

REPORT

CLEAR
ACOUSTIC DESIGN

16 Priory Road, Kew, TW9 3DF

Noise Impact Assessment

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CLEAR
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1.0 Introduction

Clear Acoustic Design has been appointed to carry out a noise impact assessment to support a planning application at 16 Priory Road, Kew. The planning application is in relation to externally located air conditioning plant. There will be 1 externally mounted unit on the roof of the building. The building is a semi-detached house and therefore the proposed noise source is in proximity to noise sensitive receptors in the form of other dwellings.

The source of potential noise is not considered industrial in nature, however the common standard BS 4142: 2014, which is typically used to assess industrial noise in residential areas, is seen to be appropriate for this assessment.

This report has been compiled by Patrick Shuttleworth and issued by Stefan Hannan of Clear Acoustic Design. Both hold full corporate membership of the Institute of Acoustics (MIOA), and 10 / 15 years of consulting experience respectively.

2.0 Relevant Performance Standards

2.1 Council Requirements

There are currently no known specific council requirements other than the request for a noise impact assessment. An assessment in line with BS 4142: 2014 is likely to be required.

2.2 IEMA Guidelines for Environmental Noise Impact Assessment

The IEMA 'Guidelines for Environmental Noise Impact Assessment' is a design guide prepared by the Institute of Environmental Management and Assessment. This document provides guidance on assessing all forms of environmental noise and evaluating the effect and impact.

TABLE 7-12 EFFECT DESCRIPTORS

Very Substantial	Greater than 10 dB LAeq change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB LAeq change in sound level at a noise-sensitive receptor; or a 5 to 9.9 dB LAeq change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB LAeq change in sound level at a sensitive or highly sensitive noise receptor; or a greater than 5 dB LAeq change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9 dB LAeq change in sound level at a receptor of some sensitivity
None/Not Significant	Less than 2.9 dB LAeq change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

TABLE 7-14 IMPACT FROM THE CHANGE IN SOUND LEVELS
(Source HS2 Phase 1 Environmental Statement)

Long-term Impact Classification	Short-term Impact Classification	Sound level change dB LpAeqT (positive or negative) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥ 1 dB and < 3 dB
Minor	Moderate	≥ 3 dB and < 5 dB
Moderate	Major	≥ 5 dB and < 10 dB
Major		≥ 10 dB

Figure 2.1 Extract from IEMA document showing effect of change in noise level

2.3 BS4142:2014

BS4142:2014 is a method of assessing the noise impact of new sources of industrial noise. This is done by comparing the proposed new sources of industrial noise (Rating Level L_{Aeq}) against the existing level of background noise (L_{A90}).

BS4142:2014 suggests that new sources of noise (rating noise level) should be designed to not exceed the existing background noise level, depending on the context. If this is achieved, it is a positive indication that the noise impact will be low.

2.1 BS8233:2014

BS8233:2014 provides a range of internal noise level targets for many building types, including residential buildings. This British Standard is commonly used by planning authorities to place design targets on new residential developments near major sources of noise, such as transportation networks.

The guideline internal noise levels for residential buildings, taken from BS 8233:2014 are shown in the Table below.

Activity	Location	Day (0700-2300)	Night (2300-0700)
Resting	Living Room	35 dB $L_{Aeq, 16hour}$	---
Dining	Dining Room / Area	40 dB $L_{Aeq, 16hour}$	---
Sleeping (Daytime Resting)	Bedroom	35 dB $L_{Aeq, 16hour}$	30 dB $L_{Aeq, 8hour}$

Table 2.2 BS8233:2014 internal noise level criteria

3.0 Site Description

The site and surrounding area are shown below in the overhead images. The main sources of ambient noise affecting the general area are road traffic on the surrounding local roads, and rail traffic on the nearby main railway line. Background noise levels are dominated by distant and more generalised road traffic noise, including that originating from the A205 to the west.

