellets 10 kW - Pellet drzewny - C1 spełnia, przy nominalnej i minimalnej wydajności grzewczej, wymogi emisyjne według **Klasy 5**, zgodnie z ČSN EN 303-5:2013 Tabela 6.

|                        |        |                                                                                                       |
|------------------------|--------|-------------------------------------------------------------------------------------------------------|
| Akredytowany nr próby: | T 001* | Tytuł próby: Próba ciepła wyjściowego, wejściowego i wydajności<br>Próba wydajności spalania - emisje |
|------------------------|--------|-------------------------------------------------------------------------------------------------------|

Wymagania: ČSN EN 303-5:2013  
Załącznik C,  
Rozbieżność względem wersji austriackiej, C.2.2, C.2.3

Zbadana próbka: EEI Pellets 8kW, EEI Pellets 10kW

**Wyniki badań:** Ocena wyników badania wskazana jest wyłącznie w niniejszym Protokole z Badań.

| Wymóg                                                                                       | Wskazanie wymogu                                                                   | Ocena po badaniu           |
|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------------------|
| <b>Sprawność kotła przy nominalnej wydajności cieplnej i minimalnej wydajności cieplnej</b> | ČSN EN 303- 5:2013<br>Załącznik C, Rozbieżność względem wersji austriackiej, C.2.2 | <u>Pellet drzewny - C1</u> |
| <b>Kocioł</b>                                                                               |                                                                                    | +                          |
| <b>Sprawność minimalna</b>                                                                  |                                                                                    |                            |
| <u>Kotły grzewcze na paliwa stałe</u>                                                       |                                                                                    | 75%                        |
| <b>a) zasilane manualnie</b>                                                                |                                                                                    |                            |
| <u>do 10 kW</u>                                                                             |                                                                                    | 79%                        |
| <u>&gt;10 do 200 kW</u>                                                                     |                                                                                    |                            |
| <u>&gt;200 kW</u>                                                                           |                                                                                    | 89 %                       |
| <b>a) zasilane automatycznie</b>                                                            |                                                                                    |                            |
| <u>do 10 kW</u>                                                                             |                                                                                    | 80 %                       |
| <u>&gt;10 do 200 kW</u>                                                                     |                                                                                    |                            |
| <u>&gt;200 kW</u>                                                                           |                                                                                    | 90 %                       |
| <u>UWAGA Pn odpowiada nominalnej wydajności grzewczej (Qn w niniejszej normie)</u>          |                                                                                    |                            |
|                                                                                             |                                                                                    |                            |
|                                                                                             |                                                                                    |                            |

| Wymóg                                             |                                              |                                             |                     |                                        | Wskazanie wymogu                                                                             | Ocena po badaniu    |                  |
|---------------------------------------------------|----------------------------------------------|---------------------------------------------|---------------------|----------------------------------------|----------------------------------------------------------------------------------------------|---------------------|------------------|
| Limity emisyjne                                   |                                              |                                             |                     |                                        | ČSN EN 303- 5:2013<br><br>Załącznik C, Rozbieżność<br>względem wersji<br>austriackiej, C.2.3 | Pellet drzewny – C1 |                  |
| Małe kotły na automatycznie zasilane paliwa stałe |                                              |                                             |                     |                                        |                                                                                              |                     |                  |
| Parametr                                          | Limity emisyjne mg-MJ                        |                                             |                     |                                        |                                                                                              |                     |                  |
|                                                   | Pellety Drzewne<br><br>- Ogrzewacze Pokojowe | Pellety Drzewne<br><br>Ogrzewacze centralne | Inne paliwa drzewne | Inne standaryzowane paliwa biogeniczne |                                                                                              |                     |                  |
|                                                   | CO                                           | 500 <sup>a</sup>                            | 250 <sup>a</sup>    | 250 <sup>a</sup>                       |                                                                                              |                     | 500 <sup>a</sup> |
|                                                   | NO <sub>x</sub>                              | 100                                         | 100                 | 100                                    |                                                                                              |                     | 300              |
|                                                   | OGC/THC                                      | 30                                          | 20                  | 30                                     |                                                                                              |                     | 20               |
| Dust                                              | 25                                           | 20                                          | 30                  | 35                                     |                                                                                              |                     |                  |

<sup>a</sup> Wartość graniczną można przekroczyć o 50 % podczas pracy w obciążeniu częściowym wynoszącym 30 % nominalnej wydajności grzewczej.

**Wyniki pomiaru:** EEI Pellets 8kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Sprawność minimalna | Mierzona efektywność |
|--------------------------|---------------------|----------------------|
| Nominalna                | 80.0                | 92.2                 |
| Minimalna                |                     | 87.5                 |

**Ocena po badaniu:**

Zmierzona wydajność kotła EEI Pellets 8 kW - Pellet drzewny - C1 jest **wyższa**, niż wymagana.

**Wyniki pomiaru:** EEI Pellets 8 kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Wartości średnie      |             |                          |                  |                             |                                         |                            |                    |                |
|--------------------------|-----------------------|-------------|--------------------------|------------------|-----------------------------|-----------------------------------------|----------------------------|--------------------|----------------|
|                          | Wartości zmierzone    |             |                          |                  |                             | Wartości przeliczone O <sub>2</sub> =0% |                            |                    |                |
|                          | O <sub>2</sub><br>[%] | CO<br>[ppm] | NO <sub>x</sub><br>[ppm] | OGC/THC<br>[ppm] | Pył<br>[mg/m <sup>3</sup> ] | CO<br>[mg/MJ]                           | NO <sub>x</sub><br>[mg/MJ] | OGC/THC<br>[mg/MJ] | Pył<br>[mg/MJ] |
| Nominalna                | 8.11                  | 134         | 89                       | 2                | 42                          | 70                                      | 77                         | 1                  | 18             |
| Minimalna                | 14.04                 | 229         | 47                       | 7                | 21                          | 222                                     | 75                         | 9                  | 16             |

**Ocena po badaniu:**

Zmierzone wartości emisyjne kotła EEI Pellets 8 kW - Pellet drzewny - C1 **nie przekraczają** specyfikowanych wartości.

**Wyniki pomiaru:** EEI Pellets 10kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Sprawność minimalna | Mierzona efektywność |
|--------------------------|---------------------|----------------------|
| Nominalna                | 80.0                | 91.6                 |
| Minimalna                |                     | 87.5                 |

**Ocena po badaniu:**

Zmierzona wydajność kotła EEI Pellets 10 kW - Pellet drzewny - C1 jest **wyższa**, niż wymagana.

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**Wyniki pomiaru:** EEI Pellets 10 kW - Pellet drzewny - C1

| Wydajność<br>grzewcza<br>kotła | Wartości średnie   |       |                 |         |                      |                                         |                 |         |         |
|--------------------------------|--------------------|-------|-----------------|---------|----------------------|-----------------------------------------|-----------------|---------|---------|
|                                | Wartości zmierzone |       |                 |         |                      | Wartości przeliczone O <sub>2</sub> =0% |                 |         |         |
|                                | O <sub>2</sub>     | CO    | NO <sub>x</sub> | OGC/THC | Pył                  | CO                                      | NO <sub>x</sub> | OGC/THC | Pył     |
|                                | [%]                | [ppm] | [ppm]           | [ppm]   | [mg/m <sup>3</sup> ] | [mg/MJ]                                 | [mg/MJ]         | [mg/MJ] | [mg/MJ] |
| Nominalna                      | 8.30               | 66    | 99              | 1       | 42                   | 35                                      | 86              | 1       | 18      |
| Minimalna                      | 14.04              | 229   | 47              | 7       | 21                   | 222                                     | 75              | 9       | 16      |

**Ocena po badaniu:**

Zmierzone wartości emisyjne kotła EEI Pellets 10 kW - Pellet drzewny - C1 **nie przekraczają** specyfikowanych wartości.

|                               |  |                     |                                                           |
|-------------------------------|--|---------------------|-----------------------------------------------------------|
| <u>Akredytowany nr próby:</u> |  | <u>Tytuł próby:</u> | <b>Próba ciepła wyjściowego, wejściowego i wydajności</b> |
| <b>T 001*</b>                 |  |                     | <b>Próba wydajności spalania - emisje</b>                 |

Wymagania:

ČSN EN 303-5:2013

Załącznik C

Rozbieżność względem wersji duńskiej, C.4.1, C.4.2

Zbadana próbka:

EEl Pellets 8kW, 10 kW

**Wyniki badań:** Ocena wyników badania wskazana jest wyłącznie w niniejszym Protokole z Badań.

|                                                                                                                                                                                       |  |        |                             |                                                                                      |       |                     |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------|-----------------------------|--------------------------------------------------------------------------------------|-------|---------------------|--|
| Wymóg                                                                                                                                                                                 |  |        |                             | Wskazanie wymogu                                                                     |       | Ocena po badaniu    |  |
| Wydajność Kotła                                                                                                                                                                       |  |        |                             | ČSN EN 303- 5:2013<br>Załącznik C, Rozbieżność<br>względem wersji<br>duńskiej, C.4.1 |       | Pellet drzewny - C1 |  |
| Według Duńskiego Kodeksu Budowlanego BR08, Punkt 8.5.1.4, Podpunkt 7, kotły na węgiel, koks, biopaliwo lub biomasę powinna cechować wydajność odpowiadająca Klasie 3 według EN 303-5. |  |        |                             |                                                                                      |       |                     |  |
| Minimalna wydajność (67 + 6 log Qn) %                                                                                                                                                 |  |        |                             |                                                                                      |       |                     |  |
| Do kotłów powyżej 300 kW stosuje się wymóg odpowiadający 300 kW.                                                                                                                      |  |        |                             |                                                                                      |       |                     |  |
|                                                                                                                                                                                       |  |        |                             |                                                                                      |       |                     |  |
| Wymóg                                                                                                                                                                                 |  |        |                             | Wskazanie wymogu                                                                     |       | Ocena po badaniu    |  |
| Limity emisyjne                                                                                                                                                                       |  |        |                             |                                                                                      |       | Pellet drzewny - C1 |  |
| Według Duńskiego Rozporządzenia EPA nr 1432 z dnia 11-12-2007, w Danii dopuszcza się stosowanie kotłów wyłącznie Klasy 3 (lub wyższej).                                               |  |        |                             | ČSN EN 303- 5:2013<br>Załącznik C, Rozbieżność<br>względem wersji<br>duńskiej, C.4.2 |       |                     |  |
| Zasilanie                                                                                                                                                                             |  | Paliwo | Nominalna wydajność cieplna |                                                                                      |       |                     |  |
|                                                                                                                                                                                       |  |        |                             | CO                                                                                   | OGC / | Pył                 |  |



|                     |                    |              | THC                                       |     |     |
|---------------------|--------------------|--------------|-------------------------------------------|-----|-----|
|                     |                    |              | mg-m <sup>3</sup> przy 10% O <sub>2</sub> |     |     |
|                     |                    | kW           | Klasa                                     |     |     |
|                     |                    |              | 3                                         |     |     |
| <u>Manualne</u>     | <u>Biogeniczne</u> | ≤50          | 5000                                      | 150 | 150 |
|                     |                    | > 50 do 150  | 2500                                      | 100 |     |
|                     |                    | > 150 do 300 | 1200                                      |     |     |
|                     | <u>Kopalne</u>     | ≤50          | 5000                                      | 150 | 125 |
|                     |                    | > 50 do 150  | 2500                                      | 100 |     |
|                     |                    | > 150 do 300 | 1200                                      |     |     |
| <u>Automatyczne</u> | <u>Biogeniczne</u> | ≤50          | 3000                                      | 80  | 150 |
|                     |                    | > 50 do 150  | 2500                                      |     |     |
|                     |                    | > 150 do 300 | 1200                                      |     |     |
|                     | <u>Kopalne</u>     | ≤50          | 3000                                      | 100 | 125 |
|                     |                    | > 50 do 150  | 2500                                      | 80  |     |
|                     |                    | > 150 do 300 | 1200                                      |     |     |

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Protokół 39-11431/T

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**Wyniki pomiaru:** EEI Pellets 8 kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Sprawność minimalna | Sprawność mierzona |
|--------------------------|---------------------|--------------------|
| Nominalna                | 72.5                | 92.2               |
| Minimalna                |                     | 87.5               |

**Ocena po badaniu:**

Zmierzona wydajność kotła EEI Pellets 8 kW - Pellet drzewny - C1 jest **wyższa**, niż wymagana.

**Wyniki pomiaru:** EEI Pellets 8 kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Wartości średnie emisji |       |         |                      |                                          |                      |                      |
|--------------------------|-------------------------|-------|---------|----------------------|------------------------------------------|----------------------|----------------------|
|                          | Wartości zmierzone      |       |         |                      | Wartości przeliczone O <sub>2</sub> =10% |                      |                      |
|                          | O <sub>2</sub>          | CO    | OGC/THC | Pył                  | CO                                       | OGC/THC              | Pył                  |
|                          | [%]                     | [ppm] | [ppm]   | [mg/m <sup>3</sup> ] | [mg/m <sup>3</sup> ]                     | [mg/m <sup>3</sup> ] | [mg/m <sup>3</sup> ] |
| Nominalna                | 8.11                    | 134   | 2       | 42                   | 143                                      | 3                    | 36                   |
| Minimalna                | 14.04                   | 229   | 7       | 21                   | 453                                      | 18                   | 33                   |

**Ocena po badaniu:**

Zmierzona wartość emisji kotła EEI Pellets 8 kW - Pellet drzewny - C1 **nie przekracza** wartości specyfikowanych.

Strojírenský zkušební ústav, s.p.

Instytut Badań Inżynieryjnych

Protokół 39-11431/T

Strona 39 z 52

**Wyniki pomiaru:** EEI Pellets 10 kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Sprawność minimalna | Sprawność mierzona |
|--------------------------|---------------------|--------------------|
| Nominalna                | 73.0                | 91.6               |
| Minimalna                |                     | 87.5               |

**Ocena po badaniu:**

Zmierzona wydajność kotła EEI Pellets 10 kW - Pellet drzewny - C1 jest **wyższa**, niż wymagana.

**Wyniki pomiaru:** EEI Pellets 10 kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Wartości średnie emisji |       |          |                      |                                          |                      |                      |
|--------------------------|-------------------------|-------|----------|----------------------|------------------------------------------|----------------------|----------------------|
|                          | Wartości zmierzone      |       |          |                      | Wartości przeliczone O <sub>2</sub> =10% |                      |                      |
|                          | O <sub>2</sub>          | CO    | OGC/THC  | Pył                  | CO                                       | OGC/THC              | Pył                  |
|                          | [%]                     | [ppm] | [ppm]    | [mg/m <sup>3</sup> ] | [mg/m <sup>3</sup> ]                     | [mg/m <sup>3</sup> ] | [mg/m <sup>3</sup> ] |
| Nominalna                | 8.30                    | 66    | <u>1</u> | 42                   | 72                                       | 2                    | 37                   |
| Minimalna                | 14.04                   | 229   | <u>7</u> | 21                   | 453                                      | 18                   | 33                   |

**Ocena po badaniu:**

Zmierzona wartość emisji kotła EEI Pellets 10 kW - Pellet drzewny - C1 **nie przekracza** wartości specyfikowanych.

|                        |               |                               |                                                                                                        |
|------------------------|---------------|-------------------------------|--------------------------------------------------------------------------------------------------------|
| Akredytowany nr próby: | <b>T 001*</b> | <u>Tytuł</u><br><u>próby:</u> | <b>Próba ciepła wyjściowego, wejściowego i wydajności</b><br><b>Próba wydajności spalania - emisje</b> |
|------------------------|---------------|-------------------------------|--------------------------------------------------------------------------------------------------------|

|                 |                                                       |
|-----------------|-------------------------------------------------------|
| Wymagania:      | ČSN EN 303-5:2013                                     |
|                 | Załącznik C                                           |
|                 | Rozbieżność względem wersji niemieckiej, C.5.1, C.5.2 |
| Zbadana próbka: | EEl Pellets 8 kW, EEl Pellets 10kW                    |

**Wyniki badań:** Ocena wyników badania wskazana jest wyłącznie w niniejszym Protokole z Badań.

| Wymóg                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                                |          |                                                                                             | Wskazanie wymogu | Ocena po badaniu    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|----------|---------------------------------------------------------------------------------------------|------------------|---------------------|
| Limity emisyjne                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |                                |          |                                                                                             |                  | Pellet drzewny - C1 |
| Tabela 7 - Limity emisji                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                                |          | ČSN EN 303-5:2013<br><br>Załącznik C, Rozbieżność względem wersji niemieckiej, C.5.1, C.5.2 |                  |                     |
| Limity emisji wskazywane są w Rozdziale 2, punkty 4, 5 i Załączniku 2 Niemieckiego Rozporządzenia w sprawie Kontroli Emisji "Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen - 1. BImSchV)". Kotły zasilane paliwami stałymi powinny być montowane, posiadać cechy oraz być włączane do użytku wyłącznie pod warunkiem spełnienia poniżej przedstawionych wymogów aktu prawnego "1. BImSchV": |                    |                                |          |                                                                                             |                  |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Paliwo wg §3 (1)   | Nominalny zakres wydajności kW | Pył g/m³ |                                                                                             | CO g/m³          |                     |
| Etap 2: Urządzenia montowane po 31.12.2014                                                                                                                                                                                                                                                                                                                                                                                                                                | Pozycje od 1 do 5a | ≥4                             | 0,02     | 0,4                                                                                         | -                |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Pozycje od 6 do 7  | ≥ 30 ≤ 500                     | 0,02     | 0,4                                                                                         |                  |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    | > 500                          | 0,02     | 0,3                                                                                         |                  |                     |

|                                                                                                                                                                                                                                                                 |                    |                |      |     |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|------|-----|--|
|                                                                                                                                                                                                                                                                 | Pozycje od 8 do 13 | $\geq 4 < 100$ | 0,02 | 0,4 |  |
| UWAGA Rozbieżność względem zdania 1 odnośnie systemów spalania (urządzeń) wyłącznie zasilanych paliwami wg §3 artykuł 1 Punkt 4 w postaci szczapów - do systemów spalania (urządzeń) stosuje się limity według Etapu 2 pod warunkiem ich montażu po 31.12.2016. |                    |                |      |     |  |

**Wyniki pomiaru:** EEI Pellets8 kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Wartości średnie emisji |             |                              |                                 |                             |
|--------------------------|-------------------------|-------------|------------------------------|---------------------------------|-----------------------------|
|                          | Wartości zmierzone      |             |                              | Wartości przeliczone $O_2=13\%$ |                             |
|                          | $O_2$<br>[%]            | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[g/m <sup>3</sup> ]       | Dust<br>[g/m <sup>3</sup> ] |
| Nominalna                | 8.11                    | 134         | 42                           | 0.104                           | 0.026                       |
| Minimalna                | 14.04                   | 229         | 21                           | 0.329                           | 0.024                       |

**Ocena po badaniu:**

Zmierzone wartości emisyjne kotła EEI Pellets 8 kW - Pellet drzewny - C1 **przekraczają** wartości specyfikowane.

**Wyniki pomiaru:** EEI Pellets 10 kW - Pellet drzewny - C1

| Wydajność grzewcza kotła | Wartości średnie emisji |             |                              |                                 |                             |
|--------------------------|-------------------------|-------------|------------------------------|---------------------------------|-----------------------------|
|                          | Wartości zmierzone      |             |                              | Wartości przeliczone $O_2=13\%$ |                             |
|                          | $O_2$<br>[%]            | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[g/m <sup>3</sup> ]       | Dust<br>[g/m <sup>3</sup> ] |
| Nominalna                | 8.30                    | 66          | 42                           | 0.052                           | 0.027                       |
| Minimalna                | 14.04                   | 229         | 21                           | 0.329                           | 0.024                       |

**Ocena po badaniu:**

Zmierzone wartości emisyjne kotła EEI Pellets 10 kW - Pellet drzewny - C1 **przekraczają** wartości specyfikowane.

