



Environmental Equipment Corporation Ltd
Richmond House, Churchfield Road
Walton on Thames
Surrey. KT12 2TP
t: 01932 230940
f: 01932 230941
e: info@eec.co.uk

Project:



12 Ulster Terrace

Title:

Plant Noise Impact Assessment

quietly moving forward



Report Title		12 Ulster Terrace Plant Noise Impact Assessment	
Reference		EEC/EC20496-3	
Version		0	
Issue Date		8 February 2024	
Client		Calibre Precision Climate Control Ltd	
Author		Rebecca Shaw BSc(Hons) MIOA Acoustic Consultant 	
Checked		Tim Meed BSc(Hons) MIOA Director 	
Revision	Date	Author	Checked

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1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by Calibre Precision Climate Control Ltd to undertake a noise assessment of 2 No. of air source heat pumps to serve No. 12 Ulster Terrace.
- 1.02 This noise assessment has been conducted in accordance with the policies and requirements of Westminster City Council (WCC) and is based on a noise survey carried out at the site over a typical weekday period.
- 1.03 This assessment includes:
- the setting of plant noise limits in accordance with the requirements of WCC and national planning policy, standards and guidance; and
 - the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location.
- 1.04 This report is prepared solely for Calibre Precision Climate Control Ltd. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party. Note that the contents contained herein are produced for the purposes of review by relevant Planning Authority departments and do not constitute a detailed design or specification document to be used for the purposes of construction. Subsequent development of noise mitigation schemes shall engage EEC Ltd and Calibre Precision Climate Control Ltd so as to support the conclusions of this report.
- 1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

- 2.01 No. 12 Ulster Terrace is located within an existing seven storey residential building located in an existing residential area of Regents Park, Westminster.
- 2.02 The property is bound by the following:
- North – Ulster Terrace and Regents Park;
 - East – facades of residential dwellings on Park Square Mews;
 - South – residential dwellings on Park Square Mews; and
 - West – facades of residential dwellings on Park Square Mews.
- 2.03 This application is for 2 No. Daikin units, model RXYSCQ4TV1, which are to be located in the basement carpark, as presented in Appendix B.
- 2.04 The closest noise sensitive receptor with line of sight to the proposed plant units is No. 8 Park Square Mews.
- 2.05 All other noise sensitive receptors are at a greater distance from the proposed location of the units, or are protected by more screening by the intervening structures, and as such will be subject to lower levels of noise.

3 GUIDANCE

- 3.01 Local and National Planning Policy for the Westminster City Council is presented in Appendix C of this document.
- 3.02 A summary of the pertinent points relating to this application are presented below:
- where the existing external noise levels are above WHO Guideline levels the maximum emission level ($L_{Aeq15min}$) should not exceed 10dB below the minimum external background noise at the nearest noise sensitive properties; and
 - where the existing external noise levels do not exceed the WHO Guideline levels the maximum emission level ($L_{Aeq15min}$) should not exceed 5dB below the minimum external background noise at the nearest noise sensitive properties.
 - where background noise levels are below 30dB $L_{A90,15min}$ site specific standards that avoid noise disturbance to nearest noise sensitive receptors may be considered.

4 MEASUREMENTS

4.01 Environmental noise measurements were carried out over a weekday period, between 0945 hours on Thursday 25th January 2024 and concluded 0915 hours the following day, to establish the existing noise levels at the site. The survey methodology and results are set out below.

4.02 Noise measurements have been carried out at the following position, as shown in Appendix B and described as:

- Position 1: located to the rear of 12 Ulster Terrace at a height of approximately 1.5 metres on the terraced flat roof. The measurement was not located within 3.5 metres of any reflecting surfaces, other than the mounting surface.

4.03 This position is considered to be representative of the nearest windows to the proposed plant location.

5 EQUIPMENT

5.01 The equipment used for the survey was as follows:-

- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
- 01dB Outdoor Microphone Kit and a
- Tripod.

5.02 The equipment holds current UKAS or equivalent accreditation and serial numbers as follows:

Sound Level Meter 01dB Black Solo	Serial No.	61719
	Calibration Date	22 nd August 2022
	Cal Certificate No.	U41741
½" MCE 212 Condenser Mic.	Serial No.	166397
	Calibration Date	22 nd August 2022
	Cal Certificate No.	U41741
Calibrator CAL 21	Serial No.	34634297
	Calibration Date	2 nd May, 2023
	Cal. Certificate No.	U44154

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

- 6.01 The weather during the survey was suitable for noise measurement, it being dry with little wind for the duration of the survey.
- 6.02 Noise sources at the site include local and distant road traffic. There were no other significant sources of noise during the survey.
- 6.03 A list of the levels measured is included in Appendix D and represented graphically in Appendix E.
- 6.04 A summary of the time averaged ambient levels and lowest measured background levels over the measurement periods are shown in Table 6.1. The minimum L_{A90} is the lowest fifteen-minute measurement in the specified period.

