

Tristan Green  
Norse Group  
By Email Only

**Our Ref:** 1701193-LT-AC-0001  
**Date:** 29 January 2025

**Ref: Buxton Pavilion – Plant Noise Assessment**

Dear Tristan,

In line with your email request, MZA Acoustics is pleased to present herein the findings of an acoustic assessment of plant noise from Buxton Pavilion. The letter specifically refers to noise from fixed plant serving the building.

Buxton Pavilion is a Grade II listed building located at St John's Rd, Buxton SK17 6BE. The site's existing heating system is at end of life and the site requires a new system. The project will see the restoration of the wider LTHW distribution pipework and emitters to ensure effective heating, and bring the existing AHU installation back online to provide ventilation to the Theatre Suite. Being a listed building, Hamson Barron Smith (HBS, the Client) are required to submit a Listed Building Consent application for elements of the works that impact heritage features internally and externally, where applicable.

HBS have approached MZA Acoustics for the completion of a NIA. The Local Planning Authority (High Peak Borough Council, hereby referred to as 'LPA'), advised that a theoretical desktop survey would suffice. This letter outlines the assessment methodology which will look at the prevailing noise climate in the surrounding area, proposed changes to the fixed plant serving the Pavilion Building, and what potential impact these changes will have upon any nearby noise sensitive receptors.

A noise survey has historically been undertaken for the nearby Buxton Swimming and Fitness Centre, St John's Road. This building is located immediately adjacent to the Pavilion Gardens building and as such the findings of this survey will be used as the basis of the assessment. In particular the noise levels measured during the noise survey will be used to determine any noise level limits applicable to the new items of plant serving the Buxton Pavilion.

Mechanical plant and equipment associated with the development will be specifically assessed in accordance with BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound'*. The noise limits derived will provide guidance on the likely impact of the plant at the nearest noise sensitive receptor (NSR). Where necessary and appropriate, the letter will include details of a recommended noise mitigation scheme necessary to achieve a low impact outcome at the nearest sensitive façade(s).

## 1.1 SITE DESCRIPTION

Buxton Pavilion, hereby referred to as 'the site', is located at St John's Rd, Buxton SK17 6BE, approximately 0.5km southwest of Buxton Railway Station. The building itself comprises The Octagon, a glass-façade conference-like space, reception area, gift shop, restaurant, conservatory and East Pavilion, and Theatre. Plant serving the development is located at roof level and within a basement plant area. Roof plant is ducted directly to the atmosphere, whereas the basement plant is ducted to the façade via internal ductwork, terminating at the façade via louvred openings.

The Site is located on the south side of St John's Road/A53, which is the main road into Buxton from the west. The rear of the Pavilion building is located approximately 10m from the nearside kerb of St John's Road and as such road traffic is considered to be one of the main sources of noise at the Site.

On the north side of St John's Road there is a residential area, with the nearest properties facing the road. These properties are approximately 30m from the Site, and are approximately 10m from the northside kerb of St John's Road. As such these properties are likely to have a very similar noise climate to the conditions at the Site, assuming that road traffic on St John's Road is the main source of noise in the area.