Akredytowany nr próby: **T 001\*** Tytuł próby: **Próba ciepła wyjściowego, wejściowego i wydajności**  
**Próba wydajności spalania - emisje**

Wymagania: ČSN EN 303-5:2013  
Załącznik C  
C.6 Rozbieżność względem wersji szwajcarskiej

Zbadana próbka: EEI Pellets 8 kW, EEI Pellets 10kW

**Wyniki badań:** Ocena wyników badania wskazana jest wyłącznie w niniejszym Protokole z Badań.

| Specyfikacja                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                 | Wskazanie wymogu                                                                           | Ocena po badaniu    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------|
| <b>Limity emisyjne</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                 |                                                                                            |                     |
| Punkty 4.4.7, Tabela 7<br><br>Limity emisji są regulowane w Załączniku 4 Szwajcarskiego Rozporządzenia w sprawie Ograniczania Zanieczyszczenia Powietrza ([OAPC] SR 814.318.142.1) z dnia 1985-12-16 (na dzień 2010-07-15).<br><br>Kotły zasilane biomasą drzewną mogą być wprowadzane do handlu wyłącznie w razie spełnienia następujących specyfikacji OAPC:<br><br>-deklaracje zgodności (Rysunek 20 OAPC);<br><br>-Rysunki 1, 212, 23 Załącznika 4 OAPC;<br><br>-Rysunki 31, 32 Załącznika 5 OAPC.<br><br>Wartości emisyjne kotłów zasilanych paliwem węglowym lub drzewnym nie powinny przekraczać następujących limitów: |                                                                                                 | ČSN EN 303- 5:2013<br><br>Załącznik C<br><br>C.6 Rozbieżność względem wersji szwajcarskiej | Pellet drzewny - C1 |
| Typ instalacji                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Wymogi szczególne (limity emisyjne) <sup>a</sup> dla tlenku węgla (CO) i cząstek stałych (pyłu) |                                                                                            |                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | CO (mg-m <sup>3</sup> )                                                                         | Pył (mg-m <sup>3</sup> )                                                                   |                     |
| <u>Kotły na szczapy i kotły na węgiel, manualne zasilanie</u><br>800 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 800                                                                                             | 50                                                                                         |                     |

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |    |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|---|
| Kotły na drewno rozdrobnione i kotły na węgiel, automatyczne zasilanie                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 400 | 60 |   |
| Kotły na Pellet Drzewny, automatyczne zasilanie                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 300 | 40 |   |
| <sup>a</sup> Odnosi się do podstawy tlenowej:<br><br>-dla kotłów na drewno w stanie naturalnym, 13% objętości;<br><br>-dla kotłów na węgiel, 7% objętości.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |    | + |
| Zawartość siarki w węglu, brykiecie węglowym i koksie nie powinna przekraczać 3%. Kotły na biomasę nieдрzewną powinny spełniać następujące wymagania specyfikacyjne OAPC:<br><br>-Rysunki 741, 742, 743 Załącznika 2 OAPC;<br><br>-Rysunki 81, 82 Załącznika 3 OAPC.<br><br>Według Rysunku 743, Załącznik 2 OPAC, biomasa nieдрzewna, taka jak odpady biogeniczne i produkty rolnicze mogą być spalane wyłącznie w kotłach o wydajności grzewczej przynajmniej 70 kW. Takie urządzenia wymagają dopuszczenia i powinny spełniać bardziej rygorystyczne limity emisji według Rysunku 742, Załącznik 2 do OPAC. |     |    | 0 |

**Wyniki pomiaru:** EEI Pellets\_ 8 kW - Pellet drzewny - C1

| Wydajność<br>grzewcza kotła | Wartości średnie emisji |             |                              |                                          |                              |
|-----------------------------|-------------------------|-------------|------------------------------|------------------------------------------|------------------------------|
|                             | Wartości zmierzone      |             |                              | Wartości przeliczone O <sub>2</sub> =13% |                              |
|                             | O <sub>2</sub><br>[%]   | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]               | Dust<br>[mg/m <sup>3</sup> ] |
| Nominalna                   | 8.11                    | 134         | 42                           | 104                                      | 26                           |
| Minimalna                   | 14.04                   | 229         | 21                           | 329                                      | 24                           |

Ocena po badaniu:

Zmierzone wartości emisyjne kotła EEI Pellets\_ 8 kW - Pellet drzewny - C1 **przekraczają** specyfikowane wartości.

**Wyniki pomiaru:** EEI Pellets 10 kW - Pellet drzewny - C1

| Wydajność<br>grzewcza kotła | Wartości średnie emisji |             |                              |                                          |                              |
|-----------------------------|-------------------------|-------------|------------------------------|------------------------------------------|------------------------------|
|                             | Wartości zmierzone      |             |                              | Wartości przeliczone O <sub>2</sub> =13% |                              |
|                             | O <sub>2</sub><br>[%]   | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]               | Dust<br>[mg/m <sup>3</sup> ] |
| Nominalna                   | 8.30                    | 66          | 42                           | 52                                       | 27                           |
| Minimalna                   | 14.04                   | 229         | 21                           | 329                                      | 24                           |

Ocena po badaniu:

Zmierzone wartości emisyjne kotła EEI Pellets 10 kW - Pellet drzewny - C1 **przekraczają** specyfikowane wartości.



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Akredytowany nr  
próby:

**T 001\***

Tytuł próby:

**Próba działania elementów sterowniczych, regulacyjnych i  
zabezpieczających**

**Próba wydajności spalania - emisje**

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Metoda badawcza:

ČSN EN 303-5:2013

Art. 5.13, 5.14, 5.16.1, 5.16.2, 5.16.3

ČSN EN 303-5:2013

Art. 5.9, 5.10.4

Zbadana próbka:

EEl Pellets 8 kW, EEl Pellets 10kW

Zastosowane urządzenia pomiarowe:

Rozdział III - Urządzenia pomiarowe i badawcze

**Wyniki badań:**

| Wymóg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Wskazanie wymogu                          | Ocena badawcza | Uwagi |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------|-------|
| <p><b>Sprawdzenie funkcyjne sterownika temperaturowego oraz ogranicznika temperatury kotła</b></p> <p>Prędkość przepływu po stronie wody powinna odpowiadać wartości specyfikowanej dla próby nominalnej wydajności grzewczej. Temperatura przepływu rzędu 75 °C nie powinna być przekroczona na początku próby.</p> <p>Należy regulować palenie tak, by odpowiadało ono nominalnej wydajności grzewczej kotła, <math>Q_N</math>. Należy osiągnąć stan stabilny, a ciśnienie na sekcji wylotu gazu spalinowego powinno odpowiadać nominalnemu ustawieniu wydajności cieplnej. W przypadku kotłów zasilanych manualnie, przed rozpoczęciem próby kocioł należy ponownie zasilić do pełna po osiągnięciu stanu stabilności.</p> <p>Moc rozproszona powinna być zmniejszona do <math>(40 \pm 5) \%</math> nominalnej wydajności cieplnej kotła, przy pompie obiegowej pracującej w trybie ciągłym; regulator temperatury ustawiony na maksymalną wartość nastawową.</p> <p>Przy regulatorze temperatury pracującym normalnie, mierzona temperatura przepływu nie powinna przekroczyć 100 °C; samoczynne odcięcie, bezpiecznik temperaturowy lub urządzenie do rozpraszania nadmiernego ciepła nie powinny zostać wyzwolone.</p> <p>Należy powtórzyć próbę przy sterowniku temperatury wyłączonym. Tym razem należy sprawdzić, czy ogranicznik - wykrywacz temperatury wyłącza układ palenia przy najwyższej wartości specyfikowanej przez producenta kotła, oraz czy zapobiegnięto niebezpiecznym stanom roboczym (patrz 4.1).</p> | <p>ČSN EN 303-5:2013</p> <p>Art. 5.13</p> | <p>+</p>       |       |

**Laboratorium Testowe**

**Workplace Brno, Hudcova 424/56b, 621 00 Brno**

Protokół 32-0325

Strona 47 z 52

| Wymóg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Specyfikacja wymogu                       | Ocena po badaniu | Uwaga |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|------------------|-------|
| <p><b>Próba działania szybko odłączalnego układu palenia</b></p> <p>-Nagły zanik rozpraszania ciepła</p> <p>Prędkość przepływu po stronie wody powinna odpowiadać wartości specyfikowanej dla próby nominalnej wydajności grzewczej. Temperatura przepływu rzędu 75 °C nie powinna być przekroczona na początku próby.</p> <p>Należy dostosować palenie tak, by odpowiadało ono nominalnej wydajności grzewczej <math>Q_N</math> kotła, by osiągnięty został stan stabilnej pracy oraz by ciśnienie wylotowe na czopie gazów palnych odpowiadało znamionowej wydajności cieplnej.</p> <p>Pobór ciepła ustawiony na 0; obieg wody w kotle dopuszczony; sterownik temperatury ustawiony na maksymalną nastawę zalecaną przez producenta.</p> <p>Należy sprawdzić, czy zabezpieczenie ograniczające temperaturę lub sterownik temperaturowy odłączają układ palenia, oraz czy zapobiegnięto wszelkim niebezpiecznym stanom pracy.</p> <p>-Utrata zasilania elektrycznego</p> <p>Prędkość przepływu po stronie wody powinna odpowiadać wartości specyfikowanej dla próby nominalnej wydajności grzewczej. Temperatura przepływu rzędu 75 °C nie powinna być przekroczona na początku próby.</p> <p>Należy dostosować palenie tak, by odpowiadało nominalnej wydajności grzewczej <math>Q_N</math> kotła, by osiągnięty został stan stabilnej pracy oraz by ciśnienie wylotowe w sekcji gazów palnych odpowiadało znamionowej wydajności cieplnej.</p> <p>Sprawdzić czy nie występują niebezpieczne stany pracy po odcięciu zasilania, w tym obiegu.</p> <p>Przy ocenie temperatur i stężeń CO należy uwzględnić wyłącznie wartości średnie przy maksymalnym średnim czasie jednej minuty.</p> | <p>ČSN EN 303-5:2013</p> <p>Art. 5.14</p> | +                |       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                      |          |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------|--|
| <p><b>Próba bezpieczeństwa konsekwencji przeładowania paliwem oraz skutków zablokowania zasilania paliwa</b></p> <p>Bezpieczeństwo kotła należy sprawdzać przy pracy ciągłej urządzenia oraz przy prędkości zasilania paliwa urządzenia zasilającego ustawionej na maksymalną możliwą wydajność, przy uwzględnieniu awarii, oraz analiz ryzyka i bezpieczeństwa elektrycznego. W przypadku, gdy w drodze analizy ryzyka również inne prędkości zasilania paliwa, niższe niż maksymalna, zostaną skategoryzowane jako krytyczne, je także należy poddać badaniu.</p> <p>Sprawność zabezpieczenia odcinającego paliwo powinna polegać na zapobieganiu zapłonowi po zwolnieniu paliwa, w przypadku, gdy w komorze spalania nie występuje żadne spalanie lub jest ono niedostateczne.</p> <p>Próba zablokowanej linii przesyłu paliwa powinna zostać wykonana poprzez wyłączenie urządzenia zasilającego.</p> <p><b>Wymagane jest spełnienie wymogów wskazanych w punkcie 4.3.4.</b></p> | <p>ČSN EN 303-5:2013 Art. 5.16.2</p> | <p>+</p> |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------|--|

| Wymóg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Wskazanie wymogu              | Ocena po badaniu | Uwaga |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------|-------|
| <b>Zanik zasilania powietrza spalania</b><br><br>Bezpieczeństwo kotła grzewczego powinno być sprawdzane przy maksymalnym cieple wejściowym, w następujących warunkach:<br><br>-awaria wentylatora powietrza spalania;<br><br>-awaria zamknięcia regulowanego zasilania powietrza spalania.<br><br>W każdym przypadku, symulowana powinna być wyłącznie jedna awaria.<br><br>Stężenia CO w kotle nie powinny przekraczać 5% objętości.<br><br>Pomiar stężenia CO powinien być przeprowadzony w sekcji pomiaru gazu spalania.<br><br><b>Próba utraty zasilania powietrza spalania</b> | ČSN EN 303-5:2013 Art. 5.16.3 | +                |       |

Uwaga:

|   |               |
|---|---------------|
| + | Spełnia       |
| - | Nie spełnia   |
| 0 | Nie stosowane |
| X | Nie oceniono  |

**Wyniki pomiaru:**

| Sterownik temperatury |      |                                                 |
|-----------------------|------|-------------------------------------------------|
| Temperatura           | [°C] | Uwagi                                           |
| Nastawa               | 80.0 | Nastawa temperatury na regulatorze termostatu   |
| Odłączenie            | 84.9 | Wyłączenie wentylatora i zasilania paliwa (tryb |

|                    |      |                                            |
|--------------------|------|--------------------------------------------|
|                    |      | powstrzymania)                             |
| Przywrócenie pracy | 70.0 | Wentylator i zasilanie paliwem przywrócone |

| Ogranicznik temperatury (manualne przywrócenie temperatury) - STB |                                                                                                                                                               |                                                    |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Temperatura                                                       | [°C]                                                                                                                                                          | Uwagi:                                             |
| Nastawa                                                           | 90                                                                                                                                                            | Ustawienie temperatury na ograniczniku temperatury |
| Odłączenie                                                        | 93.1                                                                                                                                                          | Wyłączenie wentylatora i zasilania paliwa          |
| Przywrócenie pracy                                                | Bezpowrotne wyłączenie kotła. W celu przywrócenia pracy konieczna interwencja manualna po spadku temperatury poniżej temperatury przełączeniowej ogranicznika |                                                    |

**Ocena po badaniu:** Prawidłowe funkcjonowanie elementów bezpieczeństwa zostało zweryfikowane.

|                                                |                           |                  |
|------------------------------------------------|---------------------------|------------------|
| Osoba badająca: Inż. Michal Havlu              | Dnia: 04/2017,<br>03/2018 | Podpisano: _____ |
| Osoba<br>zatwierdzająca: Inż. Stanislav Buchta | Dnia: 06/2018             | Podpisano: _____ |

#### **V. Wykaz materiałów źródłowych**

Badania zostały przeprowadzone na podstawie

-Zlecenia B-61427 z dnia 2018-01-25 (wpłynięcie 2018-01-19)

- Umowy B-61427/39

-ČSN EN 303-5:2013 - Kotły grzewcze - Część 5: Kotły grzewcze na paliwa stałe, zasilane manualnie i automatycznie, nominalna wydajność grzewcza do 500 kW - Terminologia, wymagania, badania i oznakowanie

-ČSN EN 15456 – Kotle grzewcze - Zużycie energii elektrycznej dla generatorów ciepła - Pomiary

Opracowanie:

Inż. Michal Havlu

Osoby wskazane poniżej ponoszą odpowiedzialność za prawdziwość przedstawionych powyżej danych:

**Milan Holomek**

Kierownik Stacji Badań Urządzeń Grzewczych i Ekologicznych

-Koniec tekstu-





## **TEST REPORT**

### **39-10942/T1**

**Product:** Hot-water boiler for solid fuel (wood pellets – C1)

**Type designation:** EEI Pellets 16 kW

**Versions:** -

**Customer:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Giżycko  
Poland

**Manufacturer:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Giżycko  
Poland

**Person responsible for re-view and evaluation:** Ing. Stanislav Buchta

**Report issue date:** 2016-08-09

**Distribution list:** 1 copy to the Engineering Test Institute  
1 copy to the Customer

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The results of tests and the evaluations relate only to the products tested.  
(\*\*) Thus indicated parts of the Report contain findings verified otherwise than by tests within the meaning of ČSN EN ISO/IEC 17025.



The tests were conducted on the basis of Order B-56724 dated 2016-08-03 (received on 2016-08-03), Contract B-56724/39.

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

The hot-water boilers for solid fuel (wood pellets - C1) with automatic fuel supply, EEI Pellets 16 kW are intended for heating of family houses, office buildings, small businesses, etc.

The body of boiler is from welded steel sheets. The boiler is de-signed for burning of wood pellets – C1. The burner for wood pellets is situated on the side in the lower part of the boiler, combustion air is provided by the fan, pellets are supplied by a screw feeder from fuel hopper. The hot flue gas goes through the boiler body from combustion chamber to heat exchanger. The flue gas leaves the boiler through the socked situated at the rear side of the boiler. Water connections are at the rear of the boiler.

Boiler body is insulated with mineral insulation. The covering is made of steel sheets. Electronic control unit is situated in the upper part of the front side of the boiler.

Further detailed descriptions of individual assembly groups are provided in the enclosed technical documentation to Task 39-10746.

## **II. Sample tested**

Boiler output versions that are the subject of the proceedings:

(table 1)

| Boiler output version | Heat output | EKV No.           | Place of testing |
|-----------------------|-------------|-------------------|------------------|
| EEI Pellets 16 kW     | 15 kW       | 0211.15.16594.000 | SZÚ Brno         |

Visual inspection, testing and evaluation were carried out by Bc. Petr Matoušek, Test Engineer, at the test station of SZU in Brno, in 12/2015.

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



### **III. Measuring and test equipment**

| <b>No.</b> | <b>Description</b>                                  | <b>Inventory number</b> | <b>Calibration valid until</b>        | <b>Accuracy</b>                        |
|------------|-----------------------------------------------------|-------------------------|---------------------------------------|----------------------------------------|
| 1.         | Combustion product analyser, Horiba, type ENDA-680P | 022394                  | calibration prior to each measurement | see CRM 190/16<br>see CRM 103000414644 |
| 2.         | Weighing machine                                    | 022331                  | 05/2018                               | see KL 6051-KL-H0184-16                |
| 3.         | Induction flow meter                                | 022389-C/1              | 10/2017                               | see KL 6015-KL-P0446-13                |
| 4.         | Temperature measurement set                         | 022399-D/8              | 11/2017                               | see KL 140074                          |
| 5.         | Thermometer, Moisture meter                         | 116258                  | 12/2018                               | see KL 10280/2015                      |
| 6.         | Barometer                                           | 112541                  | 01/2019                               | see KL 6013-KL-K0001-14                |
| 7.         | Draught gauge                                       | MaR11-Tah               | 05/2017                               | see KL 6013-KL-C0349-15                |
| 8.         | Electronic stop watch                               | 990760                  | 11/2017                               | see KL 2955E-12                        |
| 9.         | Gravimat SHC 501                                    | 022328                  | 04/2018                               | see KL 150046-150050                   |
| 10.        | Analytic weighing machine Sartorius                 | 021682                  | 06/2017                               | see KL 24/KA-15                        |
| 11.        | Electronic thermometer                              | 116557                  | 03/2019                               | see KL 160066                          |
| 12.        | Electrometer                                        | 022389-A/4              | 05/2025                               | see KL 039/15/E                        |
| 13.        | Induction water meter                               | 116320                  | 04/2018                               | see KL Q 0254/2012                     |
| 14.        | Weighing machine                                    | 022151                  | 02/2017                               | see KL 6051-KL-H0115-15                |
| 15.        | Weighing machine                                    | 022211                  | 02/2017                               | see KL 6051-KL-H0113-15                |





#### IV. Results of tests and evaluation

| No. | Requirement                                                                                                   | Technical standard,<br>regulation applied                                                     | Source<br>materi-<br>als | Evaluation |                 |
|-----|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------|------------|-----------------|
|     |                                                                                                               |                                                                                               |                          | Test       | Evalua-<br>tion |
| 7.  | Pressurized component tightness and strength test (1001.1*)                                                   | ČSN EN 303-5:2013<br>Art. 5.4, 5.4.1, 5.4.2                                                   | Page 5                   | +          |                 |
| 8.  | Surface temperature test (1003*)                                                                              | ČSN EN 303-5:2013<br>Art. 5.12, 5.16.4, 4.3.6                                                 | Pages 6 - 7              | +          |                 |
| 9.  | Test of heat output, input and efficiency(1004.1*)<br>Test of combustion product temperature (1004.2*)        | ČSN EN 303-5:2013<br>Art. 4.4.2, 4.4.3, 5.7, 5.8, 5.10<br>ČSN EN 303-5:2013<br>Art. 4.4.3     | Pages 8 – 10             | +          |                 |
| 10. | Combustion efficiency test – emissions (1005.1*)                                                              | ČSN EN 303-5:2013<br>Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4                                    | Pages 11 – 12            | +          |                 |
| 11. | Test of heat output, input and efficiency (1004.1*)<br><br>Combustion efficiency test – emissions (1005.1*)   | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.2, C.2.3                         | Pages 13 – 14            | +          |                 |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>C.3 Deviation from Croatia                                   | -                        | 0          |                 |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark , C.4.1, C.4.2                        | Pages 15 – 16            | +          |                 |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Germany, C.5.1, C.5.2                         | Pages 17 - 18            | +          |                 |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C<br>C.6 Deviation from Switzerland                                | Pages 19 - 20            | +          |                 |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C<br>C.8 Deviation from Italy                                      | -                        | 0          |                 |
| 12. | Test of control, regulation and safety elements (1006.1*)<br>Combustion efficiency test – emissions (1005.1*) | ČSN EN 303-5:2013<br>Art. 5.13, 5.14, 5.16.2, 5.16.3<br>ČSN EN 303-5:2013<br>Art. 5.9, 5.10.4 | Pages 21 - 23            | +          |                 |
| 13. | Test of hydraulic pressure drop (1001.3*)                                                                     | ČSN EN 303-5:2013<br>Art. 4.2.4.9                                                             | Page 24                  | +          |                 |

Note:

No.: 1 - 6

(\*\*) Not a test

Evaluation:

+ Requirement fulfilled  
- Requirement not fulfilled  
x Not assessed  
0 Not applicable



Accredited test  
number:

**1001.1\*** Test title: **Pressurized component tightness and strength test**

Test method:

ČSN EN 303-5:2013  
Art. 5.4, 5.4.1, 5.4.2

Sample tested:

EEI Pellets 16 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Requirement specification    | Test evaluation                                    | Note                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------------------------------------|-----------------------------------|
| <b>Pressure test for boilers of sheet or sheet metal of non-ferrous metal</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ČSN EN 303-5:2013 Art. 5.4   |                                                    |                                   |
| <b>Tests to be carried out before production</b><br>The type test pressure is $2 \times PS$ using hydraulic pressure where $PS$ is the maximum permissible operating pressure. The test period shall be at least 10 min and if it is to apply to a range of boilers, the test shall be carried out on at least 3 boiler sizes (smallest, medium, and largest size). No leakage or noticeable permanent deformation shall occur during the test.<br><br>A record shall be made of the test, including the following details:<br>- exact description of the boiler tested by stating the drawing number;<br>- test pressure in bar and duration of the test;<br>- test result;<br>- place and date of the test, including the names of persons carrying out the test.<br>The test report shall be signed by, as a minimum, the works tester responsible and one witness. | ČSN EN 303-5:2013 Art. 5.4.1 | +<br><br><br><br><br><br><br>+<br>+<br>+<br>+<br>+ | Enclosed technical documentation. |
| <b>Test during production</b><br>Each boiler shall be tested during the production and the test pressure shall be at least $1.43 \times PS$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ČSN EN 303-5:2013 Art. 5.4.2 | +                                                  |                                   |

**Test evaluation:**

No leakages or visible permanent deformations appeared during the test.



