222 GRAYS INN ROAD, LONDON WC1X 8HB

BS4142 PLANT NOISE ASSESSMENT

15 August 2018

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ARAN ACOUSTICS

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1.0 INTRODUCTION

Aran Acoustics has been appointed to carry out a noise impact assessment for the proposed installation of 2 no. external condenser units at 222 Grays Inn Road, London.

A noise survey and assessment has been requested to ensure that noise levels from the condenser unit does not cause undue disturbance to nearby noise sensitive locations.

The purpose of this assessment is to determine the existing noise levels at the nearest noise sensitive location and establish the maximum permissible noise levels from proposed units.

Such to establish suitable plant noise levels an assessment has been carried out to BS 4142: 2014 '*Method for rating and assessing industrial and commercial sound*'. This assessment has been benchmarked against an environmental noise survey carried out on 08 August 2018.

This report therefore describes the noise survey and its results. Figure 4.1 contains a graphical representation of the noise measurements taken on site. Section 5.0 provides a review of guidance documentation and establishes the maximum permissible noise levels for the proposed plant. Section 6.0 provides an assessment of plant noise levels.

2.0 SITE DESCRIPTION

The site is located at 222 Grays Inn Road in the London Borough of Camden. The site contains an existing 7 no. storey building that provides office accommodation.

Proposals are for the installation of 2 No. additional external condenser units at roof top level to provide cooling to a new server rooms within the building as shown on the architectural drawings within Appendix A.

The nearest noise sensitive receptor to the location of the condenser units are the top floor windows of properties directly adjacent on Grays Inn Road.

A subjective noise assessment on site determined that the main noise source in the area to impact the nearest noise sensitive receptor is road traffic on Grays Inn Road along with existing plant servicing commercial units in the immediate area.

Figure 2.1 below shows a location map and aerial photo of the site and surrounding area.

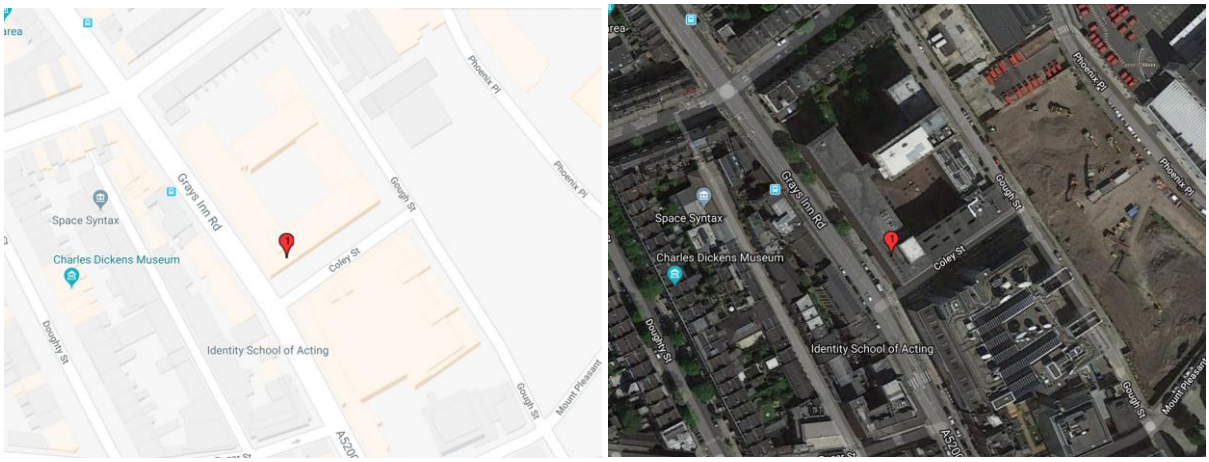


Table 2.1 – Location map and aerial photo of the site

3.0 ENVIRONMENTAL NOISE SURVEY

A 24-hour environmental noise survey was carried out between Wednesday 08 and Thursday 09 August 2018. The survey incorporated day and night time measurements. A single noise monitor was located on the front elevation of the existing building at top floor level overlooking Grays Inn Road.