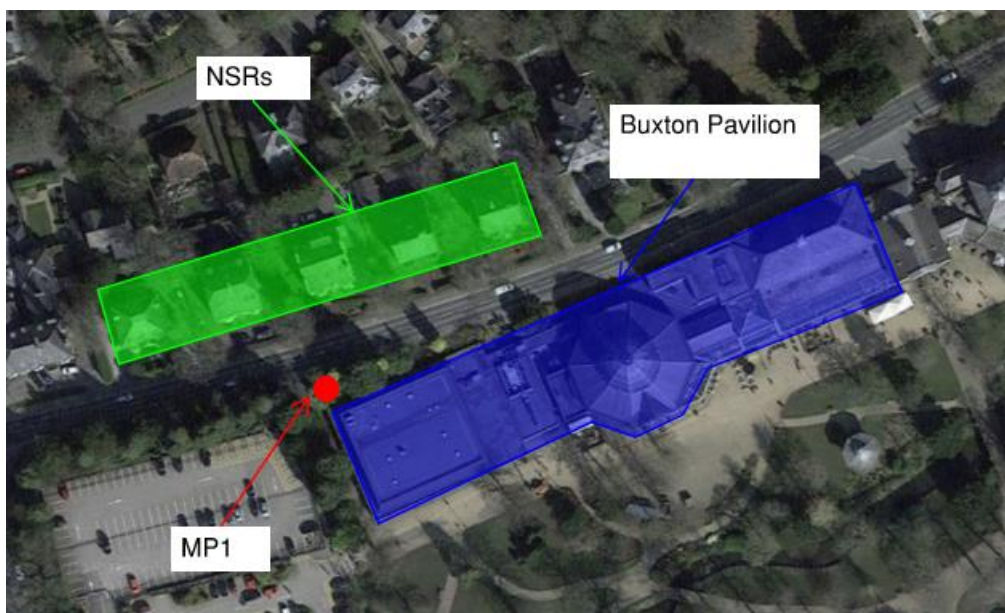


Figure 1 – Noise measurement location (MP1) presented in red

## 1.2 NOISE SURVEY

A noise survey was undertaken at the site to establish noise levels during the daytime and night-time. The survey was undertaken by Peak Acoustics in May 2023. Details of the survey are as follows (extracted from the Peak Acoustics Report – TB1805231NR – see report for full details of surveys, pictures, and detailed results):

*"To establish the existing environmental noise levels on site, a noise survey was conducted from the 25th to the 26th May 2023 between 09:10 – 09:00. Measurements of  $L_{Aeq,T}$  and  $L_{A90,T}$  were logged in 5-minute intervals in accordance with BS7445 - 'Description and Measurement*

*of Environmental Noise'. The unattended monitoring location (MP1) was positioned beside St John's Road (A53) at a height of approximately 1.5 metres. The nearest NSRs are the houses opposite the site and so the monitoring location was chosen to provide a representative background noise level. The monitoring position is deemed representative of sound levels at 'NSR 1' during the typical operational periods of the proposed development.*

The Site, proposed noise source and NSR locations are shown in Figure 1.

### 1.1 Measurement Results

Figure 2 presents a summary of the noise survey measurement results. Note that these are considered representative of the NSRs nearest the Buxton Pavilion scheme and as such are to be used as the basis for the assessment here.

| Measurement | Date(s)              | Period                     | L <sub>Aeq,T</sub> | L <sub>A90,T</sub> |
|-------------|----------------------|----------------------------|--------------------|--------------------|
| M1          | 25th & 26th May 2023 | Daytime (07:00 – 23:00)    | 66                 | 57                 |
|             | 25th – 26th May 2023 | Night-time (23:00 – 07:00) | 59                 | 49                 |

Table 2: M1 Background Noise Survey Results

Figure 2 – Noise survey summary results, extracted from Peak Acoustics report

## 1.3 PLANT NOISE ASSESSMENT

### 1.1 Plant Details

The current plan is for refurbishment of the existing AHUs serving the Paxton Suite within the building. Replacement of components would purely be like-for-like, and therefore it is not anticipated that these works would lead to any increase in noise emissions. Furthermore, this type of plant can produce greater noise levels as they age due to components wearing etc. so refurbishment is likely to improve the noise emissions from the AHU, reducing the impact from these items of plant.

Aside from the refurbishment of the AHUs, 4no. new boilers are proposed to be housed within the basement level boiler room. Preliminary selections have been made but have not yet been finalised. In light of this, the assessment will review the preliminary selections as proof of concept. The output from the boilers will be reviewed against the prevailing background noise levels, however, the assessment will outline high level plant noise limits which must be achieved by all items of new plant running simultaneously at their required duty.

The preliminary boiler selections are for the following units:

- 4no. Wessex ModuMax mk3 boilers

There are several models available, the model to be used on site is yet to be decided, but as a worst case we will be looking at the 254/254H models. The noise levels for these can be seen Appended to this document. These have a noise level, according to the manufacturer's data sheet, as follows:

- Noise emission @ 1m @ maximum modulation = 60 dBA

Note that some information is missing from the above, and it is assumed that this data represents a sound pressure level, measured at 1m away from the unit, with a hemi-spherical propagation pattern. The accuracy of the data of any final selections should be verified by an acoustician.