Accredited test  
number:

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

Test method:

ČSN EN 303-5:2013 Art. 5.12, 5.16.4, 4.3.6

Sample tested:

EEI Pellets 16 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Requirement specification     | Test evaluation | Note |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|------|
| <b>Surface temperature</b><br>The mean surface temperature shall be measured at nominal heat output. In order to do this, a minimum of 5 points on each boiler surface shall be measured. Under the same conditions, the critical temperatures (e.g. boiler doors, operating levers) shall be measured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ČSN EN 303-5:2013 Art. 5.12   | +               |      |
| The surface temperature on the outside of the boiler (including the bottom and doors but not including the flue gas outlet and maintenance openings of natural draft boilers) shall not exceed the room temperature by more than 60 K when tested in accordance with 5.12. The requirement for the bottom is not applicable for instances when the manufacturer declares that the boiler is to be installed on a non-combustible base.<br>When tested in accordance with 5.12, the surface temperature of operating levers and all parts which shall be touched by hand during operation of the boiler shall not exceed the room temperature by more than the following values: <ul style="list-style-type: none"> <li>- 35 K for metals and similar materials;</li> <li>- 45 K for porcelain and similar materials;</li> <li>- 60 K for plastics and similar materials.</li> </ul> | ČSN EN 303-5:2013 Art. 4.3.6  | +               |      |
| <b>Resistance to thermal conductance</b><br>Temperature measurement shall be performed on the surface of the stoking device at the place next to the fuel line but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber.<br>For boilers with integrated hopper, the temperature measurement shall be performed on the surface of the stoking device at the place next to the integrated hopper but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber. In addition, the highest surface temperature of the hopper shall be measured.                                                                                                                                                                                  | ČSN EN 303-5:2013 Art. 5.16.4 | +               |      |





**Measurement results:** EEI Pellets 16 kW

| Average temperatures of boiler walls, doors and covers (°C): |                   |         |
|--------------------------------------------------------------|-------------------|---------|
| Boiler type                                                  | EEI Pellets 16 kW |         |
| Fuel type                                                    | Wood Pellets - C1 |         |
| Heat output                                                  | Nominal           | Minimal |
| ambient temperature (°C)                                     | 25,0              | 25,2    |
| humidity (%)                                                 | 29,7              | 29,9    |
| air pressure (kPa)                                           | 100,03            | 99,76   |
| Front wall                                                   | 29,5              | 27,6    |
| Rear wall                                                    | 32,3              | 31,3    |
| Right wall                                                   | 35,1              | 33,3    |
| Left wall                                                    | 35,1              | 32,8    |
| Upper wall                                                   | 32,3              | 30,3    |
| Lower wall                                                   | 42,4              | 39,7    |
| Temperatures of control elements (°C):                       |                   |         |
| Handle of front cover (plastic)                              | 30                |         |
| Handle of upper door (plastic)                               | 75                |         |
| Handle of lower door (plastic)                               | 85                |         |
| El. control panel (plastic)                                  | 30                |         |
| Safety temperature limiter - STB (plastic)                   | 29                |         |

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

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

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



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1004.2\*** **Test of combustion product temperature**

Test method: ČSN EN 303-5:2013 Art. 4.4.2, 4.4.3, 5.7 to 5.10

Sample tested: EEI Pellets 16 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

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

| Test:                                                  | I.                       | II.     |
|--------------------------------------------------------|--------------------------|---------|
| Boiler type:                                           | EEI Pellets 16 kW        |         |
| Output tested:                                         | Nominal                  | Minimum |
| Fuel type:                                             | <b>Wood pellets - C1</b> |         |
| Combustion period, (automatic) stoking                 | Minimally 6 hours        |         |
| Nominal heat output (specified by manufacturer) [ kW ] | 15                       | 15      |
| Flue gas temperature [ °C ]                            | 112,9                    | 72,7    |
| Fuel mass added [ kg/h ]                               | 3,295                    | 1,025   |
| Inlet water temperature [ °C ]                         | 56,1                     | 60,9    |
| Outlet water temperature [ °C ]                        | 74,4                     | 73,5    |
| Temperature of the entering cold water [ °C ]          | 11,9                     | 13,2    |
| Cooling water flow rate [ m <sup>3</sup> /h ]          | 0,6934                   | 0,3074  |
| Draught [ Pa ]                                         | 15,6                     | 12,0    |
| Ambient temperature [ °C ]                             | 25,0                     | 25,2    |
| Relative air humidity [ % ]                            | 29,7                     | 29,9    |
| Barometric pressure [ kPa ]                            | 100,03                   | 99,76   |

***Analysis of combustion products:***

| Test (period of burning) :              | I.    | II.   |
|-----------------------------------------|-------|-------|
| Oxygen O <sub>2</sub> [ % ]             | 5,52  | 12,03 |
| Carbon dioxide CO <sub>2</sub> [ % ]    | 14,85 | 8,54  |
| Carbon monoxide CO [ ppm ]              | 16    | 181   |
| Higher hydrocarbons THC/OGC [ ppm ]     | 2     | 5     |
| Nitrogen oxides NO <sub>x</sub> [ ppm ] | 113   | 59    |
| Sulfur oxides SO <sub>2</sub> [ ppm ]   | 0     | 0     |

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

| Test (period of burning) :                                              | I.    | II.   |
|-------------------------------------------------------------------------|-------|-------|
| Stoichiometric oxygen volume [ m <sup>3</sup> /kg ]                     | 0,935 | 0,935 |
| Stoichiometric air volume [ m <sup>3</sup> /kg ]                        | 4,452 | 4,454 |
| Stoichiometric volume of dry combustion products [ m <sup>3</sup> /kg ] | 4,371 | 4,373 |
| Maximum content of CO <sub>2</sub> [ % ]                                | 19,52 | 19,52 |





|                                                    |                        |       |       |
|----------------------------------------------------|------------------------|-------|-------|
| Stoichiometric air multiple                        | [ - ]                  | 1,35  | 2,31  |
| Volume of dry combustion products. actual          | [ m <sup>3</sup> /kg ] | 5,745 | 9,976 |
| Content of H <sub>2</sub> O in combustion air      | [ m <sup>3</sup> /kg ] | 0,057 | 0,100 |
| Content of H <sub>2</sub> O in combustion products | [ m <sup>3</sup> /kg ] | 0,849 | 0,892 |

**Calculated values - thermal overview**

|                                              |               |             |             |
|----------------------------------------------|---------------|-------------|-------------|
| Test (period of burning) :                   |               | I.          | II.         |
| Loss of sensible heat of combustion products | [ % ]         | 4,7         | 4,1         |
| Loss of gas underburning                     | [ % ]         | 0,0         | 0,1         |
| Loss of mechanical underburning              | [ % ]         | 0,2         | 0,2         |
| Loss of heat transfer into environment       | [ % ]         | 2,0         | 4,8         |
| Total loss                                   | [ % ]         | 6,9         | 9,2         |
| Efficiency – indirect method                 | [ % ]         | 93,1        | 90,8        |
| Fuel mass added - actual                     | [ kg/h ]      | 3,314       | 1,031       |
| Heat input                                   | [ kW ]        | 15,7        | 4,9         |
| <b>Heat output</b>                           | <b>[ kW ]</b> | <b>14,5</b> | <b>4,4</b>  |
| Uncertainty of determining heat output       | [ kW ]        | 0,6         | 0,2         |
| <b>Efficiency – direct method</b>            | <b>[ % ]</b>  | <b>92,2</b> | <b>90,3</b> |
| Output / nominal output                      | [ % ]         | 96,6        | 29,4        |

At nominal output, when burning **Wood pellets – C1**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5:2013, Fig. 1.

**Test evaluation:**

The measured heat output is within the  $\pm 8\%$  tolerance;  
Boiler Class 5;  
At nominal output, combustion product temperature is less than 160 K above the ambient temperature;  
When burning Wood pellets – C1, the period of burning is more than 6 hours;  
The minimum heat output is less than 30% of nominal heat output.



**Test results:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| EEI Pellets 16 kW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |
| <b>Electricity consumption</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |
| During the tests, the electrical consumption shall be determined according to EN 15456. The values for maximum consumption, for stand-by, nominal heat output and minimum heat output shall be stated in the test report. For boilers with automatic feeding systems (fuel line), the electrical consumption of the boiler and the fuel line shall be determined and stated separately. The average electrical power consumption during stand by shall be measured for a minimum duration of 10 min and shall be stated in watts. In cases where control operations influence the intrinsic energy consumption, a longer duration might be necessary. |       |
| Maximum electrical input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 492 W |
| Electrical input at nominal heat output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 82 W  |
| Electrical input at minimum heat output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 23 W  |
| Electrical input for STAND BY mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2 W   |
| Maximum electrical input for ignition system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 347 W |
| Maximum electrical input for fuel supply (fuel line)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 115 W |

**Fuel analysis**

| Fuel type                                                                     | Wood pellets – C1 |                 |         |             |
|-------------------------------------------------------------------------------|-------------------|-----------------|---------|-------------|
| Analytical indicator                                                          | Symbol            | Unit            | Value   | Uncertainty |
| Higher heating value                                                          | $Q_s$             | [ MJ/kg ]       | 18,63   | 0,14        |
| Lower heating value                                                           | $Q_j$             | [ MJ/kg ]       | 17,07   | 0,14        |
| All water in original condition                                               | $W_t^r$           | [ % by weight ] | 7,20    | 0,04        |
| Ash                                                                           | A                 | [ % by weight ] | 0,47    | 0,01        |
| Carbon                                                                        | C                 | [ % by weight ] | 46,23   | 0,25        |
| Hydrogen                                                                      | H                 | [ % by weight ] | 6,33    | 0,10        |
| Nitrogen                                                                      | N                 | [ % by weight ] | 0,07    | 0,10        |
| Sulphur                                                                       | S                 | [ % by weight ] | 0,035   | 0,000       |
| Chlorine                                                                      | Cl                | [ % by weight ] | 0,007   | 0,000       |
| Oxygen – calculation for 100%                                                 | O                 | [ % by weight ] | 39,66   |             |
| Conversion factor $f_{emis}$ for emissions in [mg/m <sup>3</sup> ] to [mg/MJ] | $f_{emis}$        | [ - ]           | 0,25688 |             |

Note: Sample in original condition

**Measurement uncertainty:** Specified in Measurement results

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





Accredited test  
number:

**1005.1\*** Test title: **Combustion efficiency test - emissions**

Test method:

ČSN EN 303-5:2013  
Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4

Sample tested:

EEL Pellets 16 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

| Requirement                                                                                                                                                                                                                                                                                                                                               | Requirement specification    | Test evaluation | Note |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|------|
| <b>Emission limits</b><br>Combustion shall be of low-emission. This requirement shall be satisfied if the emission values shown in Table 6 are not exceeded when operating at nominal heat output or, in the case of boilers with heat output range, when operating at nominal heat output and minimum heat output, in accordance with 5.7, 5.9 and 5.10. | ČSN EN 303-5:2013 Art. 4.4.7 | +               |      |

Table 6

| Stoking   | Fuel     | Nominal heat output | Emission limits                         |       |       |         |       |       |       |       |       |
|-----------|----------|---------------------|-----------------------------------------|-------|-------|---------|-------|-------|-------|-------|-------|
|           |          |                     | CO                                      |       |       | OGC/THC |       |       | Dust  |       |       |
|           |          |                     | mg/m <sup>3</sup> at 10% O <sub>2</sub> |       |       |         |       |       |       |       |       |
|           |          |                     | Class                                   | Class | Class | Class   | Class | Class | Class | Class | Class |
|           |          | kW                  | 3                                       | 4     | 5     | 3       | 4     | 5     | 3     | 4     | 5     |
| Manual    | Biogenic | ≤ 50                | 5000                                    | 1200  | 700   | 150     | 50    | 30    | 150   | 75    | 60    |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 100     |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 100     |       |       |       |       |       |
|           | Fossil   | ≤ 50                | 5000                                    |       |       | 150     |       |       | 125   |       |       |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 100     |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 100     |       |       |       |       |       |
|           |          |                     |                                         |       |       |         |       |       |       |       |       |
| Automatic | Biogenic | ≤ 50                | 3000                                    | 1000  | 500   | 100     | 30    | 20    | 150   | 60    | 40    |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 80      |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 80      |       |       |       |       |       |
|           | Fossil   | ≤ 50                | 3000                                    |       |       | 100     |       |       | 125   |       |       |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 80      |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 80      |       |       |       |       |       |
|           |          |                     |                                         |       |       |         |       |       |       |       |       |

NOTE 1: The dust values in this Table are based on the experience of the gravimetric filter method. The method used needs to be referred to in the test report. The particulate matter emission measured according to this European Standard does not include condensable organic compounds which may form additional particulate matter when the flue gas is mixed with ambient air. The values are therefore not directly comparable with values measured by dilution tunnel methods. Neither can they be directly translated into ambient air particulate concentrations.

NOTE 2: Additional test methods and emission limits which apply in some countries are given in the A-Deviations in Annex C.

<sup>a</sup> Referred to dry exit flue gas, 0 °C, 1013 mbar.

<sup>b</sup> Boilers of class 3 for type E-fuels according to 1.2.1 or e-fuels according to 1.2.3 in this Table and marked with the classification E-fuels and e-fuels do not need to fulfil the requirements for the dust emissions. The actual value shall be stated in the technical documentation and shall not exceed 200 mg/m<sup>3</sup> at 10 % O<sub>2</sub>.



**Measurement results:** EEI Pellets 16 kW – Wood pellets – C1

| Boiler output | Average values     |                     |          |               |                       |                           |                                      |                              |                                      |                           |
|---------------|--------------------|---------------------|----------|---------------|-----------------------|---------------------------|--------------------------------------|------------------------------|--------------------------------------|---------------------------|
|               | Measured values    |                     |          |               |                       |                           | Converted values O <sub>2</sub> =10% |                              |                                      |                           |
|               | O <sub>2</sub> [%] | CO <sub>2</sub> [%] | CO [ppm] | OGC/THC [ppm] | NO <sub>x</sub> [ppm] | Dust [mg/m <sup>3</sup> ] | CO [mg/m <sup>3</sup> ]              | OGC/THC [mg/m <sup>3</sup> ] | NO <sub>x</sub> [mg/m <sup>3</sup> ] | Dust [mg/m <sup>3</sup> ] |
| Nominal       | 5,52               | 14,85               | 16       | 2             | 113                   | 29                        | 14                                   | 2                            | 165                                  | 20                        |
| Minimum       | 12,03              | 8,54                | 181      | 5             | 59                    | 19                        | 277                                  | 10                           | 149                                  | 23                        |

**Test evaluation:**

EEI Pellets 16 kW - Wood pellets - C1 meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5:2013 Table 6.



Accredited test number: **1004.1\*** Test title: **Test of heat output input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Austria, C.2.2, C.2.3

Sample tested: EEI Pellets 16 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                      |                                    | Requirement specification                                      | Test evaluation   |
|----------------------------------------------------------------------------------|------------------------------------|----------------------------------------------------------------|-------------------|
| Boiler efficiency for nominal heat output and minimum heat output                |                                    | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.2 | Wood Pellets – C1 |
| Boiler                                                                           | Minimum efficiency                 |                                                                | +                 |
| Heating boilers for solid fuels                                                  | 75 %                               |                                                                |                   |
| a) manually loaded                                                               |                                    |                                                                |                   |
| up to 10 kW                                                                      | 79 %                               |                                                                |                   |
| >10 to 200 kW                                                                    | (71.3 + 7.7 log P <sub>n</sub> ) % |                                                                |                   |
| >200 kW                                                                          | 89 %                               |                                                                |                   |
| a) automatically loaded                                                          |                                    |                                                                | +                 |
| up to 10 kW                                                                      | 80 %                               |                                                                |                   |
| >10 to 200 kW                                                                    | (72.3 + 7.7 log P <sub>n</sub> ) % |                                                                |                   |
| >200 kW                                                                          | 90 %                               |                                                                |                   |
| NOTE P <sub>n</sub> is the nominal heat output (Q <sub>n</sub> in this standard) |                                    |                                                                |                   |

| Requirement                                                                                                        |                                  |                                     |                    |                                     | Requirement specification                                      | Test evaluation   |
|--------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------------|--------------------|-------------------------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                                                                                    |                                  |                                     |                    |                                     | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.3 | Wood Pellets – C1 |
| Small burners used for solid fuels automatically loaded                                                            |                                  |                                     |                    |                                     |                                                                |                   |
| Parameter                                                                                                          | Emission limits<br>mg-MJ         |                                     |                    |                                     |                                                                |                   |
|                                                                                                                    | Wooden Wood Pellets Room heaters | Wooden Wood Pellets Central heaters | Other wooden fuels | Other standard-ised biogenous fuels |                                                                |                   |
| CO                                                                                                                 | 500 <sup>a</sup>                 | 250 <sup>a</sup>                    | 250 <sup>a</sup>   | 500 <sup>a</sup>                    |                                                                |                   |
| NO <sub>x</sub>                                                                                                    | 100                              | 100                                 | 100                | 300                                 |                                                                |                   |
| OGC/THC                                                                                                            | 30                               | 20                                  | 30                 | 20                                  |                                                                |                   |
| Dust                                                                                                               | 25                               | 20                                  | 30                 | 35                                  |                                                                |                   |
| <sup>a</sup> The limit value can be exceeded by 50 % during partial load operation at 30 % of nominal heat output. |                                  |                                     |                    |                                     |                                                                |                   |



**Measurement results:** EEI Pellets 16 kW – Wood pellets – C1

| Boiler output | Minimum efficiency | Measured efficiency |
|---------------|--------------------|---------------------|
| Nominal       | 81,4               | 92,2                |
| Minimum       |                    | 90,3                |

**Test evaluation:**

The measured efficiency of EEI Pellets 16 kW - Wood pellets - C1 is **higher** than required.

**Measurement results:** EEI Pellets 16 kW – Wood pellets – C1

| Boiler output | Average values          |             |                          |                  |                              |                                     |                            |                    |                 |
|---------------|-------------------------|-------------|--------------------------|------------------|------------------------------|-------------------------------------|----------------------------|--------------------|-----------------|
|               | Measured values         |             |                          |                  |                              | Converted values O <sub>2</sub> =0% |                            |                    |                 |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | NO <sub>x</sub><br>[ppm] | OGC/THC<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/MJ]                       | NO <sub>x</sub><br>[mg/MJ] | OGC/THC<br>[mg/MJ] | Dust<br>[mg/MJ] |
| Nominal       | 5,52                    | 16          | 113                      | 2                | 29                           | 7                                   | 81                         | 1                  | 10              |
| Minimum       | 12,03                   | 181         | 59                       | 5                | 19                           | 135                                 | 73                         | 5                  | 11              |

**Test evaluation:**

The measured emission values for EEI Pellets 16 kW - Wood pellets - C1 **do not exceed** the specified values.





Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Denmark, C.4.1, C.4.2

Sample tested: EEI Pellets 16 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                           | Requirement specification                                          | Test evaluation   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------|
| <b>Boiler Efficiency</b>                                                                                                                                                              | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark ,<br>C.4.1 | Wood Pellets – C1 |
| According to the Danish Construction Code BR08, Clause 8.5.1.4, Sub-clause 7, boilers for coal, coke, bio fuel or biomass shall have an efficiency equivalent to Class 3 in EN 303-5. |                                                                    |                   |
| <b>Minimum efficiency</b> <b>(67 + 6 log Qn) %</b>                                                                                                                                    |                                                                    |                   |
| For boilers above 300 kW, the requirement corresponding to 300 kW shall be used.                                                                                                      |                                                                    |                   |

| Requirement                                                                                                             |          |                     |                                         |         | Requirement specification                                          | Test evaluation   |      |
|-------------------------------------------------------------------------------------------------------------------------|----------|---------------------|-----------------------------------------|---------|--------------------------------------------------------------------|-------------------|------|
| Emission limits                                                                                                         |          |                     |                                         |         |                                                                    | Wood Pellets – C1 |      |
| According to the Danish EPA Statutory Order no. 1432 of 11-12-2007, only Class 3 (or higher) is acceptable for Denmark. |          |                     |                                         |         | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark ,<br>C.4.2 |                   |      |
| Stoking                                                                                                                 | Fuel     | Nominal heat output | Emission limit values <sup>a</sup>      |         |                                                                    |                   |      |
|                                                                                                                         |          |                     | CO                                      | OGC/THC |                                                                    |                   | Dust |
|                                                                                                                         |          | kW                  | mg·m <sup>3</sup> at 10% O <sub>2</sub> |         |                                                                    |                   |      |
|                                                                                                                         |          |                     | Class                                   |         |                                                                    |                   |      |
| Manual                                                                                                                  | Biogenic | ≤ 50                | 5000                                    | 150     |                                                                    |                   | 150  |
|                                                                                                                         |          | > 50 to 150         | 2500                                    | 100     |                                                                    |                   |      |
|                                                                                                                         |          | > 150 to 300        | 1200                                    |         |                                                                    |                   |      |
|                                                                                                                         | Fossil   | ≤ 50                | 5000                                    | 150     |                                                                    |                   | 125  |
|                                                                                                                         |          | > 50 to 150         | 2500                                    | 100     |                                                                    |                   |      |
|                                                                                                                         |          | > 150 to 300        | 1200                                    |         |                                                                    |                   |      |
| Automatic                                                                                                               | Biogenic | ≤ 50                | 3000                                    | 80      | 150                                                                |                   |      |
|                                                                                                                         |          | > 50 to 150         | 2500                                    |         |                                                                    |                   |      |
|                                                                                                                         |          | > 150 to 300        | 1200                                    |         |                                                                    |                   |      |
|                                                                                                                         | Fossil   | ≤ 50                | 3000                                    | 100     | 125                                                                |                   |      |
|                                                                                                                         |          | > 50 to 150         | 2500                                    | 80      |                                                                    |                   |      |
|                                                                                                                         |          | > 150 to 300        | 1200                                    |         |                                                                    |                   |      |
| <sup>a</sup> Referring to dry exit flue gas, 0 °C, 1 013 mbar.                                                          |          |                     |                                         |         |                                                                    |                   |      |

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



**Measurement results:** EEI Pellets 16 kW – Wood pellets - C1

| Boiler output | Minimum efficiency | Measured efficiency |
|---------------|--------------------|---------------------|
| Nominal       | 74,1               | 92,2                |
| Minimum       |                    | 90,3                |

**Test evaluation:**

Measured efficiency for EEI Pellets 16 kW - Wood pellets - C1 is **higher** than required.

**Measurement results:** EEI Pellets 16 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                  |                              |                                      |                                 |                              |
|---------------|-------------------------|-------------|------------------|------------------------------|--------------------------------------|---------------------------------|------------------------------|
|               | Measured values         |             |                  |                              | Converted values O <sub>2</sub> =10% |                                 |                              |
|               | O <sub>2</sub><br>[%]   | CO<br>[ppm] | OGC/THC<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]           | OGC/THC<br>[mg/m <sup>3</sup> ] | Dust<br>[mg/m <sup>3</sup> ] |
| Nominal       | 5,52                    | 16          | 2                | 29                           | 14                                   | 2                               | 20                           |
| Minimum       | 12,03                   | 181         | 5                | 19                           | 277                                  | 10                              | 23                           |

**Test evaluation:**

The measured emission values for EEI Pellets 16 kW - Wood pellets - C1 **do not exceed** the specified values.





Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Germany, C.5.1, C.5.2

Sample tested: EEI Pellets 16 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                         |                       |                     | Requirement specification                                      | Test evaluation   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|---------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                         |                       |                     |                                                                | Wood Pellets – C1 |
| Table 7 – Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                         |                       |                     | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Germany, C.5.1 |                   |
| The emission limits are regulated in Chapter 2, paragraphs 4, 5 and Annex 2 of the German Immission Control Ordinance "Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen - 1. BImSchV)". Boilers operated with solid fuels shall only be installed, possess the quality and be put into operation if they fulfil the following specifications of the 1. BImSchV: |                     |                         |                       |                     |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fuel acc. to §3 (1) | Nominal output range kW | Dust g/m <sup>3</sup> | CO g/m <sup>3</sup> |                                                                |                   |
| Stage 2: Appliances, which will be installed after 31.12.2014                                                                                                                                                                                                                                                                                                                                                                              | Numbers 1 to 5a     | ≥ 4                     | 0.02                  | 0.4                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers 6 to 7      | ≥ 30 ≤ 500              | 0.02                  | 0.4                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     | > 500                   | 0.02                  | 0.3                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers 8 to 13     | ≥ 4 < 100               | 0.02                  | 0.4                 |                                                                |                   |
| NOTE Differing from sentence 1 for firing systems (appliances) which will exclusively be fired by fuels according §3 article 1 Number 4 in the form of split logs, the limits according Stage 2 apply for firing systems (appliances) if they are installed after 31.12.2016.                                                                                                                                                              |                     |                         |                       |                     |                                                                |                   |



**Measurement results:** EEI Pellets 16 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                              |                                      |                             |
|---------------|-------------------------|-------------|------------------------------|--------------------------------------|-----------------------------|
|               | Measured values         |             |                              | Converted values O <sub>2</sub> =13% |                             |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[g/m <sup>3</sup> ]            | Dust<br>[g/m <sup>3</sup> ] |
| Nominal       | 5,52                    | 16          | 29                           | 0,010                                | 0,015                       |
| Minimum       | 12,03                   | 181         | 19                           | 0,201                                | 0,017                       |

**Test evaluation:**

The measured emission values for EEI Pellets 16 kW - Wood pellets - C1 **do not exceed** the specified values.



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C  
C.6 Deviation from Switzerland

Sample tested: EEI Pellets 16 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                               | Requirement specification                                      | Test evaluation   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------|
| <b>Emission limits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                               |                                                                |                   |
| Clause 4.4.7, Table 7<br>The emission limits are regulated in Annex 4 of the Swiss Ordinance on Air Pollution Control ([OAPC] SR 814.318.142.1) of 1985-12-16 (as at 2010-07-15). Boilers operated with woody biomass shall only be put on the market if they fulfil the following specifications of the OAPC:<br>– declarations of conformity (Figure 20 OAPC);<br>– Figures 1, 212, 23 Annex 4 OAPC;<br>– Figures 31, 32 Annex 5 OAPC.<br>Emissions for boilers operated with coal or wood fuels shall not exceed the following limits:                  |                                                                                                               | ČSN EN 303-5:2013<br>Annex C<br>C.6 Deviation from Switzerland | Wood Pellets - C1 |
| Type of installation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Particular requirements (emission limits) <sup>a</sup> for carbon monoxide (CO) and particulate matter (dust) |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CO (mg·m <sup>-3</sup> )      Dust (mg·m <sup>-3</sup> )                                                      |                                                                |                   |
| Boilers for log wood and boilers for coal, manual stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 800      50                                                                                                   |                                                                |                   |
| Boilers for chipped wood and boilers for coal, automatic stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 400      60                                                                                                   |                                                                |                   |
| Boilers for Wood Pellets, automatic stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 300      40                                                                                                   |                                                                | +                 |
| <sup>a</sup> Referred to oxygen basis:<br>– for boilers for natural state wood 13 % volume;<br>– for boilers for coal 7 % volume.                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                               |                                                                |                   |
| The sulphur content of coal, coal briquettes and coke shall not exceed 3 %. Boilers operated with non-woody biomass shall comply with the following specifications of the OAPC:<br>– Figures 741, 742, 743 Annex 2 OAPC;<br>– Figures 81, 82 Annex 3 OAPC.<br>According to Figure 743, Annex 2 OAPC, non-woody biomass, such as biogenic waste and products from agriculture, may only be burnt in boilers with a heat input of at least 70 kW. Such units need an approval and shall meet stronger emission limits according to Figure 742, Annex 2 OAPC. |                                                                                                               |                                                                | 0                 |



**Measurement results:** EEI Pellets 16 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                              |                                      |                              |
|---------------|-------------------------|-------------|------------------------------|--------------------------------------|------------------------------|
|               | Measured values         |             |                              | Converted values O <sub>2</sub> =13% |                              |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]           | Dust<br>[mg/m <sup>3</sup> ] |
| Nominal       | 5,52                    | 16          | 29                           | 10                                   | 15                           |
| Minimum       | 12,03                   | 181         | 19                           | 201                                  | 17                           |

**Test evaluation:**

The measured emission values for EEI Pellets 16 kW - Wood pellets - C1 **do not exceed** the specified values.





Accredited test number: **1006.1\*** Test title:  
**1005.1\*** **Function test of control, regulation and safety elements**  
**Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Art. 5.13, 5.14, 5.16.1, 5.16.2, 5.16.3  
ČSN EN 303-5:2013  
Art. 5.9, 5.10.4

Sample tested: EEI Pellets 16 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirement specification               | Test evaluation | Note |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------|------|
| <p><b>Function check of the temperature controller and safety temperature limiter at the boiler</b></p> <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test °C.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler. A steady state condition shall be reached and the outlet pressure at the flue gas section shall be according to the nominal heat output setting. For manual stoked boilers, the boiler shall be refuelled after reaching steady state with a full batch before starting the test.</p> <p>The dissipated output shall be reduced to <math>(40 \pm 5) \%</math> of the nominal heat output of the boiler, circulating pump running in continuous operation; temperature controller adjusted to maximum set value.</p> <p>When the temperature controller is operating normally, the measured flow temperature shall not exceed 100 °C; the safety temperature cut out or limiter or the device for dissipating excess heat shall not trigger.</p> <p>Repeat the test with the temperature controller out of function. This time, check if the safety temperature limiter-detector switches off the firing system at the highest value specified by the boiler manufacturers and if all hazardous operation states are avoided (see 4.1).</p> | <p>ČSN EN 303-5:2013<br/> Art. 5.13</p> | <p>+</p>        |      |



| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirement specification                 | Test evaluation | Note |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------|------|
| <p><b>Function test for the rapidly disconnectable firing system</b></p> <p>– Sudden absence of heat dissipation</p> <p>The water-side flow rate shall comply with that specified for the nominal output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler, a steady state condition is reached and the outlet pressure at the flue spigot is according to the rated heat output.</p> <p>The heat consumption is set to 0; water circulation in the boiler is permitted; temperature controller is adjusted to manufacture recommended maximum set value.</p> <p>Check if the safety temperature limiter or the temperature controller switches off the firing system and all hazardous operation states are avoided.</p> <p>– Loss of the electrical power supply</p> <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler, a steady state condition is reached and the outlet pressure at the flue gas section is according to the rated heat output.</p> <p>The electrical power supply including the circulation is cut off, check that no hazardous operation conditions occur.</p> <p>For the evaluation of the temperatures and the CO-concentrations, only mean values at a maximum average time of one minute shall be considered.</p> | <p>ČSN EN 303-5:2013<br/> Art. 5.14</p>   | <p>+</p>        |      |
| <p><b>Safety test of consequences of fuel overload and effect of a blockage of the fuel supply</b></p> <p>The safety of the boiler shall be checked at continuous operation of the boiler with the fuel feed rate of the stoking device set at possible maximum capacity, taking into account failures according to the risk analyses and the electrical safety. If other fuel feed rates lower than the maximum are categorised as critical by the risk analysis, these shall also be tested.</p> <p>The functionality of the safety device for the shut-down of the fuel shall occur by prevention of the ignition after release of fuel if no or insufficient combustion in the combustion chamber occurs.</p> <p>The test for blocked fuel line shall be achieved by deactivating the stoking device.</p> <p><b>The requirements specified in 4.3.4 shall be satisfied.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>ČSN EN 303-5:2013<br/> Art. 5.16.2</p> | <p>+</p>        |      |





| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Requirement specification        | Test evaluation | Note |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------|------|
| <b>Loss of combustion air supply</b><br>The safety of the heating boiler shall be checked at maximum heat input under the following conditions: <ul style="list-style-type: none"> <li>– failure of combustion air fan;</li> <li>– failure to close of the adjustable combustion air supply.</li> </ul> In each case, only one failure shall be simulated.<br>The CO concentrations in the boiler shall not exceed 5 % volume.<br>The measurement of CO concentration shall be carried out in the flue gas measuring section.<br><b>Test of combustion air supply loss</b> | ČSN EN 303-5:2013<br>Art. 5.16.3 | +               |      |

Note:

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

**Measurement results:** EEI Pellets 16 kW

| Temperature controller   |        |                                                       |
|--------------------------|--------|-------------------------------------------------------|
| Temperature              | [ °C ] | Note:                                                 |
| Pre-set                  | 80     | Temperature set on the operating thermostat regulator |
| Shutdown                 | 80     | Fan and stoking switched off (suppression mode)       |
| Restoration of operation | 79     | Fan and stoking restored                              |

| Temperature limiter (manual restoration of temperature) STB |                                                                                                                                                                          |                                            |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Temperature                                                 | [ °C ]                                                                                                                                                                   | Note:                                      |
| Pre-set                                                     | 90                                                                                                                                                                       | Temperature set on the temperature limiter |
| Shutdown                                                    | 96                                                                                                                                                                       | Fan and stoking switched off               |
| Restoration of operation                                    | The boiler irreversibly switched off. In order to restore operation, a manual intervention required, after the temperature drops under the limiter switching temperature |                                            |

**Test evaluation:**

Proper functioning of safety elements has been verified.



Accredited test  
number:

**1001.3\*** Test title:  
**Test of hydraulic pressure drop**

Test method:

ČSN EN 303-5:2013  
Art. 4.2.4.9

Sample tested:

EEI Pellets 16 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

**Evaluation results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                    | Requirement specification      | Evaluation | Note |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|------|
| <b>Water side resistance of the boiler</b><br>The water side resistances are to be determined for those flows which correspond to the nominal heat output with two temperature differences of 10 K and 20 K between the flow and return connections of the boiler. The results are to be stated in mbar for each boiler size and shall correspond to the values indicated by the manufacturer. | ČSN EN 303-5:2013 Art. 4.2.4.9 | +          |      |

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

**Measurement results:**

| no.                 | Q                                  | $\Delta P$ |
|---------------------|------------------------------------|------------|
| [-]                 | [m <sup>3</sup> ·h <sup>-1</sup> ] | [mbar]     |
| differences of 20 K | 0,645                              | 0,9        |
| differences of 10 K | 1,290                              | 1,9        |

Tested by: Bc. Petr Matoušek     Date: 08/2016

Signed: 

Reviewed by: Ing. Stanislav Buchta     Date: 08/2016

Signed: 





The test methods in this Report were applied without deviations, additions or exceptions.

**V. List of source materials**

The tests were performed based on

- Order B-56724 dated 2016-08-03 (received on 2016-08-03)
- Contract B-56724/39
- ČSN EN 303-5:2013 – Heating boilers - Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW - Terminology, requirements, testing and marking

The persons named below are accountable for the accuracy of the above-specified data:

**Mr. Stanislav Buchta**  
Head of Boilers and Industrial Heat  
Equipment Department



**Mr. Milan Holomek**  
Head of Heat and Environment-  
Friendly Equipment Test Station



## **TEST REPORT**

### **39-10746/T2**

**Product:** Hot-water boiler for solid fuel (wood pellets – C1)

**Type designation:** Twin Bio Luxury 24 kW

**Versions:** -

**Customer:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Giżycko  
Poland

**Manufacturer:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Giżycko  
Poland

**Person responsible for re-  
view and evaluation:** Ing. Stanislav Buchta

**Report issue date:** 2016-03-24

**Distribution list:** 1 copy to the Engineering Test Institute  
1 copy to the Customer

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This document may be copied in its entirety without written consent of the Engineering Test Institute. Partial copies are subject to approval.

The results of tests and the evaluations relate only to the products tested.

(\*\*) Thus indicated parts of the Report contain findings verified otherwise than by tests within the meaning of ČSN EN ISO/IEC 17025.



The tests were conducted on the basis of Order B-54654 dated 2015-11-30 (received on 2015-12-01), Contract B-54654/39 and amendment D1 to the contract B-54654/39.

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

The hot-water boilers for solid fuel (wood pellets - C1) with automatic fuel supply, Twin Bio Luxury 24 kW are intended for heating of family houses, office buildings, small businesses, etc.

The body of boiler is from welded steel sheets. The boiler is de-signed for burning of wood pellets – C1. The burner for wood pellets is situated on the side in the lower part of the boiler, combustion air is provided by the fan, pellets are supplied by a screw feeder from fuel hopper. The hot flue gas goes through the boiler body from combustion chamber to heat exchanger. The flue gas leaves the boiler through the socked situated at the rear side of the boiler. Water connections are at the rear of the boiler.

Boiler body is insulated with mineral insulation. The covering is made of steel sheets. Electronic control unit is situated in the upper part of the front side of the boiler.

Further detailed descriptions of individual assembly groups are provided in the enclosed technical documentation to Task 39-10746.

## **II. Sample tested**

Boiler output versions that are the subject of the proceedings:

(table 1)

| Boiler output version | Heat output | EKV No.           | Place of testing |
|-----------------------|-------------|-------------------|------------------|
| Twin Bio Luxury 24 kW | 24 kW       | 0211.16.16718.000 | SZÚ Brno         |

Visual inspection, testing and evaluation were carried out by Bc. Petr Matoušek, Test Engineer, at the test station of SZÚ in Brno, in 03/2016.

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



### **III. Measuring and test equipment**

| <b>No.</b> | <b>Description</b>                               | <b>Inventory number</b> | <b>Calibration valid until</b>        | <b>Accuracy</b>                              |
|------------|--------------------------------------------------|-------------------------|---------------------------------------|----------------------------------------------|
| 1.         | Combustion product analyser, Horiba, type 680 P  | 92-0004                 | calibration prior to each measurement | see CRM 103000237769<br>see CRM 103000237770 |
| 2.         | Weighing machine                                 | 02-2290                 | 02/2017                               | see CS 6051-CS-H-0117-15                     |
| 3.         | Water meter, NW 20                               | 02-1575                 | 03/2017                               | see CS ACS-P/006/2009                        |
| 4.         | Data collection system                           | 02-2241                 | 12/2017                               | see CS 110002                                |
| 5.         | Moisture meter, thermometer                      | 11-6258                 | 11/2017                               | see CS 8346F/12                              |
| 6.         | Barometer                                        | 11-2541                 | 01/2019                               | see CS 6013-CS-K0001-14                      |
| 7.         | Draught gauge                                    | 11-7275                 | 02/2017                               | see CS 1165F/13                              |
| 8.         | Stop watch                                       | 99-0760                 | 10/2017                               | see CS 2955E-12                              |
| 9.         | Calorimeter, IKA, type C 5000                    | 02-2236                 | 03/2017                               | $\pm 0,12$ MJ/kg                             |
| 10.        | Elemental analyser, Perkin Elmer, type 2400 CHNS | 02-2107                 | 03/2017                               | $\pm 0,2$ % rel.                             |
| 11.        | Gravimat, SHC 501                                | 02-2328                 | 04/2018                               | see CS 150046-150050                         |
| 12.        | Laboratory weighing machine                      | 02-1458                 | 06/2017                               | see CS 26/KA-15                              |
| 13.        | Weighing machine, Ohaus MB 45                    | 02-2274                 | 06/2017                               | see CS 6051-CS-H0400-13                      |
| 14.        | Manometer                                        | 18-3336                 | 06/2017                               | see CS 130052                                |
| 15.        | Prandtl tube, 0.3 m                              | ME 484                  | 11/2017                               | see CS 5012-CS-RS090-09                      |
| 16.        | Psychrometer H 4220                              | 92-0005                 | 12/2016                               | see CS 090176                                |
| 17.        | Electrometer                                     | 03524781                | 03/2022                               | see CS 002/12/E                              |