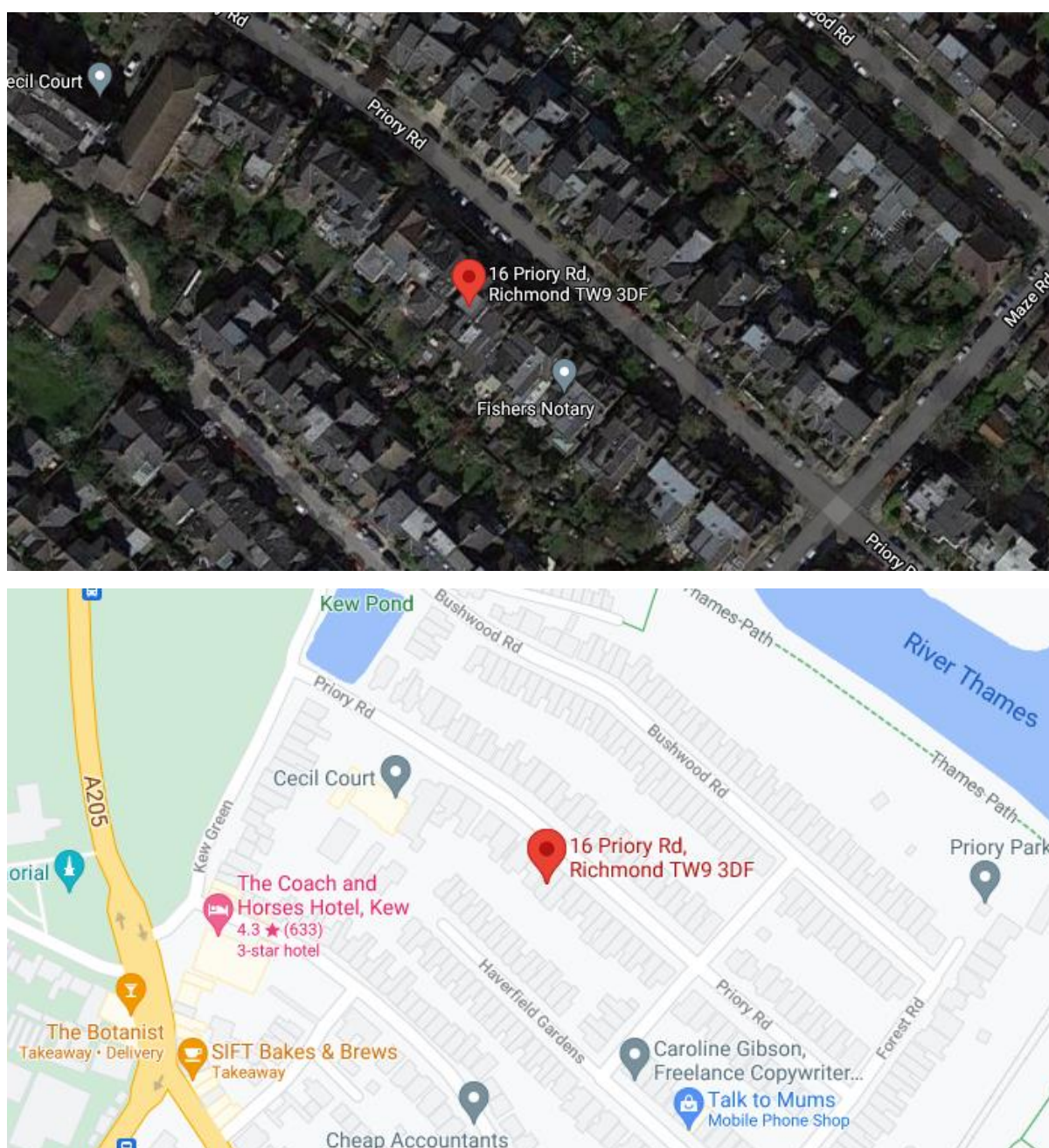


Figure 3.1 Aerial images of general surrounding area

4.0 Existing Noise Measurements

A long-term noise survey was carried out between 30/04/21 and 04/05/21 to establish the level of existing noise in the area. Measurements of the ambient noise (L_{Aeq}) and background noise (L_{A90}) were taken using 15-minute samples.

The sound level meter was positioned in the alley between 16 and 14 Priory Road, and elevated to a height of approximately 3 metres. This serves to provide a more representative background noise level for the nearby residential windows, on which the assessment of plant noise emissions will be based. Appendix D provides an image of the noise survey location.

4.1 Measurement Equipment

The following equipment was used for the survey.