## 1.2 Noise Limits

In line with the guidance within BS 4142:2014, plant noise emissions are to be assessed as a rating level against the typical background level at the location of the nearest NSR. The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This difference is then considered as follows:

- A difference of around +10 dB or more is likely to be an indication of a **significant adverse impact**, depending on the context.
- A difference of around +5 dB is likely to be an indication of an **adverse impact**, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a **low impact**, depending on the context."

BS 4142 further states that "where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact" again depending upon the specific context of the site. Therefore, the new plant should be designed so that the noise emissions do not exceed the typical background noise level when measured at the nearest receptor.

Based on the Peak Acoustics noise survey, the typical background noise level can be taken to be 57 dBL<sub>A90,T</sub> during the daytime and 49 dB L<sub>A90,T</sub> during the night time. In line with BS4142, the plant noise emissions from the boiler should be no higher than this when measured 1m from the façade of the NSRs. It should be noted that the existing AHU to be refurbished (along with all other existing items of plant) would have been active during the time of the Peak Acoustics survey. As such they are considered part of the prevailing noise climate at the Site and do not need to be accounted for in this plant noise assessment. Only new items are to be assessed, which is limited to the 4no. boilers.

The basement plant room, where the boilers are to be housed, is ducted to the façade via louvred openings (see Figure 3). As the figure shows, there are two louvres – one for intake and one for exhaust. These are on the north elevation, concealed below street level down a ramp into the basement where the heating plant is installed. Being on the north façade, these louvres are directed towards the NSRs on St John's Road. Due to them being concealed beneath street level, there will likely be some screening of the noise in the direction of the NSRs, however, we will assume no acoustic screening here as a worst case.

Based on the noise level limits applied at the NSRs (57 dB during the day and 49 dB during the night) we can distance correct back to the location of the louvres. Based on these levels, a

separation distance of 30m between the source and the receiver, and hemispherical radiation  
**the following plant noise limits apply at the 1m from the louvres:**

- **87 dB  $L_{Ar,Tr}$  during the daytime (07:00-23:00)**
- **79 dB  $L_{Ar,Tr}$  during the night time (23:00-07:00)**

Note that these are presented as BS4142 rating levels ( $L_{Ar,Tr}$ ) and may need to account for acoustic characteristics such as tonality, intermittency, or impulsivity. This will be discussed in more detail in the following section.



**Figure 3** – Louvred openings in the façade, leading to the basement plant room

## 1.4 DISCUSSION

Based on the preliminary selections for the boilers (with a sound pressure level of 60 dBA each) these noise levels are likely to be achievable with no mitigation measures required. Furthermore, when considering that these preliminary selections are for the louder units at maximum modulation, their noise output will likely be lower in most cases.

Note that the limits outlined in section 1.3 are BS142:2014 rating levels and must account for certain acoustic characteristics. Table 1 presents how corrections are applied for these characteristics. Note that corrections are to be added linearly to the specific sound level of the plant (i.e. the dBA level as measured).

It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

**Table 1 – BS 4142 Subjective Method Rating Correction**

| Level of Perceptibility | Tonal Correction dB | Impulsivity Correction dB | Correction for 'other sound characteristics' dB                  | Intermittency Correction dB                    |
|-------------------------|---------------------|---------------------------|------------------------------------------------------------------|------------------------------------------------|
| No Perceptibility       | +0                  | +0                        | Where neither tonal nor impulsive but clearly identifiable<br>+3 | If intermittency is readily identifiable<br>+3 |
| Just Perceptible        | +2                  | +3                        |                                                                  |                                                |
| Clearly perceptible     | +4                  | +6                        |                                                                  |                                                |
| Highly perceptible      | +6                  | +9                        |                                                                  |                                                |

New items of plant are typically not considered to have tonal qualities, nor impulsivity. It is possible that intermittency corrections could be applied if the boilers are to switch on and off throughout the day/night, rather than run continuously. However, at the noise level output of the boilers, and the distance to the receptors, it is anticipated that any intermittency would be just perceptible, at most.

Based on the above, it is anticipated that the new items of plant to be installed at the Site are not likely to lead to significant impact at the NSRs. Furthermore, it is unlikely that mitigation measures will be required for the plant to achieve these limits. The final selections should be reviewed by an acoustician to make sure that they satisfy the noise limits as set out in this letter.