#### **IV. Results of tests and evaluation**

| No. | Requirement                                                                                                   | Technical standard,<br>regulation applied                                                     | Source materials | Evaluation |            |
|-----|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------|------------|------------|
|     |                                                                                                               |                                                                                               |                  | Test       | Evaluation |
| 7.  | Pressurized component tightness and strength test (1001.1*)                                                   | ČSN EN 303-5:2013<br>Art. 5.4, 5.4.1, 5.4.2                                                   | Page 5           | +          |            |
| 8.  | Surface temperature test (1003*)                                                                              | ČSN EN 303-5:2013<br>Art. 5.12, 5.16.4, 4.3.6                                                 | Pages 6 - 7      | +          |            |
| 9.  | Test of heat output, input and efficiency(1004.1*)<br>Test of combustion product temperature (1004.2*)        | ČSN EN 303-5:2013<br>Art. 4.4.2, 4.4.3, 5.7, 5.8, 5.10<br>ČSN EN 303-5:2013<br>Art. 4.4.3     | Pages 8 - 10     | +          |            |
| 10. | Combustion efficiency test – emissions (1005.1*)                                                              | ČSN EN 303-5:2013<br>Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4                                    | Pages 11 - 12    | +          |            |
| 11. | Test of heat output, input and efficiency (1004.1*)<br><br>Combustion efficiency test – emissions (1005.1*)   | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.2, C.2.3                         | Pages 13 - 14    | +          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>C.3 Deviation from Croatia                                   | -                | 0          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark , C.4.1, C.4.2                        | Pages 15 - 16    | +          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Germany, C.5.1, C.5.2                         | Pages 17 - 18    | +          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C<br>C.6 Deviation from Switzerland                                | Pages 19 - 20    | +          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C<br>C.8 Deviation from Italy                                      | -                | 0          |            |
| 12. | Test of control, regulation and safety elements (1006.1*)<br>Combustion efficiency test – emissions (1005.1*) | ČSN EN 303-5:2013<br>Art. 5.13, 5.14, 5.16.2, 5.16.3<br>ČSN EN 303-5:2013<br>Art. 5.9, 5.10.4 | Pages 21 - 23    | +          |            |
| 13. | Test of hydraulic pressure drop (1001.3*)                                                                     | ČSN EN 303-5:2013<br>Art. 4.2.4.9                                                             | Page 24          | +          |            |

Note:

No.: 1 - 6

(\*\*) Not a test

Evaluation:

+ Requirement fulfilled  
- Requirement not fulfilled  
x Not assessed  
0 Not applicable



Accredited test number: **1001.1\*** Test title: **Pressurized component tightness and strength test**

Test method: ČSN EN 303-5:2013  
Art. 5.4, 5.4.1, 5.4.2

Sample tested: TWIN BIO LUXURY 24 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Requirement specification    | Test evaluation                               | Note                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------|-----------------------------------|
| <b>Pressure test for boilers of sheet or sheet metal of non-ferrous metal</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ČSN EN 303-5:2013 Art. 5.4   |                                               |                                   |
| <b>Tests to be carried out before production</b><br>The type test pressure is $2 \times PS$ using hydraulic pressure where $PS$ is the maximum permissible operating pressure. The test period shall be at least 10 min and if it is to apply to a range of boilers, the test shall be carried out on at least 3 boiler sizes (smallest, medium, and largest size). No leakage or noticeable permanent deformation shall occur during the test.<br>A record shall be made of the test, including the following details:<br>- exact description of the boiler tested by stating the drawing number;<br>- test pressure in bar and duration of the test;<br>- test result;<br>- place and date of the test, including the names of persons carrying out the test.<br>The test report shall be signed by, as a minimum, the works tester responsible and one witness. | ČSN EN 303-5:2013 Art. 5.4.1 | +<br><br><br><br><br><br><br>+<br>+<br>+<br>+ | Enclosed technical documentation. |
| <b>Test during production</b><br>Each boiler shall be tested during the production and the test pressure shall be at least $1.43 \times PS$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ČSN EN 303-5:2013 Art. 5.4.2 | +                                             |                                   |

**Test evaluation:** No leakages or visible permanent deformations appeared during the test.



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

Test method: ČSN EN 303-5:2013 Art. 5.12, 5.16.4, 4.3.6

Sample tested: TWIN BIO LUXURY 24 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Requirement specification     | Test evaluation | Note |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|------|
| <b>Surface temperature</b><br>The mean surface temperature shall be measured at nominal heat output. In order to do this, a minimum of 5 points on each boiler surface shall be measured. Under the same conditions, the critical temperatures (e.g. boiler doors, operating levers) shall be measured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ČSN EN 303-5:2013 Art. 5.12   | +               |      |
| The surface temperature on the outside of the boiler (including the bottom and doors but not including the flue gas outlet and maintenance openings of natural draft boilers) shall not exceed the room temperature by more than 60 K when tested in accordance with 5.12. The requirement for the bottom is not applicable for instances when the manufacturer declares that the boiler is to be installed on a non-combustible base.<br>When tested in accordance with 5.12, the surface temperature of operating levers and all parts which shall be touched by hand during operation of the boiler shall not exceed the room temperature by more than the following values: <ul style="list-style-type: none"> <li>- 35 K for metals and similar materials;</li> <li>- 45 K for porcelain and similar materials;</li> <li>- 60 K for plastics and similar materials.</li> </ul> | ČSN EN 303-5:2013 Art. 4.3.6  | +               |      |
| <b>Resistance to thermal conductance</b><br>Temperature measurement shall be performed on the surface of the stoking device at the place next to the fuel line but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber.<br>For boilers with integrated hopper, the temperature measurement shall be performed on the surface of the stoking device at the place next to the integrated hopper but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber. In addition, the highest surface temperature of the hopper shall be measured.                                                                                                                                                                                  | ČSN EN 303-5:2013 Art. 5.16.4 | +               |      |



**Measurement results:** TWIN BIO LUXURY 24 kW

| Average temperatures of boiler walls, doors and covers (°C): |                       |         |
|--------------------------------------------------------------|-----------------------|---------|
| <b>Boiler type</b>                                           | TWIN BIO LUXURY 24 kW |         |
| <b>Fuel type</b>                                             | Wood Pellets - C1     |         |
| <b>Heat output</b>                                           | Nominal               | Minimal |
| ambient temperature (°C)                                     | 22,9                  | 22,7    |
| humidity (%)                                                 | 28,8                  | 27,5    |
| air pressure (kPa)                                           | 98,45                 | 98,27   |
| <b>Front wall</b>                                            | 28,6                  | 25,9    |
| <b>Rear wall</b>                                             | 28,5                  | 29,7    |
| <b>Right wall</b>                                            | 33,9                  | 30,3    |
| <b>Left wall</b>                                             | 35,8                  | 31,6    |
| <b>Upper wall</b>                                            | 31,7                  | 28,7    |
| <b>Lower wall</b>                                            | 43,3                  | 35,9    |
| Temperatures of control elements (°C):                       |                       |         |
| Handle of front cover (plastic)                              | 37                    |         |
| Handle of upper door (plastic)                               | 108                   |         |
| Handle of lower door (plastic)                               | 115                   |         |
| El. control panel (plastic)                                  | 28                    |         |
| Safety temperature limiter - STB (plastic)                   | 29                    |         |

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

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

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





Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1004.2\*** **Test of combustion product temperature**

Test method: ČSN EN 303-5:2013 Art. 4.4.2, 4.4.3, 5.7 to 5.10  
Sample tested: TWIN BIO LUXURY 24 kW  
Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

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

| Test:                                                  | I.                       | II.     |
|--------------------------------------------------------|--------------------------|---------|
| Boiler type:                                           | TWIN BIO LUXURY 24 kW    |         |
| Output tested:                                         | Nominal                  | Minimum |
| Fuel type:                                             | <b>Wood pellets - C1</b> |         |
| Combustion period, (automatic) stoking                 | Minimally 6 hours        |         |
| Nominal heat output (specified by manufacturer) [ kW ] | 24                       | 24      |
| Flue gas temperature [ °C ]                            | 140,9                    | 78,3    |
| Fuel mass added [ kg/h ]                               | 5,123                    | 1,596   |
| Inlet water temperature [ °C ]                         | 53,2                     | 56,4    |
| Outlet water temperature [ °C ]                        | 73,6                     | 76,5    |
| Temperature of the entering cold water [ °C ]          | 9,6                      | 9,5     |
| Cooling water flow rate [ m <sup>3</sup> /h ]          | 0,9544                   | 0,3027  |
| Draught [ Pa ]                                         | 17,9                     | 13,7    |
| Ambient temperature [ °C ]                             | 22,9                     | 22,7    |
| Relative air humidity [ % ]                            | 28,8                     | 27,5    |
| Barometric pressure [ kPa ]                            | 98,45                    | 98,27   |

***Analysis of combustion products:***

| Test (period of burning) :            | I.    | II.   |
|---------------------------------------|-------|-------|
| Oxygen O <sub>2</sub> [ % ]           | 4,03  | 8,76  |
| Carbon dioxide CO <sub>2</sub> [ % ]  | 15,11 | 11,22 |
| Carbon monoxide CO [ppm]              | 100   | 147   |
| Higher hydrocarbons THC/OGC [ppm]     | 4     | 7     |
| Nitrogen oxides NO <sub>x</sub> [ppm] | 107   | 75    |
| Sulfur oxides SO <sub>2</sub> [ppm]   | 0     | 0     |

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

| Test (period of burning) :                                              | I.    | II.   |
|-------------------------------------------------------------------------|-------|-------|
| Stoichiometric oxygen volume [ m <sup>3</sup> /kg ]                     | 0,936 | 0,936 |
| Stoichiometric air volume [ m <sup>3</sup> /kg ]                        | 4,457 | 4,456 |
| Stoichiometric volume of dry combustion products [ m <sup>3</sup> /kg ] | 4,376 | 4,375 |
| Maximum content of CO <sub>2</sub> [ % ]                                | 19,52 | 19,52 |



|                                                    |                        |       |       |
|----------------------------------------------------|------------------------|-------|-------|
| Stoichiometric air multiple                        | [ - ]                  | 1,23  | 1,70  |
| Volume of dry combustion products. actual          | [ m <sup>3</sup> /kg ] | 5,652 | 7,601 |
| Content of H <sub>2</sub> O in combustion air      | [ m <sup>3</sup> /kg ] | 0,045 | 0,059 |
| Content of H <sub>2</sub> O in combustion products | [ m <sup>3</sup> /kg ] | 0,837 | 0,851 |

**Calculated values - thermal overview**

| Test (period of burning) :                   |               | I.          | II.         |
|----------------------------------------------|---------------|-------------|-------------|
| Loss of sensible heat of combustion products | [ % ]         | 6,2         | 3,7         |
| Loss of gas underburning                     | [ % ]         | 0,0         | 0,1         |
| Loss of mechanical underburning              | [ % ]         | 0,1         | 0,1         |
| Loss of heat transfer into environment       | [ % ]         | 1,7         | 3,6         |
| Total loss                                   | [ % ]         | 8,1         | 7,6         |
| Efficiency – indirect method                 | [ % ]         | 91,9        | 92,4        |
| Fuel mass added - actual                     | [kg/h ]       | 5,150       | 1,605       |
| Heat input                                   | [ kW ]        | 24,4        | 7,6         |
| <b>Heat output</b>                           | <b>[ kW ]</b> | <b>22,3</b> | <b>7,0</b>  |
| Uncertainty of determining heat output       | [ kW ]        | 0,9         | 0,3         |
| <b>Efficiency – direct method</b>            | <b>[ % ]</b>  | <b>91,3</b> | <b>91,7</b> |
| Output / nominal output                      | [ % ]         | 92,9        | 29,1        |

At nominal output, when burning **Wood pellets – C1**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5:2013, Fig. 1.

**Test evaluation:**

The measured heat output is within the  $\pm 8\%$  tolerance;  
Boiler Class 5;

At nominal output, combustion product temperature is less than 160 K above the ambient temperature;

When burning Wood pellets – C1, the period of burning is more than 6 hours;

The minimum heat output is less than 30% of nominal heat output.



**Test results:**

| TWIN BIO LUXURY 24 kW                                                                                                                                                                                                                                                                           |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| <b>Electricity consumption</b>                                                                                                                                                                                                                                                                  |       |
| During the tests, the electrical consumption shall be determined according to EN 15456.                                                                                                                                                                                                         |       |
| The values for maximum consumption, for stand-by, nominal heat output and minimum heat output shall be stated in the test report. For boilers with automatic feeding systems (fuel line), the electrical consumption of the boiler and the fuel line shall be determined and stated separately. |       |
| The average electrical power consumption during stand by shall be measured for a minimum duration of 10 min and shall be stated in watts. In cases where control operations influence the intrinsic energy consumption, a longer duration might be necessary.                                   |       |
| Maximum electrical input                                                                                                                                                                                                                                                                        | 492 W |
| Electrical input at nominal heat output                                                                                                                                                                                                                                                         | 128 W |
| Electrical input at minimum heat output                                                                                                                                                                                                                                                         | 27 W  |
| Electrical input for STAND BY mode                                                                                                                                                                                                                                                              | 2 W   |
| Maximum electrical input for ignition system                                                                                                                                                                                                                                                    | 347 W |
| Maximum electrical input for fuel supply (fuel line)                                                                                                                                                                                                                                            | 115 W |

**Fuel analysis**

| Fuel type                                                                     | Wood pellets – C1 |                 |         |             |
|-------------------------------------------------------------------------------|-------------------|-----------------|---------|-------------|
| Analytical indicator                                                          | Symbol            | Unit            | Value   | Uncertainty |
| Higher heating value                                                          | $Q_s$             | [ MJ/kg ]       | 18,63   | 0,14        |
| Lower heating value                                                           | $Q_j$             | [ MJ/kg ]       | 17,07   | 0,14        |
| All water in original condition                                               | $W_t^r$           | [ % by weight ] | 7,20    | 0,04        |
| Ash                                                                           | A                 | [ % by weight ] | 0,47    | 0,01        |
| Carbon                                                                        | C                 | [ % by weight ] | 46,23   | 0,25        |
| Hydrogen                                                                      | H                 | [ % by weight ] | 6,33    | 0,10        |
| Nitrogen                                                                      | N                 | [ % by weight ] | 0,07    | 0,10        |
| Sulphur                                                                       | S                 | [ % by weight ] | 0,035   | 0,000       |
| Chlorine                                                                      | Cl                | [ % by weight ] | 0,007   | 0,000       |
| Oxygen – calculation for 100%                                                 | O                 | [ % by weight ] | 39,66   |             |
| Conversion factor $f_{emis}$ for emissions in [mg/m <sup>3</sup> ] to [mg/MJ] | $f_{emis}$        | [ - ]           | 0,25688 |             |

*Note:* Sample in original condition

**Measurement uncertainty:** Specified in Measurement results

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



Accredited test  
number:

**1005.1\*** Test title: **Combustion efficiency test - emissions**

Test method:

ČSN EN 303-5:2013  
Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4

Sample tested:

TWIN BIO LUXURY 24 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

| Requirement                                                                                                                                                                                                                                                                                                                                               | Requirement specification    | Test evaluation | Note |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|------|
| <b>Emission limits</b><br>Combustion shall be of low-emission. This requirement shall be satisfied if the emission values shown in Table 6 are not exceeded when operating at nominal heat output or, in the case of boilers with heat output range, when operating at nominal heat output and minimum heat output, in accordance with 5.7, 5.9 and 5.10. | ČSN EN 303-5:2013 Art. 4.4.7 | +               |      |

Table 6

Table 3

| Stoking   | Fuel     | Nominal heat output | Emission limits                         |       |       |         |       |       |       |       |       |
|-----------|----------|---------------------|-----------------------------------------|-------|-------|---------|-------|-------|-------|-------|-------|
|           |          |                     | CO                                      |       |       | OGC/THC |       | Dust  |       |       |       |
|           |          |                     | mg/m <sup>3</sup> at 10% O <sub>2</sub> |       |       |         |       |       |       |       |       |
|           |          | kW                  | Class                                   | Class | Class | Class   | Class | Class | Class | Class | Class |
|           |          |                     | 3                                       | 4     | 5     | 3       | 4     | 5     | 3     | 4     | 5     |
| Manual    | Biogenic | ≤ 50                | 5000                                    | 1200  | 700   | 150     | 50    | 30    | 150   | 75    | 60    |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 100     |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 100     |       |       |       |       |       |
|           | Fossil   | ≤ 50                | 5000                                    |       |       | 150     |       |       | 125   |       |       |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 100     |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 100     |       |       |       |       |       |
| Automatic | Biogenic | ≤ 50                | 3000                                    | 1000  | 500   | 100     | 30    | 20    | 150   | 60    | 40    |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 80      |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 80      |       |       |       |       |       |
|           | Fossil   | ≤ 50                | 3000                                    |       |       | 100     |       |       | 125   |       |       |
|           |          | > 50 ≤ 150          | 2500                                    |       |       | 80      |       |       |       |       |       |
|           |          | > 150 ≤ 500         | 1200                                    |       |       | 80      |       |       |       |       |       |

NOTE 1: The dust values in this Table are based on the experience of the gravimetric filter method. The method used needs to be referred to in the test report. The particulate matter emission measured according to this European Standard does not include condensable organic compounds which may form additional particulate matter when the flue gas is mixed with ambient air. The values are therefore not directly comparable with values measured by dilution tunnel methods. Neither can they be directly translated into ambient air particulate concentrations.

NOTE 2: Additional test methods and emission limits which apply in some countries are given in the A-Deviations in Annex C.

<sup>a</sup> Referred to dry exit flue gas, 0 °C, 1013 mbar.

<sup>b</sup> Boilers of class 3 for type E-fuels according to 1.2.1 or e-fuels according to 1.2.3 in this Table and marked with the classification E-fuels and e-fuels do not need to fulfil the requirements for the dust emissions. The actual value shall be stated in the technical documentation and shall not exceed 200 mg/m<sup>3</sup> at 10 % O<sub>2</sub>.



**Measurement results:** TWIN BIO LUXURY 24 kW – Wood pellets – C1

| Boiler output | Average values        |                        |             |                  |                          |                              |                                      |                                 |                                         |                              |
|---------------|-----------------------|------------------------|-------------|------------------|--------------------------|------------------------------|--------------------------------------|---------------------------------|-----------------------------------------|------------------------------|
|               | Measured values       |                        |             |                  |                          |                              | Converted values O <sub>2</sub> =10% |                                 |                                         |                              |
|               | O <sub>2</sub><br>[%] | CO <sub>2</sub><br>[%] | CO<br>[ppm] | OGC/THC<br>[ppm] | NO <sub>x</sub><br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]           | OGC/THC<br>[mg/m <sup>3</sup> ] | NO <sub>x</sub><br>[mg/m <sup>3</sup> ] | Dust<br>[mg/m <sup>3</sup> ] |
| Nominal       | 4,03                  | 15,11                  | 100         | 4                | 107                      | 33                           | 81                                   | 5                               | 142                                     | 22                           |
| Minimum       | 8,76                  | 11,22                  | 147         | 7                | 75                       | 25                           | 165                                  | 10                              | 138                                     | 23                           |

**Test evaluation:**

TWIN BIO LUXURY 24 kW - Wood pellets - C1 meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5:2013 Table 6.



Accredited test number: **1004.1\*** Test title: **Test of heat output input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Austria, C.2.2, C.2.3

Sample tested: TWIN BIO LUXURY 24 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                       |                       | Requirement specification                                      | Test evaluation   |
|-------------------------------------------------------------------|-----------------------|----------------------------------------------------------------|-------------------|
| Boiler efficiency for nominal heat output and minimum heat output |                       | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.2 | Wood Pellets – C1 |
| Boiler                                                            | Minimum efficiency    |                                                                | +                 |
| Heating boilers for solid fuels                                   |                       |                                                                |                   |
| a) manually loaded                                                |                       |                                                                |                   |
| up to 10 kW                                                       | 79 %                  |                                                                |                   |
| >10 to 200 kW                                                     | (71.3 + 7.7 log Pn) % |                                                                |                   |
| >200 kW                                                           | 89 %                  |                                                                |                   |
| a) automatically loaded                                           |                       |                                                                |                   |
| up to 10 kW                                                       | 80 %                  |                                                                | +                 |
| >10 to 200 kW                                                     | (72.3 + 7.7 log Pn) % |                                                                |                   |
| >200 kW                                                           | 90 %                  |                                                                |                   |
| NOTE Pn is the nominal heat output (Qn in this standard)          |                       |                                                                |                   |

| Requirement                                             |                                     |                                        |                       |                                            | Requirement specification                                      | Test evaluation   |
|---------------------------------------------------------|-------------------------------------|----------------------------------------|-----------------------|--------------------------------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                         |                                     |                                        |                       |                                            | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.3 | Wood Pellets – C1 |
| Small burners used for solid fuels automatically loaded |                                     |                                        |                       |                                            |                                                                |                   |
| Parameter                                               | Emission limits<br>mg-MJ            |                                        |                       |                                            |                                                                |                   |
|                                                         | Wooden Wood Pellets<br>Room heaters | Wooden Wood Pellets<br>Central heaters | Other wooden<br>fuels | Other standard-<br>ised<br>biogenous fuels |                                                                |                   |
| CO                                                      | 500 <sup>a</sup>                    | 250 <sup>a</sup>                       | 250 <sup>a</sup>      | 500 <sup>a</sup>                           |                                                                | +                 |
| NO <sub>x</sub>                                         | 100                                 | 100                                    | 100                   | 300                                        |                                                                |                   |
| OGC/THC                                                 | 30                                  | 20                                     | 30                    | 20                                         |                                                                |                   |
| Dust                                                    | 25                                  | 20                                     | 30                    | 35                                         |                                                                |                   |

<sup>a</sup> The limit value can be exceeded by 50 % during partial load operation at 30 % of nominal heat output.

<sup>a</sup> The limit value can be exceeded by 50 % during partial load operation at 30 % of nominal heat output.