Position	Period	Average $L_{Aeq,T}$ – dB	Minimum L_{A90} – dB
1	Day time (0700-1900 hrs)	49	44
	Evening (1900-2300 hrs)	48	44
	Night-time (2300-0700 hrs)	52	42

Table 6.1: Free-Field Measured Ambient and Lowest Background Noise Levels

7 PLANT ASSESSMENT

- 7.01 This application is for the installation of 2 No of plant units to be located in the basement carpark area for 12 Ulster Terrace.
- 7.02 Based on the standard requirements of Westminster City Council and the lowest measured background noise level in each time period, Table 7.1 sets out the recommended noise limits that the proposed items of plant should meet.
- 7.03 Please note, that in accordance with the noise criteria of WCC as set out in Appendix C, the proposed noise limits are based on being 5 dB below the lowest measured background noise level during the daytime and evening period, and 10 dB below the lowest measured background noise level during the night-time period.

Location	Period	Measured Existing $L_{A90,T}$	Proposed Noise Limit L_{Ar}
1	Day	44 dB	39 dB
	Evening	44 dB	39 dB
	Night	42 dB	32 dB

Table 7.1: Suggested Plant Noise Emission Limits Based on Lowest Measured L_{A90} , Free-field dB

- 7.04 Note that the limits suggested above are rating levels and as such any design should take into account the acoustic characteristics of the plant. In this instance the proposed units display none of the characteristics whereby the acoustic correction should be applied.
- 7.05 Assuming the proposed items meet the noise limits set out in Table 7.1 noise will be below the NOEL with respect to the NPPF.
- 7.06 Manufacturers published noise emission levels for the operating modes of the Daikin RXYSCQ4TV1 units are presented in Table 7.2 below. Copies of the manufacturer’s plant data sheets are included in Appendix F.

Operating Mode	Sound Pressure level measured at a distance of 1m dB(A)
Cooling	51
Heating	52
Night Quiet Mode: Level 1	51
Night Quiet Mode: Level 2	47
Night Quiet Mode: Level 3	46

Table 7.2: Manufacturers Published Noise Emission Data for All Proposed Plant dB(A)

- 7.07 It is proposed that all plant installations be installed on suitable anti-vibration mounts to limit the levels of structure borne noise transfer to connecting structures.
- 7.08 Predicted noise levels have been calculated at the closest noise sensitive windows which have a line of sight to the plant units, the residential dwellings at No 8 Park Mews Square.
- 7.09 Other residential receptors located further from the site will be subject to lower noise levels than those predicted at the above locations.
- 7.10 Tables 7.3 – 7.5 present the results of worst-case plant noise predictions at the worst-case locations.
- 7.11 It should be noted that the air source heat pumps units will be running in quiet mode level 2 during the night-time period.

Item	Noise Level	Notes
2 No. Daikin RXYSCQ4TV1 Units	55 dB(A)	Cumulative sound pressure level at 1 metre with units operating in normal mode
Reflections	+ 9 dB	Additional reflections from surrounding walls of the basement
Point source area losses over 25 metres	- 28 dB	Distance to closest window
Cumulative Resultant Noise Level	36 dB(A)	Closest window at No. 8 Park Square Mews

Table 7.3: No 8 Park Square Mews Plant Noise Calculation (DAYTIME/EVE)

Item	Noise Level	Notes
2 No. Daikin RXYSCQ4TV1 Units	50 dB(A)	Cumulative sound pressure level at 1 metre with units operating on quiet mode 2
Reflections	+ 9 dB	Additional reflections from surrounding walls of the basement
Point source area losses over 25 metres	- 28 dB	Distance to closest window
Cumulative Resultant Noise Level	31 dB(A)	Closest window at No. 8 Park Square Mews

Table 7.4: No 8 Park Square Mews Plant Noise Calculation (NIGHT-TIME)

Property	Period	Proposed Noise Limit L_{Ar}	Predicted $L_{Aeq,T}$	Exceedance of noise limit
No. 8 Park Square Mews	Daytime	39 dB	36 dB	-3 dB
	Evening	39 dB	36 dB	-3 dB
	Night-time	32 dB	31 dB	-1 dB

Table 7.5: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

- 7.12 It can be seen from the above tables that the noise limits are not exceeded during any period at the nearest noise sensitive location when the plant units are operating in quiet mode level 2 during the night-time period.
- 7.13 Assuming that the proposed plant is operating in normal mode during the daytime and in quiet mode 2 during the night-time, predicted noise levels will meet the requirements of the Local Authority during all periods of operation and at the closest most affected noise sensitive receptor.
- 7.14 With respect to the NPPF, achieving the noise limits would be classified as approaching the NOEL during the day and evening periods and being below the NOEL at night time.