Equipment	Serial Number	Calibration Date
NTi XL2 sound level meter	A2A-16925-E0	28/11/2019
NTi Microphone Capsule - MC230A	A17732	28/11/2019
NTi Preamplifier - MA220	8657	28/11/2019

Table 4.1 Measuring equipment used for survey

4.2 Weather Conditions

The weather was witnessed to be fine and dry for the majority of the survey with generally light wind speeds of less than 10 mph.

4.3 Measured Noise Levels

The measured noise levels are provided in Table 4.2 and in graphical form in Figure 4.1. The ambient noise level (L_{Aeq}) and the background noise level (L_{A90}) for the assessment period are shown. Note that the representative background noise level (L_{A90}) provided is the modal value between 0700-2300 and 2300-0700.

	Measured Ambient Noise Level, dB L_{Aeq}	Representative Background Noise level, dB L_{A90}
Day (0700-2300)	52 dB	37 dB
Night (2300-0700)	49 dB	30 dB

Table 4.2 Summary of noise levels measured on site

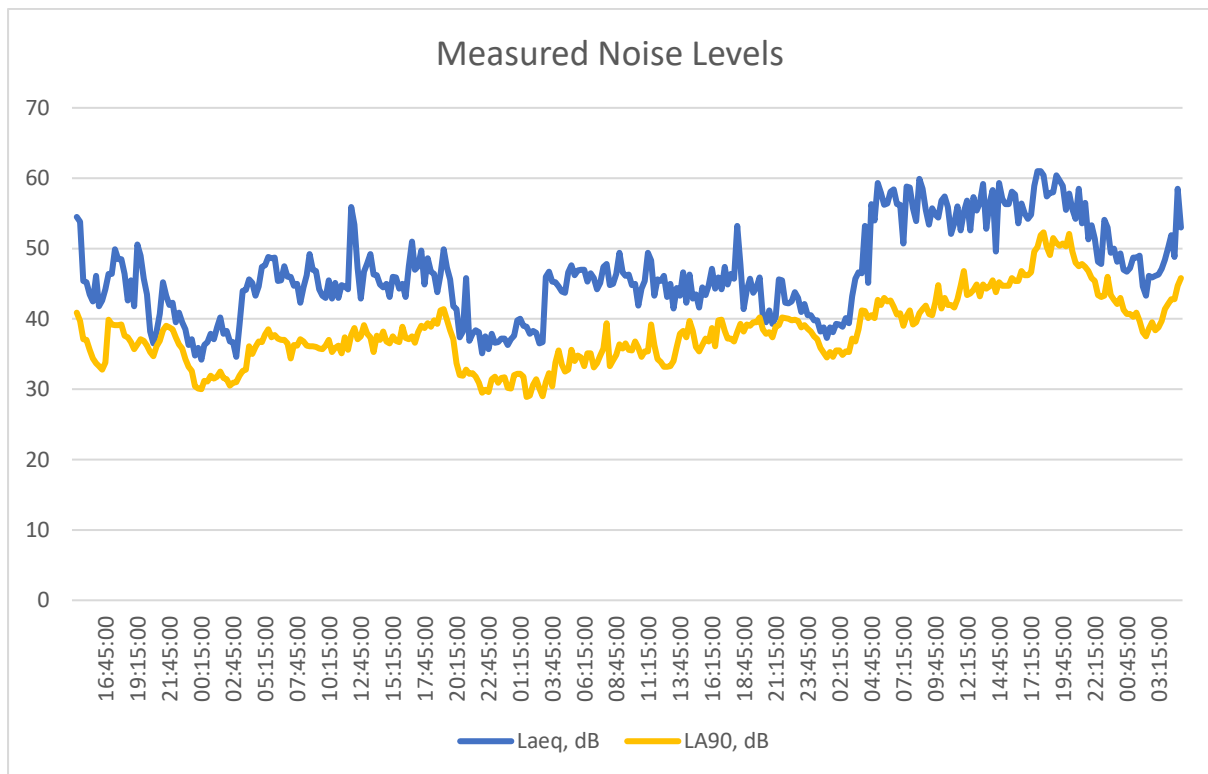


Figure 4.1 Graph showing continuous external noise levels measured on site

5.0 Assessment of Plant Noise Levels

The existing background noise levels on site are fairly low. Rating levels equal to or below 30 dB $L_{A,T}$ are generally regarded as sufficiently low so as to avoid noise disturbance, regardless of the existing background noise level. BS 4142: 2014 also states that;

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.