Yours sincerely,

**Robbie Christie**  
**Senior Consultant**

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# Wessex ModuMax mk3

- Floor standing •
- Condensing modular boiler •
- Compact & lightweight •
- 90°C maximum flow temperature •

UP TO  
**40°C**  
 $\Delta T$



15 MODELS, OUTPUTS 97 - 762KW

up to  
**95%**  
Gross Seasonal  
Efficiency

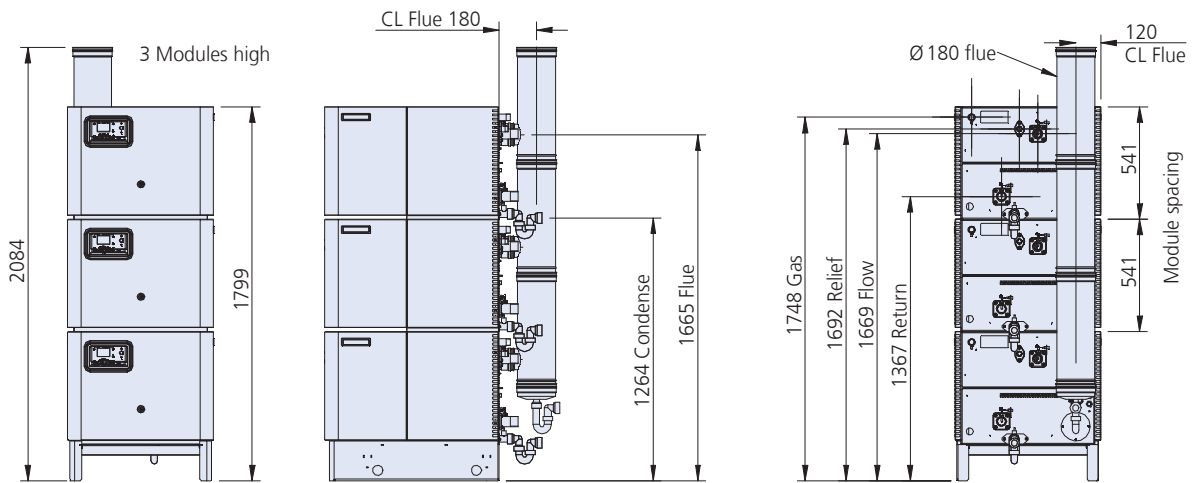
Nat Gas  
LPG

up to  
**15:1**  
Turndown

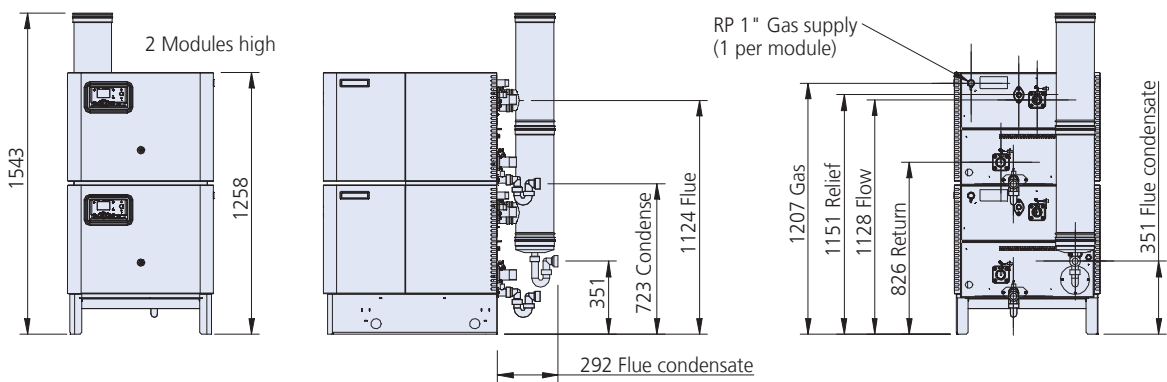
**10** Yr  
Heat Exchanger  