8 CONCLUSIONS

- 8.01 Calibre Precision Climate Control Ltd has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for the installation of two air source heat pumps units, 2 No Daikin RXYSCQ4TV1 to be located in the basement carpark.
- 8.02 The assessment has been carried out in accordance with national planning guidance and the requirements of the WCC, and is based on an environmental noise survey conducted at the site over a mid-week period.
- 8.03 A noise assessment has been undertaken to evaluate the potential noise impact of the proposed plant at the closest existing residential receptors.
- 8.04 Plant noise limits have been set based on the methodology contained in BS4142, the results of a background noise survey and the requirements of Westminster City Council, to control the noise from the proposed plant units. In accordance with the LA, the noise limits have been set 5 dB below the lowest measured background noise level during the daytime and evening period and, 10 dB below the lowest measured background noise level during the night-time period.

- 8.05 Predictions have shown that the noise criterion is met at all assessment locations during all periods of the proposed operation of the plant, assuming that the units are running in quiet mode 2 during the night-time.
- 8.06 Assessing the site in accordance with the principles of the National Planning Policy Framework has shown that predicted noise levels would be below the level at which no effects are observed to occur, the NOEL.
- 8.07 On the basis of this assessment, it is considered that noise does not pose a material constraint to the operation of the plant units.

APPENDIX A
GLOSSARY OF TECHNICAL TERMS

ACOUSTIC TERMINOLOGY

Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dB(A)	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BBS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

APPENDIX B

**SITE PLAN
&
MEASUREMENT LOCATION**



APPENDIX C
PLANNING POLICY
AND GUIDANCE

PLANNING POLICY AND GUIDANCE

Westminster's planning policy framework is set out in a range of documents including Westminster's "City Plan 2019 – 2040" (formally adopted 21 April 2021) and other Local Development Framework documents.

Together with national planning policy and the Mayor of London's London Plan, these set out their strategy for managing growth and development in the City.

Policy 7 "Managing development for Westminster's people" and Policy 33 "Local environmental effects" of the City Plan sets out the council's policy on noise.

Policy 7

"Development will be neighbourly by:

- A. Protecting and where appropriate enhancing amenity, by preventing unacceptable impacts in terms of daylight and sunlight, sense of enclosure, overshadowing, privacy and overlooking.*
- B. Protecting and where appropriate enhancing local environmental quality.*
- C. Protecting and positively responding to local character and the historic environment.*
- D. Not overburdening the capacity of local infrastructure.*
- E. Contributing to the greening of the city.*
- F. Improving sustainable transport infrastructure and highway conditions.*
- G. Making appropriate and effective waste management arrangements."*

Policy 33 (Section C)

"NOISE AND VIBRATION

C. Development should prevent adverse effects of noise and vibration and improve the noise environment in compliance with the council's Noise Thresholds, with particular attention to:

- 1. minimising noise impacts and preventing noise intrusion to residential developments and sensitive uses;*
- 2. minimising noise from plant and machinery and internal activities;*
- 3. minimising noise from servicing and deliveries; and*
- 4. protecting the relative tranquillity in and around open spaces."*

In the Glossary of terminology Noise Sensitive Receptors are described as:

"Comprises residential use, educational establishments, hospitals, hotels, hostels, concert halls, theatres, law courts, and broadcasting and recording studios".

In addition to the City Plan 2019 – 2040, Westminster council has published a Noise Technical Guidance Note (in public draft as of August 2021) which outlines the standard design targets, or "Noise Thresholds" required in order to achieve the above Policies.

Table 3 of this document (reproduced below) presents the Noise Thresholds for noise emissions from plant and machinery.

Table 3: Noise criteria for plant machinery and internal/external activities

Existing External Ambient Noise Level	Tonal or Intermittent Noise/ Noise Source	Sound Emission Level that should not be Exceeded at the nearest Noise Sensitive Receptor ³
Exceed WHO Guideline levels. L _{Aeq} 55 dB over periods of daytime (07.00-23.00hrs) and L _{Aeq} 45 dB at night-time (23.00-07.00hrs).	Does not contain tones or intermittent noise sufficient to attract attention.	10 dB below the minimum external background noise level
	Contains tones or be intermittent noise sufficient to attract attention.	15 dB below the minimum external background noise level.

² These criteria will be applied to development no matter the background/assessed

³ Measured at the nearest noise sensitive receptors 1m from the most affected façade, relative to the existing external background noise level in this location and including assessment at the quietest time during which the plant operates or when there is internal activity at the development site. The background noise level should be expressed in terms of the lowest L_{A90,15min} during day time or night time (depending on the hours of use being applied for).