The microphone was placed on a boom pole and extended approximately 1.5m from the façade of the building. Noise levels measured at this location are considered representative of the existing environmental noise levels to impact the adjacent noise sensitive receptor.

Site photos of the microphone location are provided in Appendix B.

3.1 Measurement Equipment

The following measurement equipment was used, which complies with the performance specifications for a Class 1 device in accordance with BS EN 61672-1, BS EN 61260 and BS EN 60942.

Name	Serial Number	Last Calibrated	Calibration Due
Norsonic Precision Sound Analyser Type 140	1403701	Oct 2016	Oct 2018
Norsonic Type 1209 Pre-amplifier	13278	Oct 2016	Oct 2018
Norsonic Type 1225 Microphone	106867	Oct 2016	Oct 2018
Norsonic Sound Calibrator Type 1251	32994	Oct 2017	Oct 2018

Table 3.1 – Measurement equipment used on site

The meter was calibrated before and after testing - no deviations were found. The meter was set to measure consecutive 'A' weighted 15-minute samples. This time period is in line with BS 4142 requirements.

3.2 Weather Conditions

The weather was fine and dry for the duration of the survey. Wind speed remained below 5 m/s. The temperature varied between approximately 16 and 26 ^{o}C.

The weather conditions were seen as suitable for environmental noise surveying in accordance with BS 7445-1:2003 '*Description and measurement of environmental noise'*.

4.0 SURVEY RESULTS

The noise levels measured during the 24-hour survey period are shown in Figure 4.1 below. The full set of acoustic data measured on site is available upon request.

