B L Acoustics Ltd
MEASUREMENT IS THE KEY

THE MARBLE GRILL

BS4142 SURVEY

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Client: Brilliant Grill Ltd

Quality Management

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1 Glossary of Acoustic Terminology

To aid the understanding of acoustic terminology and the relative difference between noise levels the following background information is provided.

We perceive sound when the ear detects fluctuations in air pressure (sound waves), which are then processed by the brain and perceived as sound. Humans can hear an incredibly wide range of sound intensities ranging from jet engines to fingertips lightly brushing against each other. This range is quantified using a logarithmic scale called the decibel scale (dB). The comfortable range of the decibel scale typically ranges from 0dB (the threshold of hearing) to around 140dB. Here are some examples common environments and their typical noise levels.

Noise Level Environment

0 dB(A)	Threshold of hearing
20 to 30 dB(A)	Quiet bedroom at night
30 to 40 dB(A)	Living room during the day
40 to 50 dB(A)	Typical office
50 to 60 dB(A)	Inside a moving car
60 to 70 dB(A)	Typical high street
100 to 110 dB(A)	Fire alarm at 1 metre away
140 dB(A)	Threshold of pain

Terminology

dB (decibel)
A unit used to quantify the pressure level of sound. Defined as 20 times the logarithm of the ratio between the root-mean-square pressure of a given sound field and a reference pressure level (2x10-5 Pa - threshold of hearing).

dB(A)
A-weighted decibel. A-weighting is a correction factor applied to decibel values in order to give a more accurate representation of human hearing which compensates for the varying sensitivity of the human ear with frequency.

LAeq, h

The equivalent continuous sound level over a stated period. Quantifies a fluctuating sound level over a given period as the equivalent continuous sound level in which the same amount of acoustic energy is contained over.

LA90

The sound level exceeded 90% of the time. Typically used to describe background noise the L90 is regarded as the 'average minimum level' and quantifies the common sound level of a fluctuation sound field i.e., the sound level that occurs 90% of the time. Alternatively, L10 describes the sound level exceeded 10% of the time and therefore quantifies the 'average maximum level' of sound which is often used during the calculation of road traffic noise.

LAFmax

The maximum, fast A-weighted sound pressure level. This effectively describes the highest noise level recorded at an instant in time, over a given time period. It is used to measure individual, short lived noise events that may not have a significant effect on the LAeq of that period.

2 Executive Summary

A Noise Impact Assessment was undertaken to establish the potential impact of installing an air extraction fan to the rear of 29A Queen Street, Haverhill.

The equipment being proposed to be installed is a Helios 400 T120 Fan, that produced 53dBA noise at 4m.

The background noise was surveyed both at the front and rear of the property. The noise at the front is currently at 60dB $_{LAeq\ DAY}$ and 55dBA $_{LA90\ DAY}$, at the rear it was measured at 58dB $_{LAeq\ DAY}$ and 56dBA $_{LA90\ DAY}$.

The current background noise at the front and rear of the property is reasonably high and is affected by road traffic and the existing extractor at the rear of 25-27 Queen Street.

The predicted noise generated by the addition of an extractor fan at the rear of 29A Queen Street will be 9dB below the current background noise at the nearest noise sensitive receptor. It is therefore determined the new fan will not have an adverse effect on the nearest noise sensitive receptor at 25-27 Queen Street.

3 Introduction

Bl Acoustics were commissioned by Mr A Diaconu to carry out a Noise Impact Assessment at 29A Queen Street, Haverhill.

The property is currently a retail unit and as part of a conversion, new air extraction is required at the rear of the property. Drawing titled '23.11-D1 Existing and Proposed Plans' details the proposed installation and is attached to the planning application.

The assessment was to measure the current background noise levels in the area, determine existing noise sources and then assess the potential impact of the new extraction fan.

Specific noise measurements were taken along with background noise measurements between the hours of 3pm and 11pm.

Where applicable recommendations on mitigating specific noise levels are to be made to reduce noise emissions.

BS4142:2014 procedures were used to carry out our assessment.

4 Legislation

BS4142:2014 – "Method for Rating and Assessing Industrial and Commercial Sound" [British Standards Institution]

BS 4142:2014 provides a method of rating and assessing impact from industrial and commercial sounds. It was first published in 1967 and has been extensively used by local authorities and consultants to rate noise from fixed installations. The standard was considerably revised in 1990, clarified in 1997, and finally significantly altered in 2014. The methods described in this British Standard use outdoor sound levels to assess the likely impacts of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incidental.