	Noise emitted from emergency plant or an emergency life supporting generators. ⁴	10 dB above the lowest background noise level within a 24-hour period.
Does not exceed WHO Guideline levels. L _{Aeq} 55 dB over periods of daytime (07.00-23.00hrs) and L _{Aeq} 45 dB night-time (23.00-07.00hrs).	Does not contain tones or intermittent noise sufficient to attract attention.	5 dB below the minimum external background noise level.
	Contains tones or be intermittent noise sufficient to attract attention.	10 dB below the minimum external background noise level.
	Noise emitted from emergency plant or an emergency life supporting generators. ⁵	10 dB above the lowest background noise level within a 24-hour period.
Below 30 dB L _{A90,15min} at the nearest noise sensitive receptors Both daytime (07.00-23.00hrs) and night-time (23.00-07.00hrs).	Noise contains and/or does not contain tones or intermittent noise	Site specific standards that avoid noise disturbance to nearest noise sensitive receptors may be considered.

In addition to the above, further design criteria are outlined for the protection of Tranquil Open Spaces. The Technical Note states the following:

“The noise criteria in sections 2.3 and 2.4 [table 3 above] apply to the closest edge of the nearest tranquil open space, or for development within a tranquil open space the criteria apply 5 metres from the noise sources at the quietest time of day or night (when the plant operates or when there is internal or external activity at the development) ...

...It is acknowledged that some developments will enhance the soundscape; in this case the specified standards above will not need to be met. These developments may include children’s play areas, sonic installations and local amenities.”

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 (as amended on 20th December 2023) and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

Paragraph 180 in Section 15 of the NPPF , entitled Conserving and enhancing the natural environment, states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability...”

Paragraph 191 in Section 15 also states that:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...”

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

“NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.”

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:

avoid significant adverse impacts on health and quality of life;

mitigate and minimise adverse impacts on health and quality of life; and

where possible, contribute to the improvement of health and quality of life.”

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

2.25 This aim (the third aim), seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

British Standard 4142

To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 ‘Methods for rating and assessing industrial and commercial sound’ has been used to assess the likelihood any adverse impacts based on the resultant noise level from the new plant item, including any corrections for the character of the noise against the existing background noise level.

BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a ‘rating level’ of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the ‘rating level’ to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +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 noise level, the less likely it is that the specific sound source will have an adverse impact or 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 sound impact, depending on the context.

This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

The 'rating level' of the noise source is obtained taking the following factors into consideration:

- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq} .
- An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

BS 4142 goes onto state that:

'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.'

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.

APPENDIX D
SURVEY RESULTS
(TABULAR)

EC 20496 - 12 Ulster Terrace

Calibre Climate

Tabulated Noise data

Time	L _{Aeq}	L _{AMax}	L _{A90}
09:45	47	62	45
10:00	48	61	45
10:15	48	59	45
10:30	49	69	45
10:45	51	69	45
11:00	52	72	45
11:15	49	63	45
11:30	49	66	46
11:45	49	59	46
12:00	51	71	45
12:15	48	69	45
12:30	47	62	44
12:45	48	65	45
13:00	48	71	45
13:15	49	66	45
13:30	48	56	45
13:45	49	64	46
14:00	48	63	45
14:15	49	65	45
14:30	52	69	47
14:45	49	62	46
15:00	49	65	46
15:15	51	68	46
15:30	49	62	46
15:45	51	67	46
16:00	50	70	46
16:15	50	73	46
16:30	48	58	46
16:45	49	59	47
17:00	48	59	46
17:15	48	57	46
17:30	49	65	46
17:45	48	60	45
18:00	48	60	45
18:15	49	64	46
18:30	49	62	46
18:45	48	61	44
19:00	53	70	45
19:15	48	64	45
19:30	49	68	45
19:45	49	67	45
20:00	48	57	45
20:15	47	57	45
20:30	48	65	44
20:45	48	63	44
21:00	46	56	44
21:15	48	61	45
21:30	52	68	45