**Measurement results:** TWIN BIO LUXURY 24 kW – Wood pellets – C1

| Boiler output | Minimum efficiency | Measured efficiency |
|---------------|--------------------|---------------------|
| Nominal       | 82,9               | 91,3                |
| Minimum       |                    | 91,7                |

**Test evaluation:**

The measured efficiency of TWIN BIO LUXURY 24 kW - Wood pellets - C1 is **higher** than required.

**Measurement results:** TWIN BIO LUXURY 24 kW – Wood pellets – C1

| Boiler output | Average values          |             |                          |                  |                              |                                     |                            |                    |                 |
|---------------|-------------------------|-------------|--------------------------|------------------|------------------------------|-------------------------------------|----------------------------|--------------------|-----------------|
|               | Measured values         |             |                          |                  |                              | Converted values O <sub>2</sub> =0% |                            |                    |                 |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | NO <sub>x</sub><br>[ppm] | OGC/THC<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/MJ]                       | NO <sub>x</sub><br>[mg/MJ] | OGC/THC<br>[mg/MJ] | Dust<br>[mg/MJ] |
| Nominal       | 4,03                    | 100         | 107                      | 4                | 33                           | 40                                  | 70                         | 2                  | 11              |
| Minimum       | 8,76                    | 147         | 75                       | 7                | 25                           | 81                                  | 67                         | 5                  | 11              |

**Test evaluation:**

The measured emission values for TWIN BIO LUXURY 24 kW - Wood pellets - C1 **do not exceed** the specified values.



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Denmark, C.4.1, C.4.2

Sample tested: TWIN BIO LUXURY 24 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                           | Requirement specification                                          | Test evaluation   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------|
| <b>Boiler Efficiency</b>                                                                                                                                                              | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark ,<br>C.4.1 | Wood Pellets – C1 |
| According to the Danish Construction Code BR08, Clause 8.5.1.4, Sub-clause 7, boilers for coal, coke, bio fuel or biomass shall have an efficiency equivalent to Class 3 in EN 303-5. |                                                                    |                   |
| <b>Minimum efficiency</b> (67 + 6 log Qn) %                                                                                                                                           |                                                                    |                   |
| For boilers above 300 kW, the requirement corresponding to 300 kW shall be used.                                                                                                      |                                                                    |                   |

| Requirement                                                                                                             |          |                     |                                         | Requirement specification |      | Test evaluation                                                    |                   |
|-------------------------------------------------------------------------------------------------------------------------|----------|---------------------|-----------------------------------------|---------------------------|------|--------------------------------------------------------------------|-------------------|
| Emission limits                                                                                                         |          |                     |                                         |                           |      | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark ,<br>C.4.2 | Wood Pellets – C1 |
| According to the Danish EPA Statutory Order no. 1432 of 11-12-2007, only Class 3 (or higher) is acceptable for Denmark. |          |                     |                                         |                           |      |                                                                    |                   |
| Stoking                                                                                                                 | Fuel     | Nominal heat output | Emission limit values <sup>a</sup>      |                           |      |                                                                    |                   |
|                                                                                                                         |          |                     | CO                                      | OGC/THC                   | Dust |                                                                    |                   |
|                                                                                                                         |          |                     | mg-m <sup>3</sup> at 10% O <sub>2</sub> |                           |      |                                                                    |                   |
|                                                                                                                         | kW       | Class 3             |                                         |                           |      |                                                                    |                   |
| Manual                                                                                                                  | Biogenic | ≤ 50                | 5000                                    | 150                       | 150  |                                                                    |                   |
|                                                                                                                         |          | > 50 to 150         | 2500                                    | 100                       |      |                                                                    |                   |
|                                                                                                                         |          | > 150 to 300        | 1200                                    | 100                       |      |                                                                    |                   |
|                                                                                                                         | Fossil   | ≤ 50                | 5000                                    | 150                       | 125  |                                                                    |                   |
|                                                                                                                         |          | > 50 to 150         | 2500                                    | 100                       |      |                                                                    |                   |
|                                                                                                                         |          | > 150 to 300        | 1200                                    | 100                       |      |                                                                    |                   |
| Automatic                                                                                                               | Biogenic | ≤ 50                | 3000                                    | 80                        | 150  |                                                                    |                   |
|                                                                                                                         |          | > 50 to 150         | 2500                                    | 100                       |      |                                                                    |                   |
|                                                                                                                         |          | > 150 to 300        | 1200                                    | 80                        |      |                                                                    |                   |
|                                                                                                                         | Fossil   | ≤ 50                | 3000                                    | 100                       | 125  |                                                                    |                   |
|                                                                                                                         |          | > 50 to 150         | 2500                                    | 80                        |      |                                                                    |                   |
|                                                                                                                         |          | > 150 to 300        | 1200                                    | 80                        |      |                                                                    |                   |

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

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





**Measurement results:** TWIN BIO LUXURY 24 kW – Wood pellets - C1

| Boiler output | Minimum efficiency | Measured efficiency |
|---------------|--------------------|---------------------|
| Nominal       | 75,3               | 91,3                |
| Minimum       |                    | 91,7                |

**Test evaluation:**

Measured efficiency for TWIN BIO LUXURY 24 kW - Wood pellets - C1 is **higher** than required.

**Measurement results:** TWIN BIO LUXURY 24 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                  |                              |                                      |                                 |                              |
|---------------|-------------------------|-------------|------------------|------------------------------|--------------------------------------|---------------------------------|------------------------------|
|               | Measured values         |             |                  |                              | Converted values O <sub>2</sub> =10% |                                 |                              |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | OGC/THC<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]           | OGC/THC<br>[mg/m <sup>3</sup> ] | Dust<br>[mg/m <sup>3</sup> ] |
| Nominal       | 4,03                    | 100         | 4                | 33                           | 81                                   | 5                               | 22                           |
| Minimum       | 8,76                    | 147         | 7                | 25                           | 165                                  | 10                              | 23                           |

**Test evaluation:**

The measured emission values for TWIN BIO LUXURY 24 kW - Wood pellets - C1 **do not exceed** the specified values.



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Germany, C.5.1, C.5.2

Sample tested: TWIN BIO LUXURY 24 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                         |                       |                     | Requirement specification                                      | Test evaluation   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|---------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                         |                       |                     |                                                                | Wood Pellets – C1 |
| Table 7 – Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                         |                       |                     | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Germany, C.5.1 |                   |
| The emission limits are regulated in Chapter 2, paragraphs 4, 5 and Annex 2 of the German Immission Control Ordinance "Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen - 1. BImSchV)". Boilers operated with solid fuels shall only be installed, possess the quality and be put into operation if they fulfil the following specifications of the 1. BImSchV: |                     |                         |                       |                     |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fuel acc. to §3 (1) | Nominal output range kW | Dust g/m <sup>3</sup> | CO g/m <sup>3</sup> |                                                                |                   |
| Stage 2: Appliances, which will be installed after 31.12.2014                                                                                                                                                                                                                                                                                                                                                                              | Numbers 1 to 5a     | ≥ 4                     | 0.02                  | 0.4                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers 6 to 7      | ≥ 30 ≤ 500              | 0.02                  | 0.4                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     | > 500                   | 0.02                  | 0.3                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers 8 to 13     | ≥ 4 < 100               | 0.02                  | 0.4                 |                                                                |                   |
| NOTE Differing from sentence 1 for firing systems (appliances) which will exclusively be fired by fuels according §3 article 1 Number 4 in the form of split logs, the limits according Stage 2 apply for firing systems (appliances) if they are installed after 31.12.2016.                                                                                                                                                              |                     |                         |                       |                     |                                                                |                   |



**Measurement results:** TWIN BIO LUXURY 24 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                              |                                      |                             |
|---------------|-------------------------|-------------|------------------------------|--------------------------------------|-----------------------------|
|               | Measured values         |             |                              | Converted values O <sub>2</sub> =13% |                             |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[g/m <sup>3</sup> ]            | Dust<br>[g/m <sup>3</sup> ] |
| Nominal       | 4,03                    | 100         | 33                           | 0,059                                | 0,016                       |
| Minimum       | 8,76                    | 147         | 25                           | 0,120                                | 0,017                       |

**Test evaluation:**

The measured emission values for TWIN BIO LUXURY 24 kW - Wood pellets - C1 **do not exceed** the specified values.



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C  
C.6 Deviation from Switzerland

Sample tested: TWIN BIO LUXURY 24 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                               |                           | Requirement specification                                      | Test evaluation   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                               |                           | ČSN EN 303-5:2013<br>Annex C<br>C.6 Deviation from Switzerland | Wood Pellets - C1 |
| Clause 4.4.7, Table 7<br>The emission limits are regulated in Annex 4 of the Swiss Ordinance on Air Pollution Control ([OAPC] SR 814.318.142.1) of 1985-12-16 (as at 2010-07-15).<br>Boilers operated with woody biomass shall only be put on the market if they fulfil the following specifications of the OAPC:<br>– declarations of conformity (Figure 20 OAPC);<br>– Figures 1, 212, 23 Annex 4 OAPC;<br>– Figures 31, 32 Annex 5 OAPC.<br>Emissions for boilers operated with coal or wood fuels shall not exceed the following limits:               |                                                                                                               |                           |                                                                |                   |
| Type of installation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Particular requirements (emission limits) <sup>a</sup> for carbon monoxide (CO) and particulate matter (dust) |                           |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CO (mg·m <sup>3</sup> )                                                                                       | Dust (mg·m <sup>3</sup> ) |                                                                |                   |
| Boilers for log wood and boilers for coal, manual stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 800                                                                                                           | 50                        |                                                                |                   |
| Boilers for chipped wood and boilers for coal, automatic stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 400                                                                                                           | 60                        |                                                                |                   |
| Boilers for Wood Pellets, automatic stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 300                                                                                                           | 40                        | +                                                              |                   |
| <sup>a</sup> Referred to oxygen basis:<br>– for boilers for natural state wood 13 % volume;<br>– for boilers for coal 7 % volume.                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                               |                           |                                                                |                   |
| The sulphur content of coal, coal briquettes and coke shall not exceed 3 %. Boilers operated with non-woody biomass shall comply with the following specifications of the OAPC:<br>– Figures 741, 742, 743 Annex 2 OAPC;<br>– Figures 81, 82 Annex 3 OAPC.<br>According to Figure 743, Annex 2 OPAC, non-woody biomass, such as biogenic waste and products from agriculture, may only be burnt in boilers with a heat input of at least 70 kW. Such units need an approval and shall meet stronger emission limits according to Figure 742, Annex 2 OAPC. |                                                                                                               |                           |                                                                | 0                 |



**Measurement results:** TWIN BIO LUXURY 24 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                              |                                      |                              |
|---------------|-------------------------|-------------|------------------------------|--------------------------------------|------------------------------|
|               | Measured values         |             |                              | Converted values O <sub>2</sub> =13% |                              |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]           | Dust<br>[mg/m <sup>3</sup> ] |
| Nominal       | 4,03                    | 100         | 33                           | 59                                   | 16                           |
| Minimum       | 8,76                    | 147         | 25                           | 120                                  | 17                           |

**Test evaluation:**

The measured emission values for TWIN BIO LUXURY 24 kW - Wood pellets - C1 **do not exceed** the specified values.



Accredited test number: **1006.1\*** Test title:  
**1005.1\*** **Function test of control, regulation and safety elements**  
**Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Art. 5.13, 5.14, 5.16.1, 5.16.2, 5.16.3  
ČSN EN 303-5:2013  
Art. 5.9, 5.10.4

Sample tested: TWIN BIO LUXURY 24 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirement specification               | Test evaluation | Note |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------|------|
| <p><b>Function check of the temperature controller and safety temperature limiter at the boiler</b></p> <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test °C.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler. A steady state condition shall be reached and the outlet pressure at the flue gas section shall be according to the nominal heat output setting. For manual stoked boilers, the boiler shall be refuelled after reaching steady state with a full batch before starting the test.</p> <p>The dissipated output shall be reduced to <math>(40 \pm 5) \%</math> of the nominal heat output of the boiler, circulating pump running in continuous operation; temperature controller adjusted to maximum set value.</p> <p>When the temperature controller is operating normally, the measured flow temperature shall not exceed 100 °C; the safety temperature cut out or limiter or the device for dissipating excess heat shall not trigger.</p> <p>Repeat the test with the temperature controller out of function. This time, check if the safety temperature limiter-detector switches off the firing system at the highest value specified by the boiler manufacturers and if all hazardous operation states are avoided (see 4.1).</p> | <p>ČSN EN 303-5:2013<br/> Art. 5.13</p> | <p>+</p>        |      |



| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirement specification                | Test evaluation | Note |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|------|
| <p><b>Function test for the rapidly disconnectable firing system</b></p> <p>– Sudden absence of heat dissipation</p> <p>The water-side flow rate shall comply with that specified for the nominal output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler, a steady state condition is reached and the outlet pressure at the flue spigot is according to the rated heat output.</p> <p>The heat consumption is set to 0; water circulation in the boiler is permitted; temperature controller is adjusted to manufacture recommended maximum set value.</p> <p>Check if the safety temperature limiter or the temperature controller switches off the firing system and all hazardous operation states are avoided.</p> <p>- Loss of the electrical power supply</p> <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler, a steady state condition is reached and the outlet pressure at the flue gas section is according to the rated heat output.</p> <p>The electrical power supply including the circulation is cut off, check that no hazardous operation conditions occur.</p> <p>For the evaluation of the temperatures and the CO-concentrations, only mean values at a maximum average time of one minute shall be considered.</p> | <p>ČSN EN 303-5:2013<br/>Art. 5.14</p>   | <p>+</p>        |      |
| <p><b>Safety test of consequences of fuel overload and effect of a blockage of the fuel supply</b></p> <p>The safety of the boiler shall be checked at continuous operation of the boiler with the fuel feed rate of the stoking device set at possible maximum capacity, taking into account failures according to the risk analyses and the electrical safety. If other fuel feed rates lower than the maximum are categorised as critical by the risk analysis, these shall also be tested.</p> <p>The functionality of the safety device for the shut-down of the fuel shall occur by prevention of the ignition after release of fuel if no or insufficient combustion in the combustion chamber occurs.</p> <p>The test for blocked fuel line shall be achieved by deactivating the stoking device.</p> <p><b>The requirements specified in 4.3.4 shall be satisfied.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>ČSN EN 303-5:2013<br/>Art. 5.16.2</p> | <p>+</p>        |      |



| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Requirement specification        | Test evaluation | Note |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------|------|
| <b>Loss of combustion air supply</b><br>The safety of the heating boiler shall be checked at maximum heat input under the following conditions: <ul style="list-style-type: none"> <li>– failure of combustion air fan;</li> <li>– failure to close of the adjustable combustion air supply.</li> </ul> In each case, only one failure shall be simulated.<br>The CO concentrations in the boiler shall not exceed 5 % volume.<br>The measurement of CO concentration shall be carried out in the flue gas measuring section.<br><b>Test of combustion air supply loss</b> | ČSN EN 303-5:2013<br>Art. 5.16.3 | +               |      |

Note:

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

**Measurement results:**

| Temperature controller   |        |                                                       |
|--------------------------|--------|-------------------------------------------------------|
| Temperature              | [ °C ] | Note:                                                 |
| Pre-set                  | 80     | Temperature set on the operating thermostat regulator |
| Shutdown                 | 81     | Fan and stoking switched off (suppression mode)       |
| Restoration of operation | 76     | Fan and stoking restored                              |

| Temperature limiter (manual restoration of temperature) STB |                                                                                                                                                                          |                                            |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Temperature                                                 | [ °C ]                                                                                                                                                                   | Note:                                      |
| Pre-set                                                     | 90                                                                                                                                                                       | Temperature set on the temperature limiter |
| Shutdown                                                    | 105                                                                                                                                                                      | Fan and stoking switched off               |
| Restoration of operation                                    | The boiler irreversibly switched off. In order to restore operation, a manual intervention required, after the temperature drops under the limiter switching temperature |                                            |

**Test evaluation:**

Proper functioning of safety elements has been verified.





Accredited test  
 number:

**1001.3\***

Test title:

**Test of hydraulic pressure drop**

Test method:

ČSN EN 303-5:2013  
 Art. 4.2.4.9

Sample tested:

TWIN BIO LUXURY 24 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

**Evaluation results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                    | Requirement specification      | Evaluation | Note |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|------|
| <b>Water side resistance of the boiler</b><br>The water side resistances are to be determined for those flows which correspond to the nominal heat output with two temperature differences of 10 K and 20 K between the flow and return connections of the boiler. The results are to be stated in mbar for each boiler size and shall correspond to the values indicated by the manufacturer. | ČSN EN 303-5:2013 Art. 4.2.4.9 | +          |      |

Note:

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

**Measurement results:**

| no.                 | Q                                  | $\Delta P$ |
|---------------------|------------------------------------|------------|
| [-]                 | [m <sup>3</sup> ·h <sup>-1</sup> ] | [mbar]     |
| differences of 20 K | 1,032                              | 1,6        |
| differences of 10 K | 2,064                              | 5,5        |

Tested by: Bc. Petr Matoušek Date: 03/2016

Signed: 

Reviewed by: Ing. Stanislav Buchta Date: 03/2016

Signed: 



The test methods in this Report were applied without deviations, additions or exceptions.

**V. List of source materials**

The tests were performed based on

- Order B-54654 dated 2015-11-30 (received on 2015-12-01)
- Contract B-54654/39
- Amendment D1 to the contract B-54654/39
- ČSN EN 303-5:2013 – Heating boilers - Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW - Terminology, requirements, testing and marking

The persons named below are accountable for the accuracy of the above-specified data:

A blue ink signature consisting of a large 'B' followed by a horizontal line and a small loop.

**Mr. Stanislav Buchta**  
Head of Boilers and Industrial Heat  
Equipment Department



A blue ink signature consisting of a large, stylized 'H' with a loop.

**Mr. Milan Holomek**  
Head of Heat and Environment-  
Friendly Equipment Test Station



## **TEST REPORT**

### **39-10942/T3**

**Product:** Hot-water boiler for solid fuel (wood pellets – C1)

**Type designation:** EEI Pellets 32 kW

**Versions:** -

**Customer:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Giżycko  
Poland

**Manufacturer:** PPH KOSTRZEWA Sp.j.  
ul. Suwalska 32A  
11-500 Giżycko  
Poland

**Person responsible for re-  
view and evaluation:** Ing. Stanislav Buchta

**Report issue date:** 2016-08-09

**Distribution list:** 1 copy to the Engineering Test Institute  
1 copy to the Customer

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This document may be copied in its entirety without written consent of the Engineering Test Institute. Partial copies are subject to approval.

The results of tests and the evaluations relate only to the products tested.

(\*\*) Thus indicated parts of the Report contain findings verified otherwise than by tests within the meaning of ČSN EN ISO/IEC 17025.



The tests were conducted on the basis of Order B-56724 dated 2016-08-03 (received on 2016-08-03), Contract B-56724/39.

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

The hot-water boilers for solid fuel (wood pellets - C1) with automatic fuel supply, EEI Pellets 32 kW are intended for heating of family houses, office buildings, small businesses, etc.

The body of boiler is from welded steel sheets. The boiler is de-signed for burning of wood pellets – C1. The burner for wood pellets is situated on the side in the lower part of the boiler, combustion air is provided by the fan, pellets are supplied by a screw feeder from fuel hopper. The hot flue gas goes through the boiler body from combustion chamber to heat exchanger. The flue gas leaves the boiler through the socked situated at the rear side of the boiler. Water connections are at the rear of the boiler. Boiler body is insulated with mineral insulation. The covering is made of steel sheets. Electronic control unit is situated in the upper part of the front side of the boiler.

Further detailed descriptions of individual assembly groups are provided in the enclosed technical documentation to Task 39-10746.

## **II. Sample tested**

Boiler output versions that are the subject of the proceedings:

| (table 1)             |             |                   |                  |
|-----------------------|-------------|-------------------|------------------|
| Boiler output version | Heat output | EKV No.           | Place of testing |
| EEI Pellets 32 kW     | 32 kW       | 0211.16.16679.000 | SZÚ Brno         |

Visual inspection, testing and evaluation were carried out by Bc. Petr Matoušek, Test Engineer, at the test station of SZÚ in Brno, in 02/2016.