BS 4142:2014 advocates the use of LAeq,T - a level, which is directly measurable and termed the Specific Sound Level.

Subjectively the Specific Sound Level may be corrected as follows:

The Specific Sound Level is subject to a correction for tonality between 0dB to +6dB for sound ranging from not tonal to prominently tonal. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible.

The Specific Sound Level may also be corrected to impulsivity. A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of +3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible.

Other sound characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, can have a penalty of 3dB applied.
Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is

dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

Further corrections may be applied due to intermittency. When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

If the subjective method is not sufficient for assessing the audibility of tones in sound or the prominence of impulsive sounds, BS4142:2014 suggests using the one-third octave method and/or the reference methods, as appropriate.

The one-third octave method tests for the presence of a prominent, discrete-frequency spectral component (tone) typically compares the LZeq,T sound pressure level averaged over the time when the tone is present in a one-third-octave band with the time-average linear sound pressure levels in the adjacent one-third-octave bands. For a prominent, discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by some constant level difference.

The level differences between adjacent one-third-octave bands that identify a tone are:

- 15dB in the low-frequency one-third-octave bands (25Hz to 125Hz);
- 8dB in the middle-frequency one-third-octave bands (160Hz to 400Hz); and
- 5dB in the high-frequency one-third-octave bands (500Hz to 10,000Hz).

The reference (objective) method. If the presence of audible tones is in dispute, a special measurement procedure can be used to verify their presence. Based on the prominence of the tones this procedure also provides recommended level adjustments. The aim of the reference method is to assess the prominence of tones in the same way as listeners do on average. The method is based on the psychoacoustic concept of critical bands, which are defined so that sound outside a critical band does not contribute significantly to the audibility of tones inside that critical band. The method includes procedures for steady and varying tones, narrow-band sound and low-frequency tones, and

the result is a graduated 0dB to 6dB adjustment. It is known as the Joint Nordic Method 2 and is to be found in ISO 1996-2. The reference method is also described in BS4142:2014.

Specific Sound Level with (or without) added contentions is termed the Rating Level. When used to assess industrial or commercial sound, the Rating Level is determined and the LA90 background level is subtracted from it. Typically, the greater this difference, the greater the magnitude of the impact.

A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.

A difference of around +5dB 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.

Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be taken into consideration, including the following.

1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake

character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

Consideration ought to be given to evidence on human response to sound and in particular, industrial and/or commercial sound where it is available.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) Façade insulation treatment;
ii) Ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
iii) Acoustic screening.

BS4142:2014 states that the measurement locations should be ≥3.5m away from any other reflecting façade and at a preferred height of 1.2m - 1.5m above ground level. Should sources be located at 1st floor or above, a 4m measurement should be taken. All prevailing weather conditions should be noted, with a subjective impression of noise levels also included within any documentation.

Daytime measurement periods are defined in BS4142:2014 as being between 07:00 and 23:00 hours, with night time periods being between 23:00 and 07:00.

BS4142:2014 compares the highest noise rating level with the lowest background noise level and effectively sets out the worst possible outcome based on the levels measured.

5 Site Description

5.1 Existing Site Conditions

The property is located on at the north end of the high street, at 29A Queen Street, Haverhill, Suffolk CB9 9DZ.

On the south side the property neighbours the existing restaurant 'Smart Fish Bar' at 25-27 Queen Street and then a Premier Convenience Store. On the north side is a retail unit home to 'Mendmyi' phone repair shop. Opposite there is a further restaurant 'Jennys' Café and a Hairdressers 'Golden Scissors'. Finally, there is a public house 'The Woolpack'.

The operating hours of the adjacent businesses most likely to generate noise, either directly or from public visitors.

Smart Fish Bar

11:30 - 21:00	Monday - Thursday
12:00 - 21:30	Friday - Saturday

Closed on Sunday

Jennys

10:00 - 20:00	Tuesday - Saturday
10:00 - 16:00	Sunday

Closed on Monday

Woolpack Pub

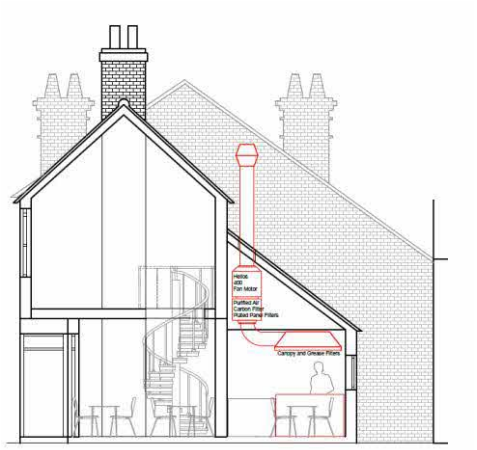
14:00 - 23:00	Monday - Wednesday
14:00 - 00:00	Thursday
12:00 - 01:30	Friday - Saturday
14:00 - 22:00	Sunday