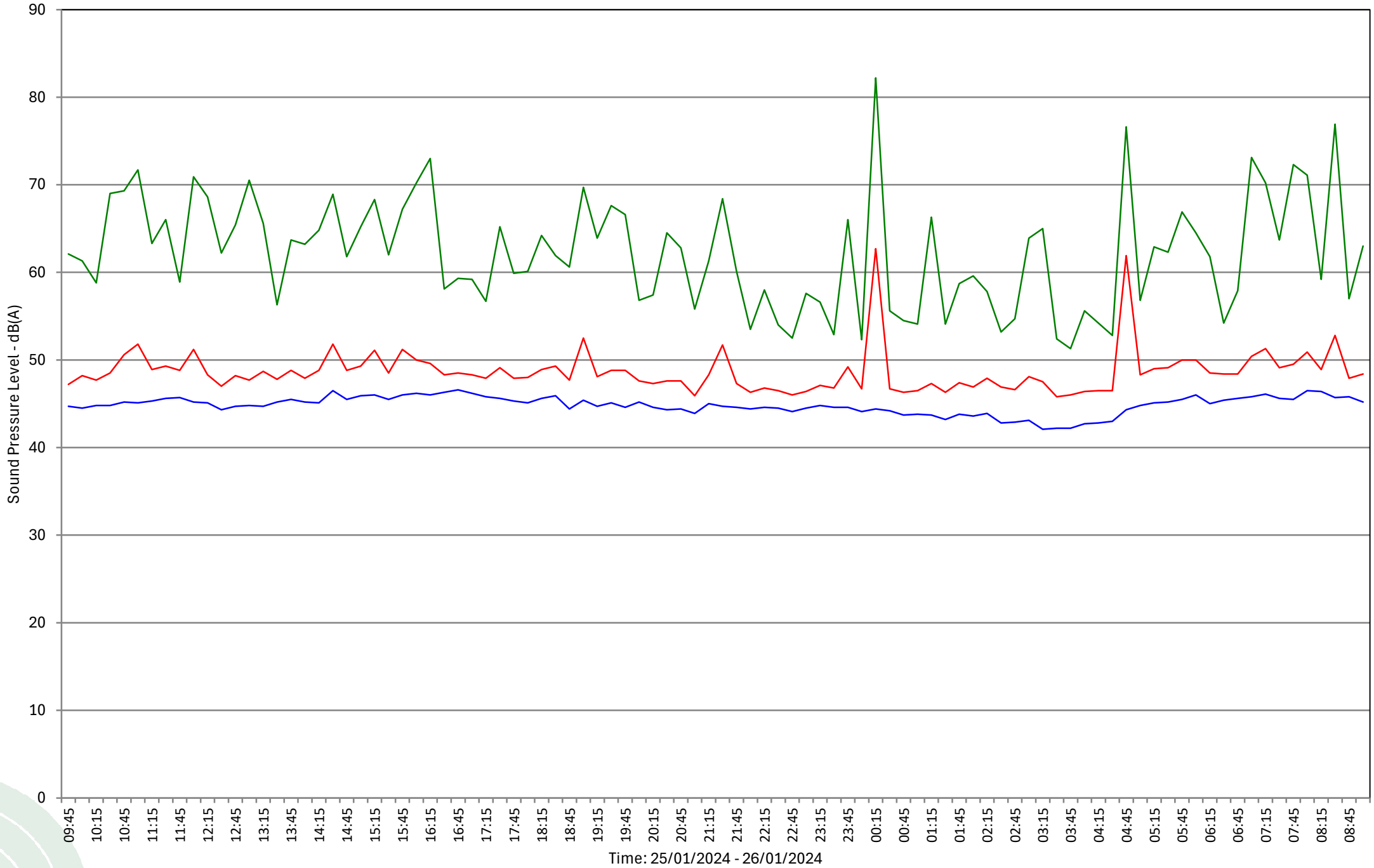
Time	L _{Aeq}	L _{AMax}	L _{A90}
21:45	47	60	45
22:00	46	54	44
22:15	47	58	45
22:30	47	54	45
22:45	46	53	44
23:00	46	58	45
23:15	47	57	45
23:30	47	53	45
23:45	49	66	45
00:00	47	52	44
00:15	63	82	44
00:30	47	56	44
00:45	46	55	44
01:00	47	54	44
01:15	47	66	44
01:30	46	54	43
01:45	47	59	44
02:00	47	60	44
02:15	48	58	44
02:30	47	53	43
02:45	47	55	43
03:00	48	64	43
03:15	48	65	42
03:30	46	52	42
03:45	46	51	42
04:00	46	56	43
04:15	47	54	43
04:30	47	53	43
04:45	62	77	44
05:00	48	57	45
05:15	49	63	45
05:30	49	62	45
05:45	50	67	46
06:00	50	65	46
06:15	49	62	45
06:30	48	54	45
06:45	48	58	46
07:00	50	73	46
07:15	51	70	46
07:30	49	64	46
07:45	50	72	46
08:00	51	71	47
08:15	49	59	46
08:30	53	77	46
08:45	48	57	46
09:00	48	63	45

APPENDIX E
SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at 12 Ulster Terrace