Warranty

ErP  
Part L  
Compliant

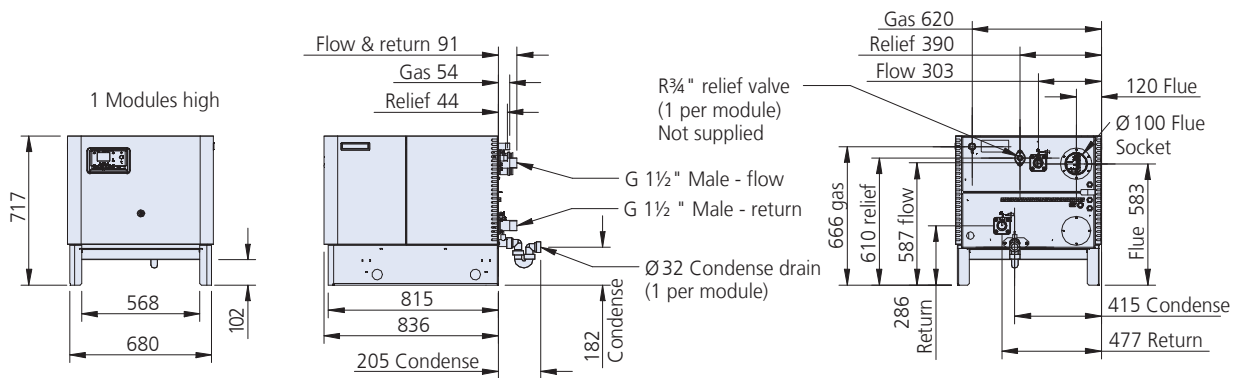
**BIM**  
Objects



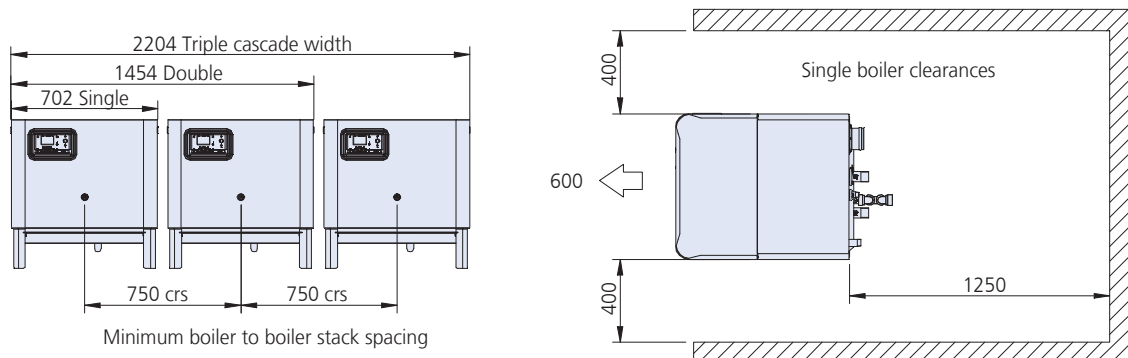
THREE HIGH MODEL



TWO HIGH MODEL



SINGLE MODULE



SPACING AND CLEARANCES

\*Note: Rear clearance required when using Hamworthy pipe kits.

All dimensions in mm unless otherwise stated.

# Technical data & dimensions

Models WM147/147H, WM147/294V, WM147/441V, WM196/196H, WM196/392V, WM196/588V, WM254/254H, WM254/508V, WM254/762V  
**147, 196 and 254kW modules**