Queen Street is a semi pedestrianised road and is closed to traffic Monday - Saturday 10am-4pm. The noise levels were slightly lower before 4pm but not hugely as at the north end of the high street from the corner with Lower Down Slade, the road is open 24/7 to traffic meaning road noise is ever present.

Appendix A shows details of the site layout and measurement locations

5.2 Proposed Site Conditions

The property is being converted from the existing retail unit into a hot food take away. As part of this conversion fan extraction is required for the kitchen. A new Helios 400 T120 extract fan is to be installed along with associated ducting, filters and canopy. The drawing to the right highlights this and is taken from the submitted document '23.11-D1 Existing and Proposed Plans' that details the proposal.



The manufacturer specifies that the unit will produce 40dBA @4m. This figure will be used in the calculation in this report to assess the impact.

5.3 Sensitive Receptors

The nearest residential property appears to be a flat above the Smart Fish Bar at 25-27 Queen Street.

6 Environmental Survey

We carried out a noise survey on Monday 4th December 2023. We chose to measure the background noise at two locations at the rear and one at the front of the property, as shown in appendix A. In all cases we have measured the total sound level of a given time (LAeq,T) along with the LA90 being recorded.

6.1 Measurement Equipment

A B&K 500 Type 2250 Class 1 Sound Level Meter was used for all measurements and was in Calibration. The meter had additional calibration checks before and after each series of measurements.

Details of the equipment and calibration can be found in **Appendix C**.

6.2 Weather Conditions

4th December 2023

	15:00 - 23:00
Climate	5°C Cloudy & Drizzle
Wind Speed	7m/s NE
Humidity	15%
Precipitation	1mm

6.3 Measured Background Noise

FRONT							
LAEQ							
3-4pm	4-5pm	5-6pm	6-7pm	7-8pm	8-9pm	9-10pm	Average
60	62	62	61	60	58	58	60

FRONT							
LA90							
3-4pm	4-5pm	5-6pm	6-7pm	7-8pm	8-9pm	9-10pm	Average
55	56	57	55	56	53	55	55

REAR							
LAEQ							
3-4pm	4-5pm	5-6pm	6-7pm	7-8pm	8-9pm	9-10pm	Average
58	57	60	59	58	59	48	58

REAR							
LA90							
3-4pm	4-5pm	5-6pm	6-7pm	7-8pm	8-9pm	9-10pm	Average
56	56	57	57	56	57	44	56

6.4 Subjective Impressions

At the front of the property

There is a reasonable amount of noise from vehicle movements along Lower Down Slade and Queen Street, from 4pm this increases and is all along Queen Street.

We observed the fish shop doing good trade right up to closing at 9pm with regular vehicle movements generated by customers stopping to buy food from the shop.

During our survey the nearby pub 'The Woolpack' was nearly empty, we would anticipate more noise generated from this business on busier nights.

At the rear of the property

The principal noise heard at the rear of the property is the noise generated by the two existing extractor vents behind 25-27 Queen Street. This is clearly a large contributing factor to the

background noise here which was measured at 56dBA, when the fans were switched off the background noise at the rear of the property dropped to 44dBA.

7.0 Assessment

7.1 Ambient Sound Level

Ambient sound level is the level of specific noise sources in operation with the additional residual background noise. In this instance the noise source under consideration is not yet installed, however it is estimated by the manufacturer to be 53dBA @4m, the nearest receptor identified is the front façade widow at property 27 Queen Street. We have calculated the signal path from the proposed fan location to the receptor to be 8.6m, this would attenuate the noise from the fan to 46dB $_{LAEQ}$.

We have also calculated the reduction created by the barrier effect of the roof, this is dependant of the frequency and is weakest at low frequency where the long wave lengths are less attenuated by increased signal paths. However, a conservative estimation of the effectiveness of the barrier would create a further >5dB reduction that should be applied to the fan noise predicted to arrive at the front of the property.