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



### **III. Measuring and test equipment**

| <b>No.</b> | <b>Description</b>                                  | <b>Inventory number</b> | <b>Calibration valid until</b>        | <b>Accuracy</b>                        |
|------------|-----------------------------------------------------|-------------------------|---------------------------------------|----------------------------------------|
| 1.         | Combustion product analyser, Horiba, type ENDA-680P | 022394                  | calibration prior to each measurement | see CRM 190/16<br>see CRM 103000414644 |
| 2.         | Weighing machine                                    | 022331                  | 05/2018                               | see KL 6051-KL-H0184-16                |
| 3.         | Induction flow meter                                | 022389-C/1              | 10/2017                               | see KL 6015-KL-P0446-13                |
| 4.         | Temperature measurement set                         | 022399-D/8              | 11/2017                               | see KL 140074                          |
| 5.         | Thermometer, Moisture meter                         | 116258                  | 12/2018                               | see KL 10280/2015                      |
| 6.         | Barometer                                           | 112541                  | 01/2019                               | see KL 6013-KL-K0001-14                |
| 7.         | Draught gauge                                       | MaR11-Tah               | 05/2017                               | see KL 6013-KL-C0349-15                |
| 8.         | Electronic stop watch                               | 990760                  | 11/2017                               | see KL 2955E-12                        |
| 9.         | Gravimat SHC 501                                    | 022328                  | 04/2018                               | see KL 150046-150050                   |
| 10.        | Analytic weighing machine Sartorius                 | 021682                  | 06/2017                               | see KL 24/KA-15                        |
| 11.        | Electronic thermometer                              | 116557                  | 03/2019                               | see KL 160066                          |
| 12.        | Electrometer                                        | 022389-A/4              | 05/2025                               | see KL 039/15/E                        |
| 13.        | Induction water meter                               | 116320                  | 04/2018                               | see KL Q 0254/2012                     |
| 14.        | Weighing machine                                    | 022151                  | 02/2017                               | see KL 6051-KL-H0115-15                |
| 15.        | Weighing machine                                    | 022211                  | 02/2017                               | see KL 6051-KL-H0113-15                |





#### IV. Results of tests and evaluation

| No. | Requirement                                                                                                   | Technical standard,<br>regulation applied                                                     | Source materials | Evaluation |            |
|-----|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------|------------|------------|
|     |                                                                                                               |                                                                                               |                  | Test       | Evaluation |
| 7.  | Pressurized component tightness and strength test (1001.1*)                                                   | ČSN EN 303-5:2013<br>Art. 5.4, 5.4.1, 5.4.2                                                   | Page 5           | +          |            |
| 8.  | Surface temperature test (1003*)                                                                              | ČSN EN 303-5:2013<br>Art. 5.12, 5.16.4, 4.3.6                                                 | Pages 6 - 7      | +          |            |
| 9.  | Test of heat output, input and efficiency(1004.1*)<br>Test of combustion product temperature (1004.2*)        | ČSN EN 303-5:2013<br>Art. 4.4.2, 4.4.3, 5.7, 5.8, 5.10<br>ČSN EN 303-5:2013<br>Art. 4.4.3     | Pages 8 – 10     | +          |            |
| 10. | Combustion efficiency test – emissions (1005.1*)                                                              | ČSN EN 303-5:2013<br>Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4                                    | Pages 11 – 12    | +          |            |
| 11. | Test of heat output, input and efficiency (1004.1*)<br><br>Combustion efficiency test – emissions (1005.1*)   | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.2, C.2.3                         | Pages 13 – 14    | +          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>C.3 Deviation from Croatia                                   | -                | 0          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark , C.4.1, C.4.2                        | Pages 15 – 16    | +          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Germany, C.5.1, C.5.2                         | Pages 17 - 18    | -          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C<br>C.6 Deviation from Switzerland                                | Pages 19 - 20    | +          |            |
|     |                                                                                                               | ČSN EN 303-5:2013<br>Annex C<br>C.8 Deviation from Italy                                      | -                | 0          |            |
| 12. | Test of control, regulation and safety elements (1006.1*)<br>Combustion efficiency test – emissions (1005.1*) | ČSN EN 303-5:2013<br>Art. 5.13, 5.14, 5.16.2, 5.16.3<br>ČSN EN 303-5:2013<br>Art. 5.9, 5.10.4 | Pages 21 - 23    | +          |            |
| 13. | Test of hydraulic pressure drop (1001.3*)                                                                     | ČSN EN 303-5:2013<br>Art. 4.2.4.9                                                             | Page 24          | +          |            |

Note:

No.: 1 - 6

(\*\*) Not a test

Evaluation:

+ Requirement fulfilled  
- Requirement not fulfilled  
x Not assessed  
0 Not applicable



Accredited test  
number:

**1001.1\*** Test title: **Pressurized component tightness and strength test**

Test method:

ČSN EN 303-5:2013  
Art. 5.4, 5.4.1, 5.4.2

Sample tested:

EEI Pellets 32 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Requirement specification    | Test evaluation               | Note                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------|-----------------------------------|
| <b>Pressure test for boilers of sheet or sheet metal of non-ferrous metal</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ČSN EN 303-5:2013 Art. 5.4   |                               |                                   |
| <b>Tests to be carried out before production</b><br>The type test pressure is $2 \times PS$ using hydraulic pressure where $PS$ is the maximum permissible operating pressure. The test period shall be at least 10 min and if it is to apply to a range of boilers, the test shall be carried out on at least 3 boiler sizes (smallest, medium, and largest size). No leakage or noticeable permanent deformation shall occur during the test.<br>A record shall be made of the test, including the following details:<br>- exact description of the boiler tested by stating the drawing number;<br>- test pressure in bar and duration of the test;<br>- test result;<br>- place and date of the test, including the names of persons carrying out the test.<br>The test report shall be signed by, as a minimum, the works tester responsible and one witness. | ČSN EN 303-5:2013 Art. 5.4.1 | +<br><br><br>+<br>+<br>+<br>+ | Enclosed technical documentation. |
| <b>Test during production</b><br>Each boiler shall be tested during the production and the test pressure shall be at least $1.43 \times PS$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ČSN EN 303-5:2013 Art. 5.4.2 | +                             |                                   |

**Test evaluation:**

No leakages or visible permanent deformations appeared during the test.



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

Test method: ČSN EN 303-5:2013 Art. 5.12, 5.16.4, 4.3.6

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Requirement specification     | Test evaluation | Note |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|------|
| <b>Surface temperature</b><br>The mean surface temperature shall be measured at nominal heat output. In order to do this, a minimum of 5 points on each boiler surface shall be measured. Under the same conditions, the critical temperatures (e.g. boiler doors, operating levers) shall be measured.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ČSN EN 303-5:2013 Art. 5.12   | +               |      |
| The surface temperature on the outside of the boiler (including the bottom and doors but not including the flue gas outlet and maintenance openings of natural draft boilers) shall not exceed the room temperature by more than 60 K when tested in accordance with 5.12. The requirement for the bottom is not applicable for instances when the manufacturer declares that the boiler is to be installed on a non-combustible base.<br>When tested in accordance with 5.12, the surface temperature of operating levers and all parts which shall be touched by hand during operation of the boiler shall not exceed the room temperature by more than the following values: <ul style="list-style-type: none"> <li>- 35 K for metals and similar materials;</li> <li>- 45 K for porcelain and similar materials;</li> <li>- 60 K for plastics and similar materials.</li> </ul> | ČSN EN 303-5:2013 Art. 4.3.6  | +               |      |
| <b>Resistance to thermal conductance</b><br>Temperature measurement shall be performed on the surface of the stoking device at the place next to the fuel line but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber.<br>For boilers with integrated hopper, the temperature measurement shall be performed on the surface of the stoking device at the place next to the integrated hopper but within a maximum distance which shall be less than 1 m against the feeding direction from the inner wall of the combustion chamber. In addition, the highest surface temperature of the hopper shall be measured.                                                                                                                                                                                  | ČSN EN 303-5:2013 Art. 5.16.4 | +               |      |





**Measurement results:** EEI Pellets 32 kW

| Average temperatures of boiler walls, doors and covers (°C): |                   |         |
|--------------------------------------------------------------|-------------------|---------|
| Boiler type                                                  | EEI Pellets 32 kW |         |
| Fuel type                                                    | Wood Pellets - C1 |         |
| Heat output                                                  | Nominal           | Minimal |
| ambient temperature (°C)                                     | 23,6              | 24,3    |
| humidity (%)                                                 | 23,1              | 30,9    |
| air pressure (kPa)                                           | 97,38             | 96,25   |
| Front wall                                                   | 29,6              | 25,8    |
| Rear wall                                                    | 33,1              | 33,8    |
| Right wall                                                   | 35,9              | 31,8    |
| Left wall                                                    | 38,1              | 30,6    |
| Upper wall                                                   | 32,0              | 30,1    |
| Lower wall                                                   | 54,1              | 37,3    |
| Temperatures of control elements (°C):                       |                   |         |
| Handle of front cover (plastic)                              | 30                |         |
| Handle of upper door (plastic)                               | 100               |         |
| Handle of lower door (plastic)                               | 109               |         |
| El. control panel (plastic)                                  | 29                |         |
| Safety temperature limiter - STB (plastic)                   | 29                |         |

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

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

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



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1004.2\*** **Test of combustion product temperature**

Test method: ČSN EN 303-5:2013 Art. 4.4.2, 4.4.3, 5.7 to 5.10

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

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

| Test:                                                  | I.                       | II.     |
|--------------------------------------------------------|--------------------------|---------|
| Boiler type:                                           | EEI Pellets 32 kW        |         |
| Output tested:                                         | Nominal                  | Minimum |
| Fuel type:                                             | <b>Wood pellets - C1</b> |         |
| Combustion period, (automatic) stoking                 | Minimally 6 hours        |         |
| Nominal heat output (specified by manufacturer) [ kW ] | 32                       | 32      |
| Flue gas temperature [ °C ]                            | 129,2                    | 79,2    |
| Fuel mass added [ kg/h ]                               | 7,611                    | 2,010   |
| Inlet water temperature [ °C ]                         | 54,8                     | 56,8    |
| Outlet water temperature [ °C ]                        | 75,4                     | 76,3    |
| Temperature of the entering cold water [ °C ]          | 9,1                      | 11,9    |
| Cooling water flow rate [ m <sup>3</sup> /h ]          | 1,3941                   | 0,3868  |
| Draught [ Pa ]                                         | 14,7                     | 15,2    |
| Ambient temperature [ °C ]                             | 23,6                     | 24,3    |
| Relative air humidity [ % ]                            | 23,1                     | 30,9    |
| Barometric pressure [ kPa ]                            | 97,38                    | 96,25   |

***Analysis of combustion products:***

| Test (period of burning) :            | I.    | II.   |
|---------------------------------------|-------|-------|
| Oxygen O <sub>2</sub> [ % ]           | 7,26  | 12,00 |
| Carbon dioxide CO <sub>2</sub> [ % ]  | 12,26 | 8,23  |
| Carbon monoxide CO [ppm]              | 21    | 112   |
| Higher hydrocarbons THC/OGC [ppm]     | 2     | 3     |
| Nitrogen oxides NO <sub>x</sub> [ppm] | 99    | 54    |
| Sulfur oxides SO <sub>2</sub> [ppm]   | 0     | 0     |

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

| Test (period of burning) :                                              | I.    | II.   |
|-------------------------------------------------------------------------|-------|-------|
| Stoichiometric oxygen volume [ m <sup>3</sup> /kg ]                     | 0,936 | 0,934 |
| Stoichiometric air volume [ m <sup>3</sup> /kg ]                        | 4,455 | 4,447 |
| Stoichiometric volume of dry combustion products [ m <sup>3</sup> /kg ] | 4,374 | 4,366 |
| Maximum content of CO <sub>2</sub> [ % ]                                | 19,52 | 19,52 |



|                                                    |                        |       |        |
|----------------------------------------------------|------------------------|-------|--------|
| Stoichiometric air multiple                        | [ - ]                  | 1,52  | 2,31   |
| Volume of dry combustion products. actual          | [ m <sup>3</sup> /kg ] | 6,968 | 10,349 |
| Content of H <sub>2</sub> O in combustion air      | [ m <sup>3</sup> /kg ] | 0,047 | 0,101  |
| Content of H <sub>2</sub> O in combustion products | [ m <sup>3</sup> /kg ] | 0,839 | 0,893  |

**Calculated values - thermal overview**

|                                              |               |             |             |
|----------------------------------------------|---------------|-------------|-------------|
| Test (period of burning) :                   |               | I.          | II.         |
| Loss of sensible heat of combustion products | [ % ]         | 6,6         | 4,9         |
| Loss of gas underburning                     | [ % ]         | 0,0         | 0,1         |
| Loss of mechanical underburning              | [ % ]         | 0,1         | 0,3         |
| Loss of heat transfer into environment       | [ % ]         | 1,9         | 3,7         |
| Total loss                                   | [ % ]         | 8,7         | 8,9         |
| Efficiency – indirect method                 | [ % ]         | 91,3        | 91,1        |
| Fuel mass added - actual                     | [kg/h ]       | 7,653       | 2,023       |
| Heat input                                   | [ kW ]        | 36,3        | 9,6         |
| <b>Heat output</b>                           | <b>[ kW ]</b> | <b>32,9</b> | <b>8,7</b>  |
| Uncertainty of determining heat output       | [ kW ]        | 1,4         | 0,4         |
| <b>Efficiency – direct method</b>            | <b>[ % ]</b>  | <b>90,6</b> | <b>90,4</b> |
| Output / nominal output                      | [ % ]         | 102,7       | 27,1        |

At nominal output, when burning **Wood pellets – C1**, the boiler efficiency meets the requirements applicable to **Class 5** as per ČSN EN 303-5:2013, Fig. 1.

**Test evaluation:**

The measured heat output is within the  $\pm 8\%$  tolerance;  
Boiler Class 5;

At nominal output, combustion product temperature is less than 160 K above the ambient temperature;

When burning Wood pellets – C1, the period of burning is more than 6 hours;

The minimum heat output is less than 30% of nominal heat output.





**Test results:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| EEI Pellets 32 kW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |
| <b>Electricity consumption</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |
| During the tests, the electrical consumption shall be determined according to EN 15456. The values for maximum consumption, for stand-by, nominal heat output and minimum heat output shall be stated in the test report. For boilers with automatic feeding systems (fuel line), the electrical consumption of the boiler and the fuel line shall be determined and stated separately. The average electrical power consumption during stand by shall be measured for a minimum duration of 10 min and shall be stated in watts. In cases where control operations influence the intrinsic energy consumption, a longer duration might be necessary. |       |
| Maximum electrical input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 509 W |
| Electrical input at nominal heat output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 74 W  |
| Electrical input at minimum heat output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 39 W  |
| Electrical input for STAND BY mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 2 W   |
| Maximum electrical input for ignition system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 351 W |
| Maximum electrical input for fuel supply (fuel line)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 112 W |

**Fuel analysis**

| Fuel type                                                                     | Wood pellets – C1 |                 |         |             |
|-------------------------------------------------------------------------------|-------------------|-----------------|---------|-------------|
| Analytical indicator                                                          | Symbol            | Unit            | Value   | Uncertainty |
| Higher heating value                                                          | $Q_s$             | [ MJ/kg ]       | 18,63   | 0,14        |
| Lower heating value                                                           | $Q_i$             | [ MJ/kg ]       | 17,07   | 0,14        |
| All water in original condition                                               | $W'_t$            | [ % by weight ] | 7,20    | 0,04        |
| Ash                                                                           | A                 | [ % by weight ] | 0,47    | 0,01        |
| Carbon                                                                        | C                 | [ % by weight ] | 46,23   | 0,25        |
| Hydrogen                                                                      | H                 | [ % by weight ] | 6,33    | 0,10        |
| Nitrogen                                                                      | N                 | [ % by weight ] | 0,07    | 0,10        |
| Sulphur                                                                       | S                 | [ % by weight ] | 0,035   | 0,000       |
| Chlorine                                                                      | Cl                | [ % by weight ] | 0,007   | 0,000       |
| Oxygen – calculation for 100%                                                 | O                 | [ % by weight ] | 39,66   |             |
| Conversion factor $f_{emis}$ for emissions in [mg/m <sup>3</sup> ] to [mg/MJ] | $f_{emis}$        | [ - ]           | 0,25688 |             |

Note: Sample in original condition

**Measurement uncertainty:** Specified in Measurement results

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



Accredited test  
number:

**1005.1\*** Test title: **Combustion efficiency test - emissions**

Test method:

ČSN EN 303-5:2013  
Art. 4.4.7, 5.7.3, 5.7.4, 5.9, 5.10.4

Sample tested:

EEI Pellets 32 kW

Measuring equipment used:

Chapter III - Measuring and test equipment

| Requirement                                                                                                                                                                                                                                                                                                                                               | Requirement specification    | Test evaluation | Note |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|------|
| <b>Emission limits</b><br>Combustion shall be of low-emission. This requirement shall be satisfied if the emission values shown in Table 6 are not exceeded when operating at nominal heat output or, in the case of boilers with heat output range, when operating at nominal heat output and minimum heat output, in accordance with 5.7, 5.9 and 5.10. | ČSN EN 303-5:2013 Art. 4.4.7 | +               |      |

Table 6

| Stoking     | Fuel        | Nominal heat output | Emission limits                         |            |            |            |            |            |            |            |            |
|-------------|-------------|---------------------|-----------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
|             |             |                     | CO                                      |            |            | OGC/THC    |            |            | Dust       |            |            |
|             |             | kW                  | mg/m <sup>3</sup> at 10% O <sub>2</sub> |            |            |            |            |            |            |            |            |
|             |             |                     | Class<br>3                              | Class<br>4 | Class<br>5 | Class<br>3 | Class<br>4 | Class<br>5 | Class<br>3 | Class<br>4 | Class<br>5 |
| Manual      | Biogenic    | ≤ 50                | 5000                                    | 1200       | 700        | 150        | 50         | 30         | 150        | 75         | 60         |
|             |             | > 50 ≤ 150          | 2500                                    |            |            | 100        |            |            |            |            |            |
|             |             | > 150 ≤ 500         | 1200                                    |            |            | 100        |            |            |            |            |            |
|             | Fossil      | ≤ 50                | 5000                                    |            |            | 150        |            |            | 125        |            |            |
|             |             | > 50 ≤ 150          | 2500                                    |            |            | 100        |            |            |            |            |            |
|             |             | > 150 ≤ 500         | 1200                                    |            |            | 100        |            |            |            |            |            |
|             |             | Automatic           | Biogenic                                | ≤ 50       | 3000       | 1000       | 500        | 100        |            | 30         | 20         |
| > 50 ≤ 150  | 2500        |                     |                                         | 80         |            |            |            |            |            |            |            |
| > 150 ≤ 500 | 1200        |                     |                                         | 80         |            |            |            |            |            |            |            |
| Fossil      | ≤ 50        |                     | 3000                                    | 100        | 125        |            |            |            |            |            |            |
|             | > 50 ≤ 150  |                     | 2500                                    | 80         |            |            |            |            |            |            |            |
|             | > 150 ≤ 500 |                     | 1200                                    | 80         |            |            |            |            |            |            |            |

NOTE 1: The dust values in this Table are based on the experience of the gravimetric filter method. The method used needs to be referred to in the test report. The particulate matter emission measured according to this European Standard does not include condensable organic compounds which may form additional particulate matter when the flue gas is mixed with ambient air. The values are therefore not directly comparable with values measured by dilution tunnel methods. Neither can they be directly translated into ambient air particulate concentrations.

NOTE 2: Additional test methods and emission limits which apply in some countries are given in the A-Deviations in Annex C.

<sup>a</sup> Referred to dry exit flue gas, 0 °C, 1013 mbar.

<sup>b</sup> Boilers of class 3 for type E-fuels according to 1.2.1 or e-fuels according to 1.2.3 in this Table and marked with the classification E-fuels and e-fuels do not need to fulfil the requirements for the dust emissions. The actual value shall be stated in the technical documentation and shall not exceed 200 mg/m<sup>3</sup> at 10 % O<sub>2</sub>.



**Measurement results:** EEI Pellets 32 kW – Wood pellets – C1

| Boiler output | Average values     |                     |          |               |                       |                           |                                      |                              |                                      |                           |
|---------------|--------------------|---------------------|----------|---------------|-----------------------|---------------------------|--------------------------------------|------------------------------|--------------------------------------|---------------------------|
|               | Measured values    |                     |          |               |                       |                           | Converted values O <sub>2</sub> =10% |                              |                                      |                           |
|               | O <sub>2</sub> [%] | CO <sub>2</sub> [%] | CO [ppm] | OGC/THC [ppm] | NO <sub>x</sub> [ppm] | Dust [mg/m <sup>3</sup> ] | CO [mg/m <sup>3</sup> ]              | OGC/THC [mg/m <sup>3</sup> ] | NO <sub>x</sub> [mg/m <sup>3</sup> ] | Dust [mg/m <sup>3</sup> ] |
| Nominal       | 7,26               | 12,26               | 21       | 2             | 99                    | 33                        | 21                                   | 3                            | 162                                  | 27                        |
| Minimum       | 12,00              | 8,23                | 112      | 3             | 54                    | 27                        | 171                                  | 7                            | 134                                  | 33                        |

**Test evaluation:**

EEI Pellets 32 kW - Wood pellets - C1 meets at nominal and minimum output the emission requirements for **Class 5**, as per ČSN EN 303-5:2013 Table 6.