It is therefore recommended that noise emissions from the proposed outdoor unit are designed to an absolute rating level of 30 dB $L_{A,T}$. The modal background noise levels on site (L_{A90}) are 37 dB during the day and 30 dB during the night.

This means that the rating level of noise emissions will be -7 dB below the existing background noise level during the day, and equal to the existing background noise level during the night at 30 dBA. Based on the recommendations of BS 4142: 2014, this indicates that there will be no adverse noise impact as a result of the proposed mechanical plant installation.

In order to make a full assessment a series of calculations need to be undertaken to predict the noise level at the noise sensitive receptor, based on distance losses, screening and other such factors. These calculations have been provided in Appendix C, and form the basis of the assessment in line with BS 4142: 2014.

The acceptability of the proposed rating level of 30 dB $L_{A,T}$ has been further assessed via an assessment in line with BS 8233: 2014. This has assumed an open window in to the worst affected residential dwelling in relation to the proposed plant installation. The assessment in line with BS 8233: 2014 is outlined in Section 6.0.

5.1 Plant Specification and Location

The current proposal is to locate 1 external unit at roof level at 16 Priory Road. The proposed location is indicated via the red circle in Figure 5.1 below. The unit will be located between the roof extension of 16 Priory Road and the party wall line to 18 Priory Road. The unit is therefore significantly screened to the adjacent residential windows at 14 and 18 Priory Road.

Sound from the proposed unit will also propagate towards the rear of the dwellings on Haverfield Gardens, and towards the front of the dwellings on the other side of Priory Road such as number 35. These dwellings however are located at a substantial distance from the proposed unit. The assessment has been conducted for various receptor locations in order to ensure a robust outcome.

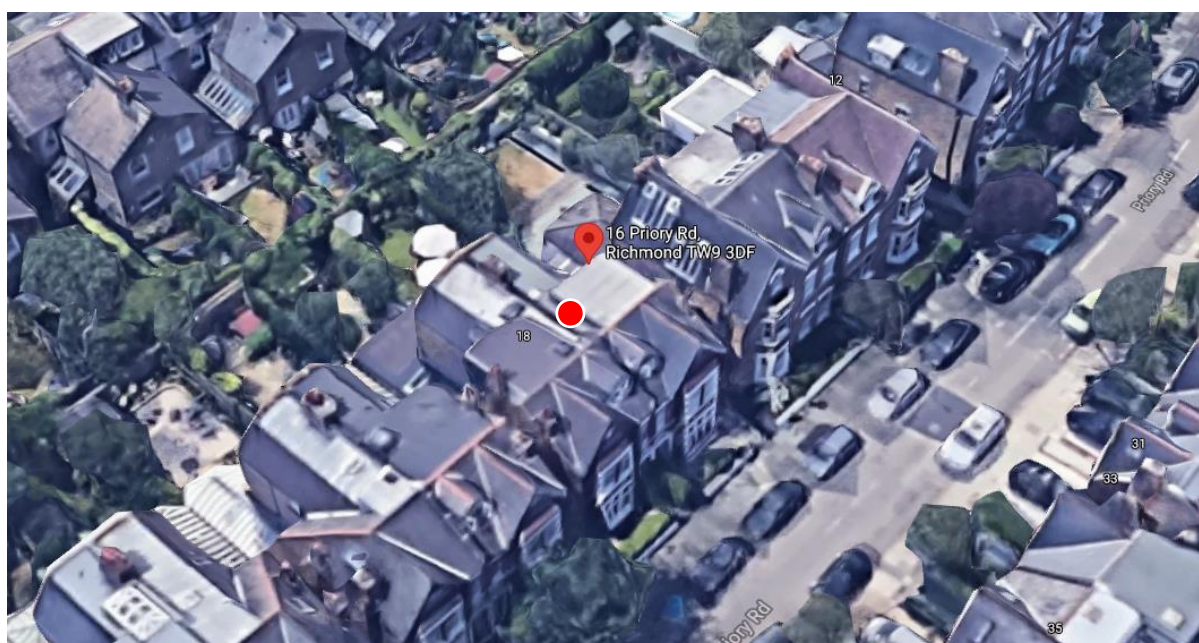


Figure 5.1 Proposed location of 1 x external unit, 16 Priory Road

At this stage it is proposed to install 1 external unit from Daikin. The unit to be installed is the 4MXM68 outdoor unit. Based on the manufacturer noise data from Daikin, a sound power level of 62 dBA has been applied to the proposed noise source. Octave band spectral sound pressure levels supplied by Daikin have been scaled to this sound power level, as spectral sound power data is not provided.