| Wessex ModuMax mk3 boiler model        |                                                            | Units      | 147/147H                                            | 147/294V             | 147/441V             | 196/196H             | 196/392V             | 196/588V             | 254/254H             | 254/508V             | 254/762V             |
|----------------------------------------|------------------------------------------------------------|------------|-----------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Energy                                 | No. of modules                                             |            | 1                                                   | 2                    | 3                    | 1                    | 2                    | 3                    | 1                    | 2                    | 3                    |
|                                        | Building regulations Part L seasonal efficiency            | % gross    | 94.8                                                | 94.8                 | 94.8                 | 93.9                 | 93.9                 | 93.9                 | 95.0                 | 95.0                 | 95.0                 |
|                                        | BS EN 15502 seasonal efficiency                            | % gross    | 95.2                                                | 95.2                 | 95.2                 | 94.1                 | 94.1                 | 94.1                 | 95.3                 | 95.3                 | 95.3                 |
|                                        | Boiler output 80/60°C, NG & LPG                            | kW         | 142.8                                               | 285.6                | 428.4                | 191.6                | 383.2                | 574.8                | 239.8                | 479.6                | 719.4                |
|                                        | Boiler output 50/30°C, NG & LPG                            | kW         | 147.4                                               | 294.8                | 442.2                | 196.3                | 392.6                | 588.9                | 254.4                | 508.7                | 763.1                |
|                                        | Boiler input (gross) - maximum, NG                         | kW         | 163                                                 | 326                  | 489                  | 219                  | 428.7                | 657                  | 275                  | 550                  | 825                  |
|                                        | Boiler input (gross) - maximum, LPG                        | kW         | 159.5                                               | 319.1                | 478.6                | 214.4                | 428.7                | 643.1                | 269.2                | 538.3                | 807.5                |
|                                        | Boiler input (nett) - maximum, NG & LPG                    | kW         | 146.8                                               | 293.6                | 440.3                | 197.2                | 394.4                | 591.6                | 247.6                | 495.3                | 742.9                |
|                                        | Boiler output - minimum 80/60°C, NG & LPG                  | kW         | 28.7                                                | 28.7                 | 28.7                 | 38.6                 | 38.6                 | 38.6                 | 48.4                 | 48.4                 | 48.4                 |
| Water                                  | Water content                                              | litres     | 22                                                  | 44                   | 66                   | 22                   | 44                   | 66                   | 22                   | 44                   | 66                   |
|                                        | System design flow rate @ 40°C ΔT rise                     | l/s        | 0.9                                                 | 1.8                  | 2.7                  | 1.2                  | 2.4                  | 3.6                  | 1.5                  | 3                    | 4.5                  |
|                                        | Water side pressure loss @ 40°C ΔT rise                    | mbar       | 36                                                  | 36                   | 36                   | 62                   | 62                   | 62                   | 100                  | 100                  | 100                  |
|                                        | System design flow rate @ 30°C ΔT rise                     | l/s        | 1.2                                                 | 2.4                  | 3.6                  | 1.6                  | 3.2                  | 4.8                  | 2                    | 4                    | 6                    |
|                                        | Water side pressure loss @ 30°C ΔT rise                    | mbar       | 60                                                  | 60                   | 60                   | 120                  | 120                  | 120                  | 180                  | 180                  | 180                  |
|                                        | System design flow rate @ 20°C ΔT rise                     | l/s        | 1.8                                                 | 3.6                  | 5.4                  | 2.4                  | 4.8                  | 7.2                  | 3                    | 6                    | 9                    |
|                                        | Water side pressure loss @ 20°C ΔT rise                    | mbar       | 145                                                 | 145                  | 145                  | 246                  | 246                  | 246                  | 395                  | 395                  | 395                  |
|                                        | System design flow rate @ 11°C ΔT rise                     | l/s        | 3.3                                                 | 6.6                  | 9.9                  | 4.3                  | 8.6                  | 12.9                 | 5.4                  | 10.8                 | 16.2                 |
|                                        | Water side pressure loss @ 11°C ΔT rise                    | mbar       | 500                                                 | 500                  | 500                  | 850                  | 850                  | 850                  | 1300                 | 1300                 | 1300                 |
|                                        | Minimum water pressure                                     | barg       | Dependent on differential temperature – see page 25 |                      |                      |                      |                      |                      |                      |                      |                      |
|                                        | Maximum water pressure                                     | barg       | 10                                                  | 10                   | 10                   | 10                   | 10                   | 10                   | 10                   | 10                   | 10                   |