The residual background noise was measured to be 55dB $_{LA90}$ at the front of the property. The predicted noise source is therefore 9dB below the background noise and will have nearly zero impact on the ambient levels. Therefore, the ambient level is precited to be the same as the background noise measured in this survey.

7.2 Specific Sound Level

Specific sound level, $L_S = L_{Aeq,Tr}$, is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr.

The specific noise source under consideration is the new fan being proposed. As calculated in 7.1 the specific noise arriving at the nearest noise sensitive receptor is 46dBA.

7.3 Rating Level

The manufacturers specification shows most energy from the fan is in lower frequencies but it does not identify any tonal element, instead it shows a smooth frequency spread with a steady decline as the frequency increases. Assuming the unit is installed as per the manufacturers recommendations and kept in full working order there will be no tonal penalty applied.

7.4 Noise Criteria

Subtracting the measured background noise level at the receptor from the rating level determines the noise level. This level determines the likelihood of impact.

Outcome = Rating Level - Background Level

Outcome = 46dB $LAeq_r$ - 55dB $LA90_{1hour}$
Outcome = -9dB

BS4142 states that the difference between the rating and background level is assessed as follows:

A difference of sound +10dB or more is likely to be an indication of a "Significant Adverse Impact" depending on the context.

A difference of sound +5dB or more is likely to be an indication of a "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 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.

7.5 Noise Criteria Outcome

Subtracting background (LA90, 1hr) from the Rating Level results in 9dB below the measured background noise levels.

It may be concluded therefore that the noise level from the proposed extraction motor would have no impact on the property at 25-27 Queen Street.

Operations past 23:00hrs are non-existing and therefore not considered in this report.

8.0 Summary

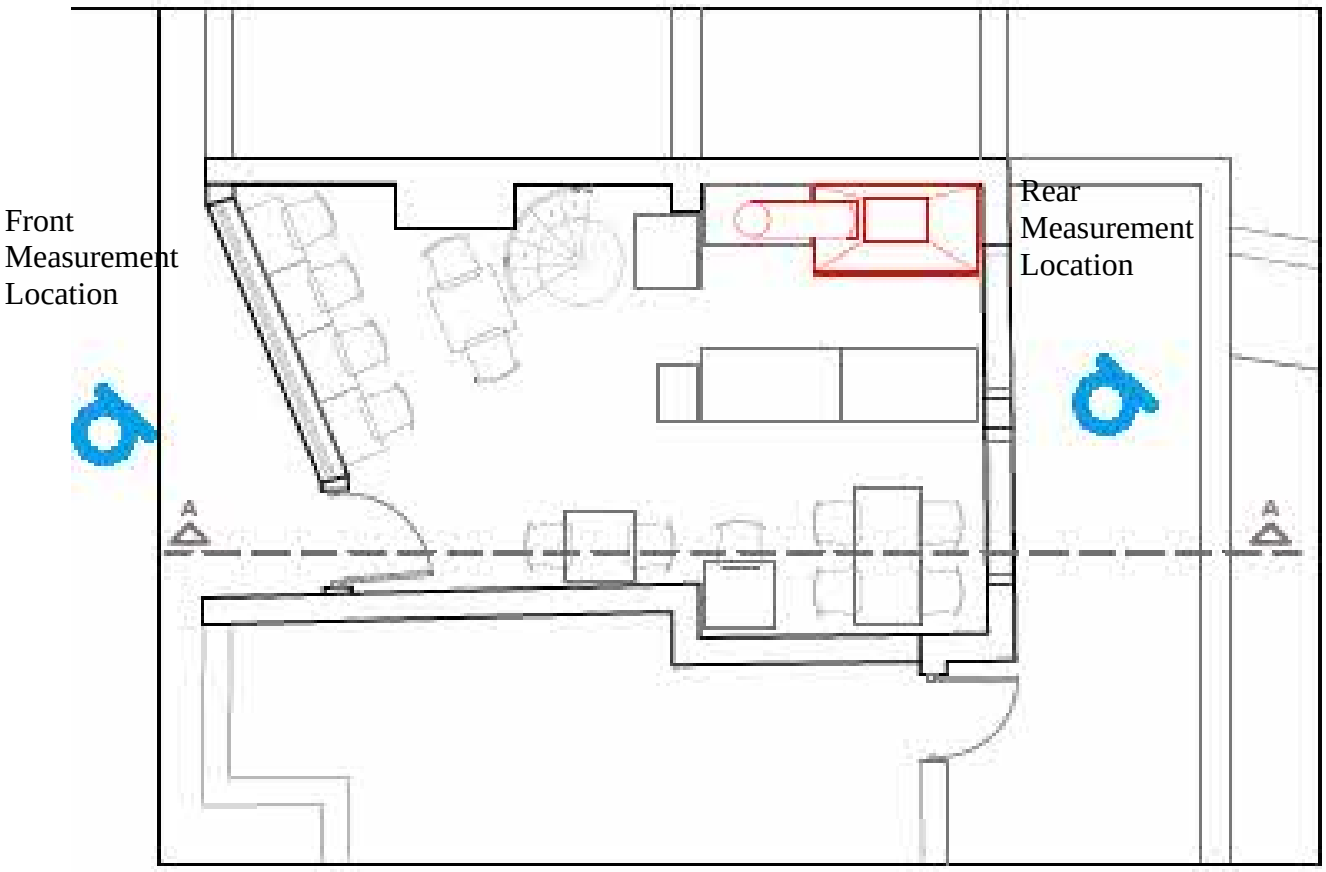
We conclude the proposal will not alter the ambient environment at the nearest noise sensitive receptor.