Accredited test number: **1004.1\*** Test title: **Test of heat output input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Austria, C.2.2, C.2.3

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                       |                       | Requirement specification                                      | Test evaluation   |
|-------------------------------------------------------------------|-----------------------|----------------------------------------------------------------|-------------------|
| Boiler efficiency for nominal heat output and minimum heat output |                       | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.2 | Wood Pellets – C1 |
| Boiler                                                            | Minimum efficiency    |                                                                | +                 |
| Heating boilers for solid fuels                                   | 75 %                  |                                                                |                   |
| a) manually loaded                                                |                       |                                                                |                   |
| up to 10 kW                                                       | 79 %                  |                                                                |                   |
| >10 to 200 kW                                                     | (71.3 + 7.7 log Pn) % |                                                                |                   |
| >200 kW                                                           | 89 %                  |                                                                |                   |
| a) automatically loaded                                           |                       |                                                                | +                 |
| up to 10 kW                                                       | 80 %                  |                                                                |                   |
| >10 to 200 kW                                                     | (72.3 + 7.7 log Pn) % |                                                                |                   |
| >200 kW                                                           | 90 %                  |                                                                |                   |
| NOTE Pn is the nominal heat output (Qn in this standard)          |                       |                                                                |                   |

| Requirement                                             |                                     |                                        |                    |                                        | Requirement specification                                      | Test evaluation   |
|---------------------------------------------------------|-------------------------------------|----------------------------------------|--------------------|----------------------------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                         |                                     |                                        |                    |                                        | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Austria, C.2.3 | Wood Pellets – C1 |
| Small burners used for solid fuels automatically loaded |                                     |                                        |                    |                                        |                                                                |                   |
| Parameter                                               | Emission limits<br>mg-MJ            |                                        |                    |                                        |                                                                |                   |
|                                                         | Wooden Wood Pellets<br>Room heaters | Wooden Wood Pellets<br>Central heaters | Other wooden fuels | Other standard-ised<br>biogenous fuels |                                                                |                   |
| CO                                                      | 500 <sup>a</sup>                    | 250 <sup>a</sup>                       | 250 <sup>a</sup>   | 500 <sup>a</sup>                       |                                                                |                   |
| NO <sub>x</sub>                                         | 100                                 | 100                                    | 100                | 300                                    |                                                                |                   |
| OGC/THC                                                 | 30                                  | 20                                     | 30                 | 20                                     |                                                                |                   |
| Dust                                                    | 25                                  | 20                                     | 30                 | 35                                     | +                                                              |                   |

<sup>a</sup> The limit value can be exceeded by 50 % during partial load operation at 30 % of nominal heat output.





**Measurement results:** EEI Pellets 32 kW – Wood pellets – C1

| Boiler output | Minimum efficiency | Measured efficiency |
|---------------|--------------------|---------------------|
| Nominal       | 83,9               | 90,6                |
| Minimum       |                    | 90,4                |

**Test evaluation:**

The measured efficiency of EEI Pellets 32 kW - Wood pellets - C1 is **higher** than required.

**Measurement results:** EEI Pellets 32 kW – Wood pellets – C1

| Boiler output | Average values          |             |                          |                  |                              |                                     |                            |                    |                 |
|---------------|-------------------------|-------------|--------------------------|------------------|------------------------------|-------------------------------------|----------------------------|--------------------|-----------------|
|               | Measured values         |             |                          |                  |                              | Converted values O <sub>2</sub> =0% |                            |                    |                 |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | NO <sub>x</sub><br>[ppm] | OGC/THC<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/MJ]                       | NO <sub>x</sub><br>[mg/MJ] | OGC/THC<br>[mg/MJ] | Dust<br>[mg/MJ] |
| Nominal       | 7,26                    | 21          | 99                       | 2                | 33                           | 10                                  | 79                         | 1                  | 13              |
| Minimum       | 12,00                   | 112         | 54                       | 3                | 27                           | 83                                  | 66                         | 3                  | 16              |

**Test evaluation:**

The measured emission values for EEI Pellets 32 kW - Wood pellets - C1 **do not exceed** the specified values.



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Denmark, C.4.1, C.4.2

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                           | Requirement specification                                          | Test evaluation   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------|
| <b>Boiler Efficiency</b>                                                                                                                                                              | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Denmark ,<br>C.4.1 | Wood Pellets – C1 |
| According to the Danish Construction Code BR08, Clause 8.5.1.4, Sub-clause 7, boilers for coal, coke, bio fuel or biomass shall have an efficiency equivalent to Class 3 in EN 303-5. |                                                                    |                   |
| <b>Minimum efficiency</b> <b>(67 + 6 log Qn) %</b>                                                                                                                                    |                                                                    |                   |
| For boilers above 300 kW, the requirement corresponding to 300 kW shall be used.                                                                                                      |                                                                    |                   |
|                                                                                                                                                                                       |                                                                    | +                 |

| Requirement                                                                                                             |          |                     |                                          | Requirement specification |      | Test evaluation   |  |
|-------------------------------------------------------------------------------------------------------------------------|----------|---------------------|------------------------------------------|---------------------------|------|-------------------|--|
| Emission limits                                                                                                         |          |                     |                                          |                           |      | Wood Pellets – C1 |  |
| According to the Danish EPA Statutory Order no. 1432 of 11-12-2007, only Class 3 (or higher) is acceptable for Denmark. |          |                     |                                          |                           |      |                   |  |
| Stoking                                                                                                                 | Fuel     | Nominal heat output | Emission limit values <sup>a</sup>       |                           |      |                   |  |
|                                                                                                                         |          |                     | CO                                       | OGC/THC                   | Dust |                   |  |
|                                                                                                                         |          |                     | mg·m <sup>-3</sup> at 10% O <sub>2</sub> |                           |      |                   |  |
|                                                                                                                         |          | kW                  | Class                                    |                           |      |                   |  |
|                                                                                                                         |          |                     | 3                                        |                           |      |                   |  |
| Manual                                                                                                                  | Biogenic | ≤ 50                | 5000                                     | 150                       | 150  |                   |  |
|                                                                                                                         |          | > 50 to 150         | 2500                                     | 100                       |      |                   |  |
|                                                                                                                         |          | > 150 to 300        | 1200                                     |                           |      |                   |  |
|                                                                                                                         | Fossil   | ≤ 50                | 5000                                     | 150                       | 125  |                   |  |
|                                                                                                                         |          | > 50 to 150         | 2500                                     | 100                       |      |                   |  |
|                                                                                                                         |          | > 150 to 300        | 1200                                     |                           |      |                   |  |
| Automatic                                                                                                               | Biogenic | ≤ 50                | 3000                                     | 80                        | 150  |                   |  |
|                                                                                                                         |          | > 50 to 150         | 2500                                     |                           |      |                   |  |
|                                                                                                                         |          | > 150 to 300        | 1200                                     |                           |      |                   |  |
|                                                                                                                         | Fossil   | ≤ 50                | 3000                                     | 100                       | 125  |                   |  |
|                                                                                                                         |          | > 50 to 150         | 2500                                     | 80                        |      |                   |  |
|                                                                                                                         |          | > 150 to 300        | 1200                                     |                           |      |                   |  |
| <sup>a</sup> Referring to dry exit flue gas, 0 °C, 1 013 mbar.                                                          |          |                     |                                          |                           |      |                   |  |

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



**Measurement results:** EEI Pellets 32 kW – Wood pellets - C1

| Boiler output | Minimum efficiency | Measured efficiency |
|---------------|--------------------|---------------------|
| Nominal       | 76,0               | 90,6                |
| Minimum       |                    | 90,4                |

**Test evaluation:**

Measured efficiency for EEI Pellets 32 kW - Wood pellets - C1 is **higher** than required.

**Measurement results:** EEI Pellets 32 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                  |                              |                                      |                                 |                              |
|---------------|-------------------------|-------------|------------------|------------------------------|--------------------------------------|---------------------------------|------------------------------|
|               | Measured values         |             |                  |                              | Converted values O <sub>2</sub> =10% |                                 |                              |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | OGC/THC<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]           | OGC/THC<br>[mg/m <sup>3</sup> ] | Dust<br>[mg/m <sup>3</sup> ] |
| Nominal       | 7,26                    | 21          | 2                | 33                           | 21                                   | 3                               | 27                           |
| Minimum       | 12,00                   | 112         | 3                | 27                           | 171                                  | 7                               | 33                           |

**Test evaluation:**

The measured emission values for EEI Pellets 32 kW - Wood pellets - C1 **do not exceed** the specified values.



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C,  
Deviation from Germany, C.5.1, C.5.2

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                         |                       |                     | Requirement specification                                      | Test evaluation   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|---------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                         |                       |                     |                                                                | Wood Pellets – C1 |
| Table 7 – Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                         |                       |                     | ČSN EN 303-5:2013<br>Annex C,<br>Deviation from Germany, C.5.1 |                   |
| The emission limits are regulated in Chapter 2, paragraphs 4, 5 and Annex 2 of the German Immission Control Ordinance "Erste Verordnung zur Durchführung des Bundes-Immissionsschutzgesetzes (Verordnung über kleine und mittlere Feuerungsanlagen - 1. BImSchV)". Boilers operated with solid fuels shall only be installed, possess the quality and be put into operation if they fulfil the following specifications of the 1. BImSchV: |                     |                         |                       |                     |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fuel acc. to §3 (1) | Nominal output range kW | Dust g/m <sup>3</sup> | CO g/m <sup>3</sup> |                                                                |                   |
| Stage 2: Appliances, which will be installed after 31.12.2014                                                                                                                                                                                                                                                                                                                                                                              | Numbers 1 to 5a     | ≥ 4                     | 0.02                  | 0.4                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers 6 to 7      | ≥ 30 ≤ 500              | 0.02                  | 0.4                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     | > 500                   | 0.02                  | 0.3                 |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                            | Numbers 8 to 13     | ≥ 4 < 100               | 0.02                  | 0.4                 |                                                                |                   |
| NOTE Differing from sentence 1 for firing systems (appliances) which will exclusively be fired by fuels according §3 article 1 Number 4 in the form of split logs, the limits according Stage 2 apply for firing systems (appliances) if they are installed after 31.12.2016.                                                                                                                                                              |                     |                         |                       |                     |                                                                |                   |





**Measurement results:** EEI Pellets 32 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                              |                                      |                             |
|---------------|-------------------------|-------------|------------------------------|--------------------------------------|-----------------------------|
|               | Measured values         |             |                              | Converted values O <sub>2</sub> =13% |                             |
|               | O <sub>2</sub><br>[ % ] | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[g/m <sup>3</sup> ]            | Dust<br>[g/m <sup>3</sup> ] |
| Nominal       | 7,26                    | 21          | 33                           | 0,015                                | 0,019                       |
| Minimum       | 12,00                   | 112         | 27                           | 0,124                                | 0,024                       |

**Test evaluation:**

The measured emission values for EEI Pellets 32 kW - Wood pellets - C1 **exceed** the specified values.



Accredited test number: **1004.1\*** Test title: **Test of heat output, input and efficiency**  
**1005.1\*** **Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Annex C  
C.6 Deviation from Switzerland

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                               |                           | Requirement specification                                      | Test evaluation   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------|----------------------------------------------------------------|-------------------|
| Emission limits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                               |                           | ČSN EN 303-5:2013<br>Annex C<br>C.6 Deviation from Switzerland | Wood Pellets - C1 |
| Clause 4.4.7, Table 7<br>The emission limits are regulated in Annex 4 of the Swiss Ordinance on Air Pollution Control ([OAPC] SR 814.318.142.1) of 1985-12-16 (as at 2010-07-15).<br>Boilers operated with woody biomass shall only be put on the market if they fulfil the following specifications of the OAPC:<br>– declarations of conformity (Figure 20 OAPC);<br>– Figures 1, 212, 23 Annex 4 OAPC;<br>– Figures 31, 32 Annex 5 OAPC.<br>Emissions for boilers operated with coal or wood fuels shall not exceed the following limits:               |                                                                                                               |                           |                                                                |                   |
| Type of installation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Particular requirements (emission limits) <sup>a</sup> for carbon monoxide (CO) and particulate matter (dust) |                           |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | CO (mg·m <sup>3</sup> )                                                                                       | Dust (mg·m <sup>3</sup> ) |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Boilers for log wood and boilers for coal, manual stoking                                                     | 800                       |                                                                | 50                |
| Boilers for chipped wood and boilers for coal, automatic stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 400                                                                                                           | 60                        |                                                                |                   |
| Boilers for Wood Pellets, automatic stoking                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 300                                                                                                           | 40                        |                                                                |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                               |                           |                                                                | +                 |
| * Referred to oxygen basis:<br>– for boilers for natural state wood 13 % volume;<br>– for boilers for coal 7 % volume.                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                               |                           |                                                                |                   |
| The sulphur content of coal, coal briquettes and coke shall not exceed 3 %. Boilers operated with non-woody biomass shall comply with the following specifications of the OAPC:<br>– Figures 741, 742, 743 Annex 2 OAPC;<br>– Figures 81, 82 Annex 3 OAPC.<br>According to Figure 743, Annex 2 OPAC, non-woody biomass, such as biogenic waste and products from agriculture, may only be burnt in boilers with a heat input of at least 70 kW. Such units need an approval and shall meet stronger emission limits according to Figure 742, Annex 2 OAPC. |                                                                                                               |                           |                                                                | 0                 |



**Measurement results:** EEI Pellets 32 kW – Wood pellets - C1

| Boiler output | Average emission values |             |                              |                             |                              |
|---------------|-------------------------|-------------|------------------------------|-----------------------------|------------------------------|
|               | Measured values         |             |                              | Converted values $O_2=13\%$ |                              |
|               | $O_2$<br>[ % ]          | CO<br>[ppm] | Dust<br>[mg/m <sup>3</sup> ] | CO<br>[mg/m <sup>3</sup> ]  | Dust<br>[mg/m <sup>3</sup> ] |
| Nominal       | 7,26                    | 21          | 33                           | 15                          | 19                           |
| Minimum       | 12,00                   | 112         | 27                           | 124                         | 24                           |

**Test evaluation:**

The measured emission values for EEI Pellets 32 kW - Wood pellets - C1 **do not exceed** the specified values.





Accredited test number: **1006.1\*** Test title:  
**1005.1\*** **Function test of control, regulation and safety elements**  
**Combustion efficiency test - emissions**

Test method: ČSN EN 303-5:2013  
Art. 5.13, 5.14, 5.16.1, 5.16.2, 5.16.3  
ČSN EN 303-5:2013  
Art. 5.9, 5.10.4

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Test results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirement specification               | Test evaluation | Note |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------|------|
| <p><b>Function check of the temperature controller and safety temperature limiter at the boiler</b></p> <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test °C.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler. A steady state condition shall be reached and the outlet pressure at the flue gas section shall be according to the nominal heat output setting. For manual stoked boilers, the boiler shall be refuelled after reaching steady state with a full batch before starting the test.</p> <p>The dissipated output shall be reduced to <math>(40 \pm 5) \%</math> of the nominal heat output of the boiler, circulating pump running in continuous operation; temperature controller adjusted to maximum set value.</p> <p>When the temperature controller is operating normally, the measured flow temperature shall not exceed 100 °C; the safety temperature cut out or limiter or the device for dissipating excess heat shall not trigger.</p> <p>Repeat the test with the temperature controller out of function. This time, check if the safety temperature limiter-detector switches off the firing system at the highest value specified by the boiler manufacturers and if all hazardous operation states are avoided (see 4.1).</p> | <p>ČSN EN 303-5:2013<br/> Art. 5.13</p> | <p>+</p>        |      |



| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Requirement specification                 | Test evaluation | Note |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-----------------|------|
| <p><b>Function test for the rapidly disconnectable firing system</b></p> <p>– Sudden absence of heat dissipation</p> <p>The water-side flow rate shall comply with that specified for the nominal output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler, a steady state condition is reached and the outlet pressure at the flue spigot is according to the rated heat output.</p> <p>The heat consumption is set to 0; water circulation in the boiler is permitted; temperature controller is adjusted to manufacture recommended maximum set value.</p> <p>Check if the safety temperature limiter or the temperature controller switches off the firing system and all hazardous operation states are avoided.</p> <p>- Loss of the electrical power supply</p> <p>The water-side flow rate shall comply with that specified for the nominal heat output test. The flow temperature of 75 °C shall not be exceeded at the start of the test.</p> <p>Adjust the firing so that it corresponds to the nominal heat output <math>Q_N</math> of the boiler, a steady state condition is reached and the outlet pressure at the flue gas section is according to the rated heat output.</p> <p>The electrical power supply including the circulation is cut off, check that no hazardous operation conditions occur.</p> <p>For the evaluation of the temperatures and the CO-concentrations, only mean values at a maximum average time of one minute shall be considered.</p> | <p>ČSN EN 303-5:2013<br/> Art. 5.14</p>   | <p>+</p>        |      |
| <p><b>Safety test of consequences of fuel overload and effect of a blockage of the fuel supply</b></p> <p>The safety of the boiler shall be checked at continuous operation of the boiler with the fuel feed rate of the stoking device set at possible maximum capacity, taking into account failures according to the risk analyses and the electrical safety. If other fuel feed rates lower than the maximum are categorised as critical by the risk analysis, these shall also be tested.</p> <p>The functionality of the safety device for the shut-down of the fuel shall occur by prevention of the ignition after release of fuel if no or insufficient combustion in the combustion chamber occurs.</p> <p>The test for blocked fuel line shall be achieved by deactivating the stoking device.</p> <p><b>The requirements specified in 4.3.4 shall be satisfied.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <p>ČSN EN 303-5:2013<br/> Art. 5.16.2</p> | <p>+</p>        |      |





| Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Requirement specification        | Test evaluation | Note |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------|------|
| <b>Loss of combustion air supply</b><br>The safety of the heating boiler shall be checked at maximum heat input under the following conditions: <ul style="list-style-type: none"> <li>– failure of combustion air fan;</li> <li>– failure to close of the adjustable combustion air supply.</li> </ul> In each case, only one failure shall be simulated.<br>The CO concentrations in the boiler shall not exceed 5 % volume.<br>The measurement of CO concentration shall be carried out in the flue gas measuring section.<br><b>Test of combustion air supply loss</b> | ČSN EN 303-5:2013<br>Art. 5.16.3 | +               |      |

Note:

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

**Measurement results:** EEI Pellets 32 kW

| Temperature controller   |        |                                                       |
|--------------------------|--------|-------------------------------------------------------|
| Temperature              | [ °C ] | Note:                                                 |
| Pre-set                  | 80     | Temperature set on the operating thermostat regulator |
| Shutdown                 | 81     | Fan and stoking switched off (suppression mode)       |
| Restoration of operation | 76     | Fan and stoking restored                              |

| Temperature limiter (manual restoration of temperature) STB |                                                                                                                                                                          |                                            |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Temperature                                                 | [ °C ]                                                                                                                                                                   | Note:                                      |
| Pre-set                                                     | 90                                                                                                                                                                       | Temperature set on the temperature limiter |
| Shutdown                                                    | 105                                                                                                                                                                      | Fan and stoking switched off               |
| Restoration of operation                                    | The boiler irreversibly switched off. In order to restore operation, a manual intervention required, after the temperature drops under the limiter switching temperature |                                            |

**Test evaluation:** Proper functioning of safety elements has been verified.



Accredited test number: **1001.3\*** Test title:  
**Test of hydraulic pressure drop**

Test method: ČSN EN 303-5:2013  
Art. 4.2.4.9

Sample tested: EEI Pellets 32 kW

Measuring equipment used: Chapter III - Measuring and test equipment

**Evaluation results:**

| Requirement                                                                                                                                                                                                                                                                                                                                                                                    | Requirement specification      | Evaluation | Note |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|------|
| <b>Water side resistance of the boiler</b><br>The water side resistances are to be determined for those flows which correspond to the nominal heat output with two temperature differences of 10 K and 20 K between the flow and return connections of the boiler. The results are to be stated in mbar for each boiler size and shall correspond to the values indicated by the manufacturer. | ČSN EN 303-5:2013 Art. 4.2.4.9 | +          |      |

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

**Measurement results:**

| no.                 | Q                                  | $\Delta P$ |
|---------------------|------------------------------------|------------|
| [-]                 | [m <sup>3</sup> ·h <sup>-1</sup> ] | [mbar]     |
| differences of 20 K | 1,376                              | 2,5        |
| differences of 10 K | 2,752                              | 9,5        |

Tested by: Bc. Petr Matoušek Date: 08/2016

Signed: 

Reviewed by: Ing. Stanislav Buchta Date: 08/2016

Signed: 



The test methods in this Report were applied without deviations, additions or exceptions.

**V. List of source materials**

The tests were performed based on

- Order B-56724 dated 2016-08-03 (received on 2016-08-03)
- Contract B-56724/39
- ČSN EN 303-5:2013 – Heating boilers - Part 5: Heating boilers for solid fuels, manually and automatically stoked, nominal heat output of up to 500 kW - Terminology, requirements, testing and marking

The persons named below are accountable for the accuracy of the above-specified data:

**Mr. Stanislav Buchta**  
Head of Boilers and Industrial Heat  
Equipment Department



**Mr. Milan Holomek**  
Head of Heat and Environment-  
Friendly Equipment Test Station