|                                        | Maximum flow temperature setting                           | °C         | 90                                                  | 90                   | 90                   | 90                   | 90                   | 90                   | 90                   | 90                   | 90                   |
| Gas                                    | Gas flow rate, NG (G20) - maximum                          | m³/hr      | 15.5                                                | 31                   | 46.5                 | 20.9                 | 41.8                 | 62.7                 | 26.2                 | 52.4                 | 78.6                 |
|                                        | Gas flow rate, LPG (G31) - maximum                         | m³/hr      | 6                                                   | 12                   | 18                   | 8.1                  | 16.2                 | 24.3                 | 10.1                 | 20.2                 | 30.3                 |
|                                        | Nominal inlet pressure, NG (LPG) - maximum                 | mbar       | 20 (37)                                             | 20 (37)              | 20 (37)              | 20 (37)              | 20 (37)              | 20 (37)              | 20 (37)              | 20 (37)              | 20 (37)              |
|                                        | Maximum gas inlet pressure NG (LPG)                        | mbar       | 25 (45)                                             | 25 (45)              | 25 (45)              | 25 (45)              | 25 (45)              | 25 (45)              | 25 (45)              | 25 (45)              | 25 (45)              |
| Flue                                   | Approx. flue gas volume @ 15°C, 8.75-9.25% CO <sub>2</sub> | m³/hr      | 214                                                 | 428                  | 642                  | 279                  | 558                  | 837                  | 354                  | 708                  | 1062                 |
|                                        | Maximum flue gas temperature @ 80/60°C                     | °C         | 78                                                  | 78                   | 78                   | 83                   | 83                   | 83                   | 82                   | 82                   | 82                   |
|                                        | Pressure at boiler flue connection                         | Pa         | 150                                                 | 150                  | 150                  | 150                  | 150                  | 150                  | 150                  | 150                  | 150                  |
|                                        |                                                            | mbar       | 1.5                                                 | 1.5                  | 1.5                  | 1.5                  | 1.5                  | 1.5                  | 1.5                  | 1.5                  | 1.5                  |
|                                        | Dry NOx emission (0% excess oxygen, dry air free) - NG     | mg/kWh     | 37.7                                                | 37.7                 | 37.7                 | 39.9                 | 39.9                 | 39.9                 | 38.8                 | 38.8                 | 38.8                 |
| Connection                             | Dry NOx emission (0% excess oxygen, dry air free) - LPG    | mg/kWh     | 69.3                                                | 69.3                 | 69.3                 | 68.6                 | 68.6                 | 68.6                 | 39.9                 | 39.9                 | 39.9                 |
|                                        | Water flow/return connections                              | inches     | G2½" male                                           | G2½" male            | G2½" male            | G2½" male            | G2½" male            | G2½" male            | G2½" male            | G2½" male            | G2½" male            |
|                                        | Gas inlet connection pipe thread size                      | inches     | R1¼" male                                           | R1¼" male            | R1¼" male            | R1¼" male            | R1¼" male            | R1¼" male            | R1¼" male            | R1¼" male            | R1¼" male            |
|                                        | Nominal flue diameter (I/D)                                | mm         | 150                                                 | 250                  | 250                  | 150                  | 250                  | 250                  | 150                  | 250                  | 250                  |
|                                        | Condensate trap connection(s) (O/D)                        | mm         | 32                                                  | 32                   | 32                   | 32                   | 32                   | 32                   | 32                   | 32                   | 32                   |
| Electrics                              | Electrical supply                                          |            | 230V<br>1 Ph<br>50Hz                                | 230V<br>1 Ph<br>50Hz | 230V<br>1 Ph<br>50Hz | 230V<br>1 Ph<br>50Hz | 230V<br>1 Ph<br>50Hz | 230V<br>1 Ph<br>50Hz | 230V<br>1 Ph<br>50Hz | 230V<br>1 Ph<br>50Hz | 230V<br>1 Ph<br>50Hz |
|                                        | Power consumption - maximum boiler modulation              | W          | 240                                                 | 480                  | 720                  | 240                  | 480                  | 720                  | 240                  | 480                  | 720                  |
|                                        | Start current (per module)                                 | Amp        | 1.3                                                 | 1.3                  | 1.3                  | 1.3                  | 1.3                  | 1.3                  | 1.3                  | 1.3                  | 1.3                  |
|                                        | Run current (per module)                                   | Amp        | 1.05                                                | 1.05                 | 1.05                 | 1.05                 | 1.05                 | 1.05                 | 1.05                 | 1.05                 | 1.05                 |
|                                        | Approx shipping weight                                     | kg         | 226                                                 | 452                  | 678                  | 226                  | 452                  | 678                  | 226                  | 452                  | 678                  |
| Noise emission @1m @maximum modulation |                                                            | Max dB (A) | 65                                                  | 65                   | 65                   | 65                   | 65                   | 65                   | 65                   | 65                   | 65                   |
| Noise emission @1m @minimum modulation |                                                            | Min dB (A) | 47                                                  | 47                   | 47                   | 47                   | 47                   | 47                   | 47                   | 47                   | 47                   |