The principal noise at the front of the property was observed to be vehicle movements along Queen Street. We completed our survey on Monday which is understood to be a quieter night and it is assumed the ambient noise could increase on busier nights.

9.0 Appendices

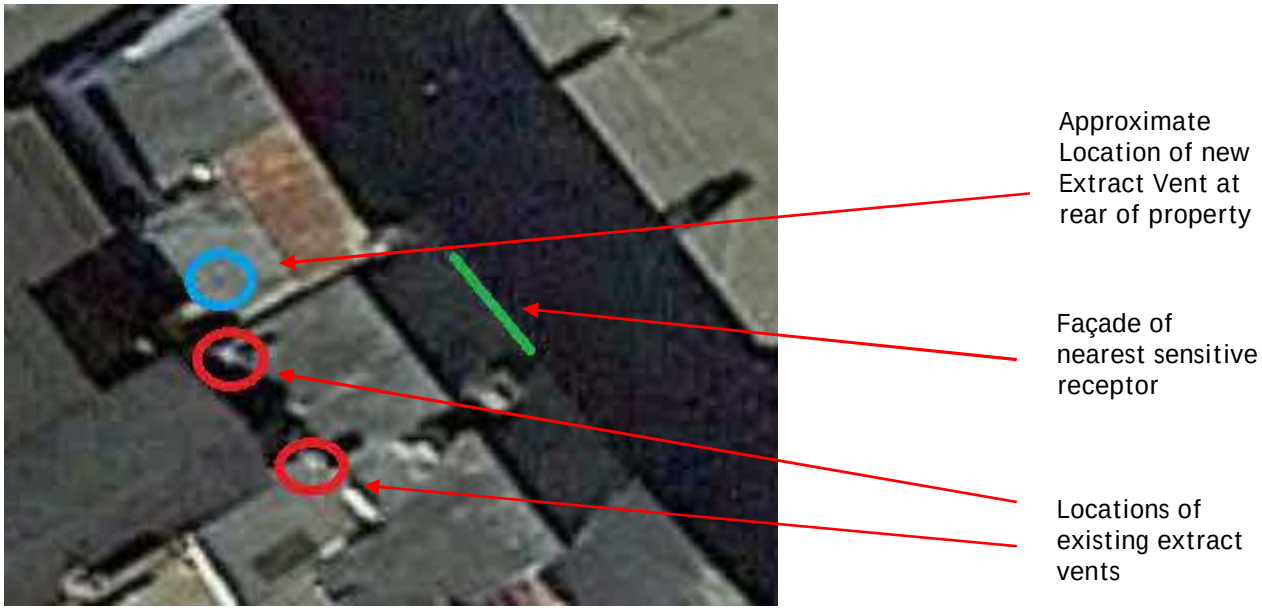
Appendix A

site layout and measurement locations



Appendix B

Extract Locations Proposed and Existing



Appendix C

Equipment Used

Bruel and Kjaer Type 2250 SERIAL NUMBER 2685341
UKAS CALIBRATION BY CAMPBELL ASSOCIATES ON 23/05/22 - EXPIRY MAY 2024

CEL-284/2 ACOUSTIC CALIBRATOR SERIAL NUMBER 4/07022815
UKAS CALIBRATION BY CAMPBELL ASSOCIATES ON 30/10/23 - EXPIRY OCT 2024

CERTIFICATES AVAILABLE ON REQUEST.