5.2 Assessment – BS 4142: 2014

Table 5.1 provides an assessment of the rating level of the proposed plant at the residential receptor locations. An acoustic feature correction of + 3 dB has been applied to form the rating level, as the proposed plant may be intermittent in nature. The proposed plant is not known to be tonal when operating correctly. Distance loss and screening have also been taken in to account in the calculation of these rating levels.

The assessment has been undertaken using the absolute rating level target of 30 dB $L_{Ar,T}$, which is equal to the modal L_{A90} during night time hours (2300-0700). This rating level limit is also -7 dB below the modal L_{A90} during day time hours (0700-2300).

Receptor Location	Approx. Distance from Source (m)	Screening Correction (dBA)	Specific Noise Level (L_{Aeq} , dB)	Intermittency Correction	Rating Level Limit ($L_{Ar,T}$, dB)	Calculated Rating Level ($L_{Ar,T}$, dB)
14 Priory Road, Worst Affected Window	10	- 7	26	+3	30	29
18 Priory Road, Worst Affected Window	6	- 10	27	+3		30
Rear of Dwellings on Haverfield Gardens	29	0	24	+3		27
34 / 35 Priory Road	25	0	25	+3		28

Table 5.1 BS 4142: 2014, Noise Propagation and Rating Level Calculations – No Mitigation

As can be seen in Table 5.1, the rating level of the proposed plant installation is compliant with the proposed upper limit of 30 dB $L_{Ar,T}$ at all of the receptor locations. This means that additional mitigation will not be required, and the proposed 4MXM68 outdoor unit from Daikin will be suitable for use in this location, subject to approval by the local planning authority.

5.3 Assessment – BS 8233: 2014

In order to further validate the acceptability of the proposed rating level limit of 30 dB $L_{Ar,T}$, the calculated rating levels have been assessed to BS 8233: 2014. The assessment has been conducted for the worst affected residential window at 18 Priory Road. To ensure the most robust assessment, the window has been assumed to be open and the internal noise level has been calculated.

A reduction of 13 dBA through an open window is widely regarded as typical within the acoustics industry, however 10 to 20 dBA of reduction can be achieved depending on the window type and configuration. 13 dBA of reduction is therefore seen to be a robust assessment. The assessment is summarised in Table 5.2 below.

The internal noise criteria of BS 8233: 2014 are provided in Section 2.4. BS 8233: 2014 provides a design criteria of 30 dB $L_{Aeq,T}$ for bedrooms. As can be seen in Table 5.2, the calculated internal noise level due to the proposed plant is 17 dBA. This is compliant with the requirements of BS 8233: 2014 by a large margin of 13 dBA.

Receptor Location	Calculated Rating Level, External ($L_{Ar,T}$, dB)	Open Window Attenuation (dBA)	BS 8233 Bedroom Criteria (dB, $L_{Aeq,T}$)	Internal Level ($L_{Ar,T}$, dB)
18 Priory Road, Worst Affected Window	30	- 13	< 30	17

Table 5.2 Assessment, BS 8233: 2014

This also includes a +3 correction for intermittency, which means that the actual noise level within the dwelling will be 14 dBA. This is 16 dBA below the maximum limit of BS 8233: 2014. This illustrates that there will be no adverse noise impact as a result of the proposed plant at the worst affected residential dwelling, even when a window is open.

It is worth noting additionally that the calculated internal noise level via an open window, due to the proposed plant - is below NR10. It is therefore not seen to be necessary to provide any further reduction to these noise levels.

6.0 Conclusion

A noise survey and noise impact assessment has been provided to support a planning application at 16 Priory Road, Kew, TW9 3DF. This report assesses the potential noise impact of the proposed 1 external unit on the nearby residential receptors.

The rating level target for the proposed external plant has been set at 30 dB $L_{Ar,T}$. This is -7 dB below the modal day time background noise level, and equal to the modal night time background noise level.