— LAeq — LAFmax — LAF90



APPENDIX F
PUBLISHED PLANT NOISE DATA



VRV IV S-series compact heat pump • RXYSQC-TV1

2 Specifications

2 - 1 Specifications

2

Technical Specifications				RXYSQC4TV1	RXYSQC5TV1	RXYSQC6TV1
Heat exchanger	Type	Cross fin coil				
	Indoor side	Air				
	Outdoor side	Air				
	Air flow rate	Cooling	Rated	m ³ /h	5,460	5,460
Fan	Quantity	1				
	Fan motor	DC motor				
Compressor	Output	200				
	Quantity	1				
Operation range	Type	Hermetically sealed swing compressor				
	Crankcase heater	W				
	Cooling	Min.	°CDB	-5.0		
		Max.	°CDB	46.0		
Heating	Min.	°CWB	-20.0			
	Max.	°CWB	15.5			
Sound power level	Cooling	Nom.	dB(A)	68.0 (4)	69.0 (4)	70.0 (4)
Sound power level	Heating	Prated,h	dB(A)	69.0 (4)	70.0 (4)	71.0 (4)
Sound pressure level	Cooling	Nom.	dB(A)	51.0 (5)	52.0 (5)	53.0 (5)
Refrigerant	Type	R-410A				
	GWP	2,087.5				
	Charge	kg				
Refrigerant oil	Type	Synthetic (ether) oil FVC50K				
Piping connections	Liquid	Type	Flare connection			
		OD	mm			
	Gas	Type	Flare connection			
		OD	mm			
Total piping length	System	Actual	m	300 (6)	19.1	
Defrost method	Reversed cycle					
Capacity control	Method	Inverter controlled				
Indication if the heater is equipped with a supplementary heater						
Supplementary heater	Back-up capacity	Heating	elbu	kW		
Power consumption in other than active mode	Crankcase heater mode	Cooling	PCK	kW		
		Heating	PCK	kW		
	Off mode	Cooling	POFF	kW		
		Heating	POFF	kW		
	Standby mode	Cooling	PSB	kW		
		Heating	PSB	kW		
	Thermostat-off mode	Cooling	PTO	kW		
		Heating	PTO	kW		
Cooling	Cdc (Degradation cooling)					
Heating	Cdh (Degradation heating)					
Safety devices	Item	01	High pressure switch			
		02	Fan driver overload protector			
		03	Inverter overload protector			
		04	PC board fuse			

Standard accessories: Installation manual;Quantity: 1;

Standard accessories: Operation manual;Quantity: 1;

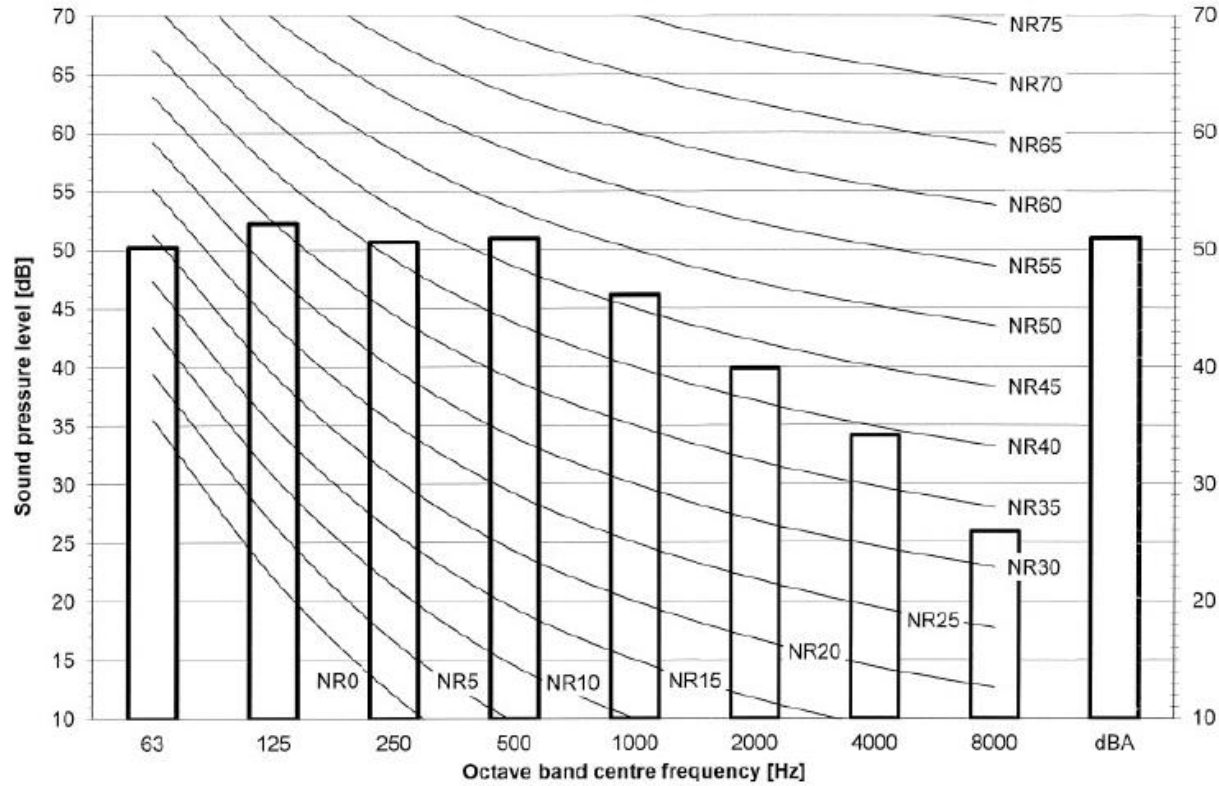
Standard accessories: Connection pipes;Quantity: 1;