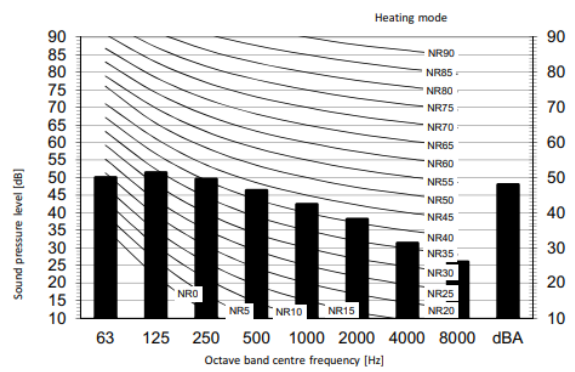
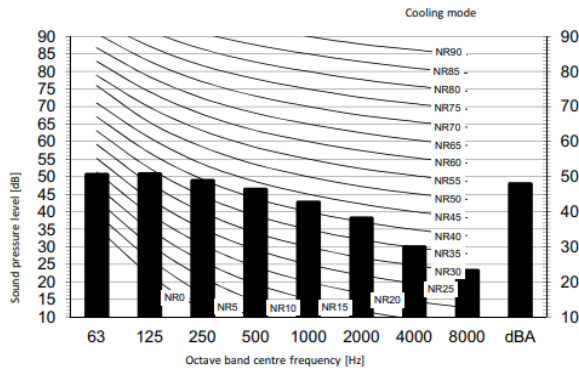
An assessment has been conducted in line with BS 4142: 2014. The assessment has indicated that the rating level of the proposed plant be compliant with the proposed target in all receptor locations. This indicates that there will be no adverse noise impact as a result of the proposed plant installation. The outcome of this assessment is presented in Table 5.1.

In order to further validate the acceptability of the proposed rating level target, the calculated rating levels have been assessed to BS 8233: 2014. The worst affected dwelling is seen to be 18 Priory Road. A calculation of noise break-in has been made in to this dwelling, via an open window, in order to assess the internal noise level due to the proposed plant installation. The calculated internal noise level (inclusive of a +3 dB intermittency correction) is 13 dBA below the recommended upper limit of BS 8233: 2014. This also indicates that there will be no adverse noise impact as a result of the proposed plant installation. The outcome of this assessment is presented in Table 5.2.

Based on the above, the proposed mechanical plant installation is seen to be acceptable. As such, it is seen that permission may be granted for these proposals on the grounds of a negligible noise impact.

Appendix A - Noise Data Sheets

4MXM68N



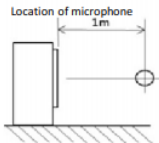
Legend

dBA = A-weighted sound pressure level (A scale according to IEC).

A Scale

High-tap

B



Cooling Total dB

A	B
dBA	48

Heating Total dB

A	B
dBA	49

Notes

- Operating conditions: power source 220-240 V/220 V 50/60 Hz; JIS standard
- Background noise already taken into account.
- Operating noise varies depending on operation and ambient conditions.
- The operation noise measuring method is in accordance with JISC9612.
- Measuring location: anechoic chamber
- The values above are for connecting with the following indoor unit types: 1.5, 2.0, 2.5, 3.5, 4.2, 5.0, 6.0 kW Class

Appendix B - Calibration Certificates



Manufacturer Calibration Certificate

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3. All tests are traceable in accordance with ISO/IEC 17025.

No pattern approval is available for this sound level meter configuration.

Sound Level Meter

Manufacturer	NTi Audio		
Type	XL2	S/N	A2A-16925-E0
Firmware	V4.20		
Reference Level Range	mid		
Microphone Model	M2230		
Preamplifier	MA220	S/N	8657
Microphone Capsule	MC230A	S/N	A17732
Performance class	Class 1		
Customer Inventory Nr.			

Customer

Issue Date 28 November 2019

Certificate FL-19-217

Results PASSED
(for detailed report see next pages)

Operator

Markus Frick



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CERTIFICATE OF CALIBRATION	Certificate Number: 136504
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Environmental conditions

The following conditions were recorded at the time of the test:

Pressure: 100.60 kPa
Temperature: 23.2 °C
Humidity: 33.6 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Acoustic Calibrator	Bruel and Kjaer	4231	1795641
Distortion Meter	Keithley	2015	1175401
Multimeter	Fluke	8845A	9440017

Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Limits	Uncertainty
Level (dB)	94.00	94.00	94.00	93.98	93.99	-0.01	±0.40	0.11 dB
Distortion (%)	< 3.00	1.16	1.16	1.29	1.20	1.20	+3.00	0.13 %
Frequency (Hz)	1000.0	1000.0	1000.0	1000.0	1000.0	0.0	±10.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

End of results

Appendix C – Plant Noise Calculations

		Calculation of Noise to Atmosphere							
RECEPTOR LOCATION:		Octave Band Centre Frequencies, Hz							L _{WA}
14 PRIORY ROAD, REAR ROOF WINDOWS		63	125	250	500	1000	2000	4000	
SWL		63	65	63	59	57	51	45	62
Distance to Receptor	10.0m	31.0	31.0	31.0	31.0	31.0	31.0	31.0	
Screening Loss		7.0	7.0	7.0	7.0	7.0	7.0	7.0	
Façade Reflection		+3	+3	+3	+3	+3	+3	+3	
Specific Noise Level at Receptor		28	30	28	24	22	16	10	26
Correction between SWL & SPL		35	35	35	35	35	35	35	
ATTENUATION		0	0	0	0	0	0	0	
ATTENUATED SPECIFIC NOISE LEVEL		28	30	28	24	22	16	10	26
INTERMITTENCY CORRECTION									3
RATING LEVEL									29

		Calculation of Noise to Atmosphere							
RECEPTOR LOCATION:		Octave Band Centre Frequencies, Hz							L _{WA}
18 PRIORY ROAD, REAR ROOF WINDOWS		63	125	250	500	1000	2000	4000	
SWL		63	65	63	59	57	51	45	62
Distance to Receptor	6.0m	27.0	27.0	27.0	27.0	27.0	27.0	27.0	
Screening Loss		10.0	10.0	10.0	10.0	10.0	10.0	10.0	
Façade Reflection		+3	+3	+3	+3	+3	+3	+3	
Specific Noise Level at Receptor		29	31	29	25	23	17	11	27
Correction between SWL & SPL		34	34	34	34	34	34	34	
ATTENUATION		0	0	0	0	0	0	0	
ATTENUATED SPECIFIC NOISE LEVEL		29	31	29	25	23	17	11	27
INTERMITTENCY CORRECTION									3
RATING LEVEL									30

		Calculation of Noise to Atmosphere							
RECEPTOR LOCATION:		Octave Band Centre Frequencies, Hz							L _{WA}
REAR OF HAVERFIELD GARDENS		63	125	250	500	1000	2000	4000	
SWL		63	65	63	59	57	51	45	62
Distance to Receptor	29.0m	40.0	40.0	40.0	40.0	40.0	40.0	40.0	
Screening Loss		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Façade Reflection		+3	+3	+3	+3	+3	+3	+3	
Specific Noise Level at Receptor		26	28	26	22	20	14	8	24
Correction between SWL & SPL		37	37	37	37	37	37	37	
ATTENUATION		0	0	0	0	0	0	0	
ATTENUATED SPECIFIC NOISE LEVEL		26	28	26	22	20	14	8	24
INTERMITTENCY CORRECTION									3
RATING LEVEL									27

		Calculation of Noise to Atmosphere							
RECEPTOR LOCATION:		Octave Band Centre Frequencies, Hz							L _{WA}
FRONT OF 35 PRIORY ROAD		63	125	250	500	1000	2000	4000	
SWL		63	65	63	59	57	51	45	62
Distance to Receptor	25.0m	39.0	39.0	39.0	39.0	39.0	39.0	39.0	
Screening Loss		0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Façade Reflection		+3	+3	+3	+3	+3	+3	+3	
Specific Noise Level at Receptor		27	29	27	23	21	15	9	25
Correction between SWL & SPL		36	36	36	36	36	36	36	
ATTENUATION		0	0	0	0	0	0	0	
ATTENUATED SPECIFIC NOISE LEVEL		27	29	27	23	21	15	9	25
INTERMITTENCY CORRECTION									3
RATING LEVEL									28

Appendix D – Noise Survey Location