Electrical Specifications				RXYSQC4TV1	RXYSQC5TV1	RXYSQC6TV1
Power supply	Name	V1				
	Phase	1~				
	Frequency	Hz				
	Voltage	V				
Powersupply intake	Both indoor and outdoor unit					
Voltage range	Min.	%				
	Max.	%				
Current	Nominal running current (RLA)	Cooling	A	19.0 (10)		23.2 (10)

6



VRV IV S-series compact heat pump • RXYSQC-TV1



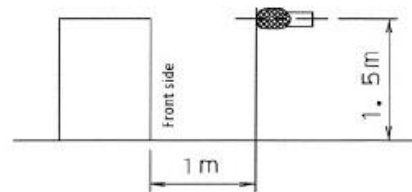
SECRET

Notes

- Data is valid at free field condition.
- Data is valid at nominal operation condition.
- dBA = A-weighted sound pressure level (A scale according to IEC).
- Reference acoustic pressure 0 dB = 20 µPa

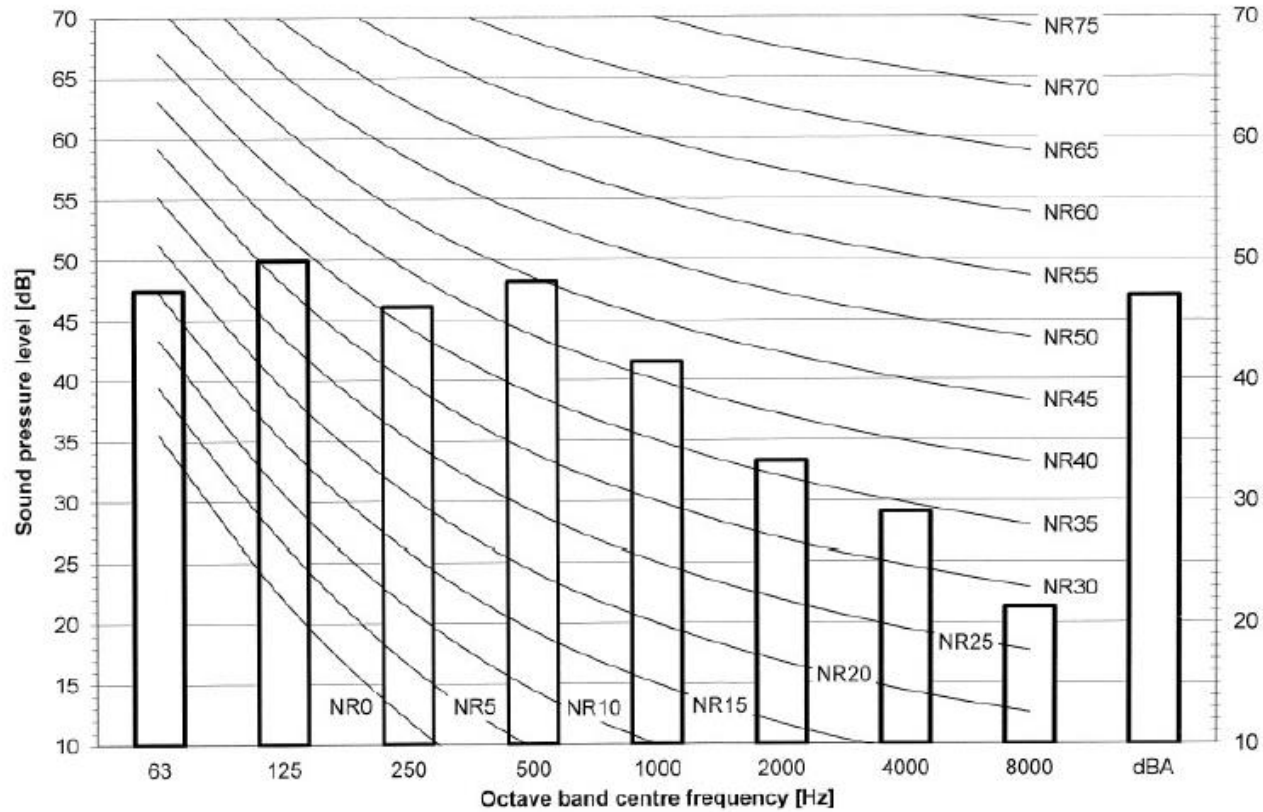
Data is valid under the following conditions

- Cooling operation
- Outdoor Ta: 35°C
- Full load (maximum fan rps and maximum compressor rps for the dedicated low noise mode)



RXVSCQ4/STMV1B
SOUND PRESSURE NIGHT QUIET L1

SECRET

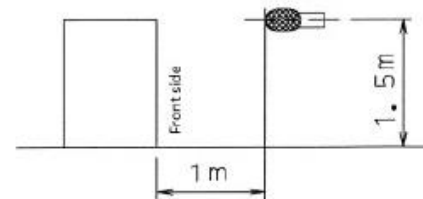


Notes

- Data is valid at free field condition.
- Data is valid at nominal operation condition.
- dBA = A-weighted sound pressure level (A scale according to IEC).
- Reference acoustic pressure 0 dB = 20 µPa

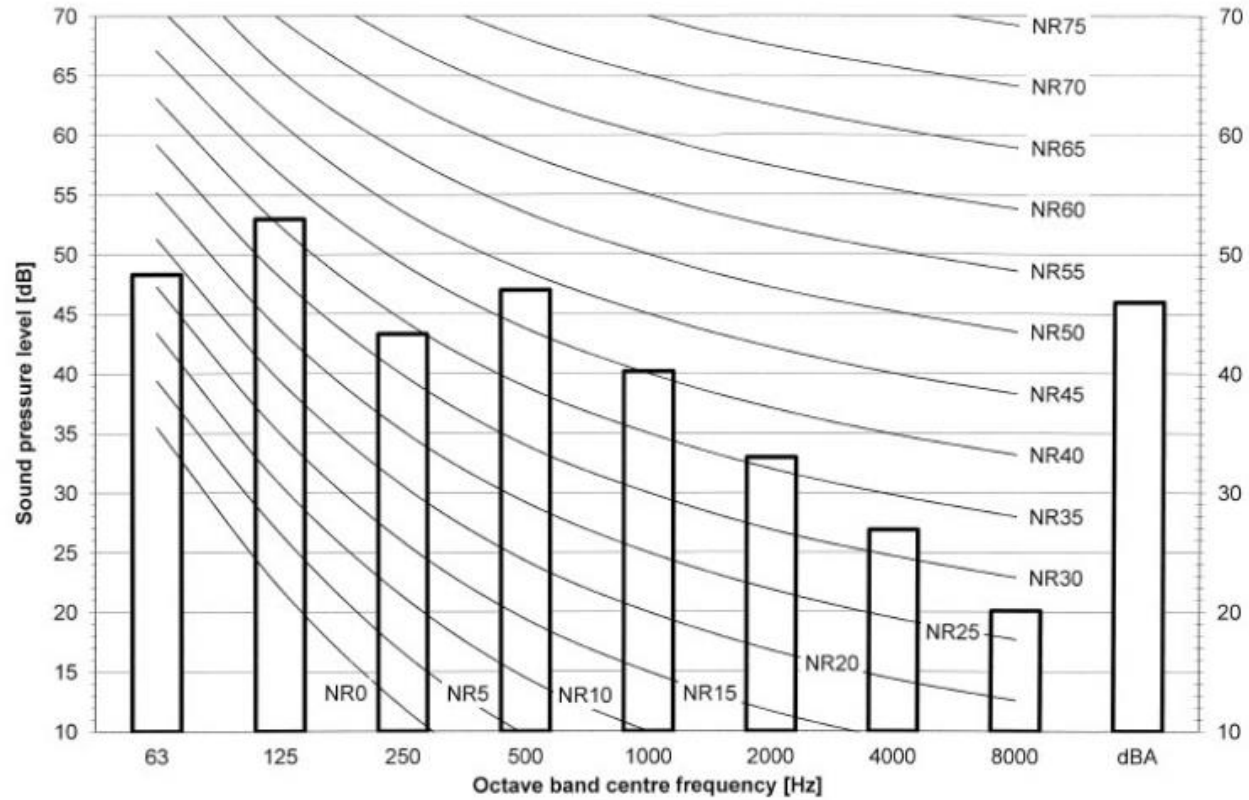
Data is valid under the following conditions

- Cooling operation
- Outdoor Ta: 35 °C
- Full load (maximum fan rps and maximum compressor rps for the dedicated low noise model)



R3YSC04/5TMV1B
SOUND PRESSURE NIGHT QUIET L2

SECRET

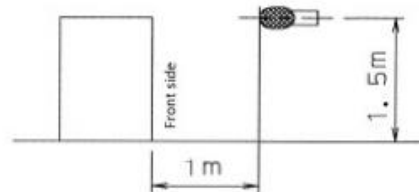


Notes

- Data is valid at free field condition.
- Data is valid at nominal operation condition.
- dBA = A-weighted sound pressure level (A scale according to IEC).
- Reference acoustic pressure 0 dB = 20 µPa

Data is valid under the following conditions

- Cooling operation
- Outdoor Ta: 35°C
- Full load (maximum fan rps and maximum compressor rps for the dedicated low noise mode)



RXY5CQ4/STMV1B
SOUND PRESSURE NIGHT QUIET L3