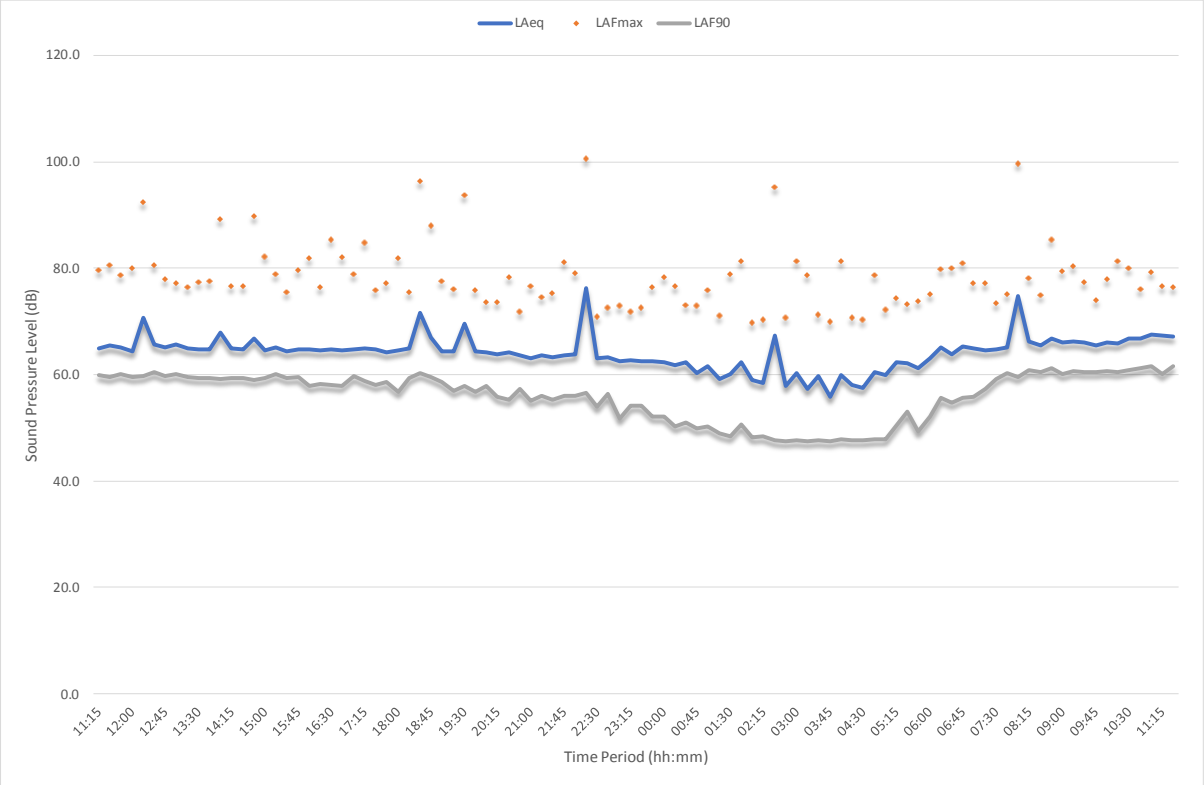


Figure 4.1 - Noise levels measured on site

The table below provides a summary of the noise levels measured on site at the fixed microphone position during the survey period including the representative background; L_{A90}.

Noise Descriptor	Daytime 07:00 – 23:00 hours	Night time 23:00 – 07:00 hours
Average Noise Level, L_{Aeq}	67	62
Representative Background, L_{A90}	59	48

Table 4.1 - Summary of measured noise levels

5.0 ASSESSMENT CRITERIA

5.1 British Standard 4142

BS 4142:2014 describes a method of determining the level of noise of an industrial nature, together with the procedures for assessing whether the noise in question is likely to give rise to complaints from persons living in the vicinity. As such, an assessment to BS 4142 is typically called for within planning conditions.

The likelihood of complaints in response to a specific noise depends on various factors. BS 4142 assesses the likelihood of complaints by considering the margin by which the noise in question exceeds the background noise level. BS 4142 states that:

a) Typically, the greater this difference, the greater the magnitude of the impact.
b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d) 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.

This standard also allows for an appropriate correction for the acoustic features present in the noise using a number of methods. A correction should be applied if one or more of the following features (see the list below), are present within the noise sources in question.

- The noise is of a tonal nature, i.e. it contains a distinguishable, discreet, continuous note such as whine, hiss, screech, hum;
- The noise is impulsive, i.e. it contains distinct impulses such as bangs, clicks, clatters, or thumps;
- The noise contains other characteristics that are neither tonal nor impulsive but is irregular enough to attract attention.

5.2 Camden Development Policies – DP28

Camden Development Policies sets out detailed planning policies that the Council use when determining applications for planning permission in the borough. Development Policy 28 (DP28) –provides assessment criteria for Noise and Vibration.

This document states that a development that exceeds Camden's Noise and Vibration thresholds will not be permitted. The upper limits for noise exposure are divided into daytime, evening and night time noise levels. The upper limits pertaining to noise levels from plant and machinery are provided in the following table:

Table E: Noise levels from plant and machinery at which planning permission will not be granted

Noise description and location of measurement	Period	Time	Noise level
Noise at 1 metre external to a sensitive façade	Day, evening and night	0000-2400	5dB(A) <LA90
Noise that has a distinguishable discrete continuous note (whine, hiss, screech, hum) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise that has distinct impulses (bangs, clicks, clatters, thumps) at 1 metre external to a sensitive façade.	Day, evening and night	0000-2400	10dB(A) <LA90
Noise at 1 metre external to sensitive façade where LA90>60dB	Day, evening and night	0000-2400	55dB$L_{Aeq'}$

Table 5.1 - DP28: Upper noise limits for plant and machinery

5.3 Target Plant Noise Levels

It is understood that plant will operate intermittently throughout the day and night time period therefore calculations are based on the lowest measured background noise levels measured during the 24 hour period.

It is considered that the external condenser units produce a broadband noise with no tonal features. The units are also inverter driven, meaning that the units will gradually increase or decrease its operating capacity depending on the level of duty required. This gives a positive indication that the noise produced is not immediate or distinguishable therefore no correction need be applied to the results.

It can be concluded from BS4142 and Camden Development Policy 28 guidance documentation that noise levels from plant and equipment should not exceed -5 dB above the minimum background noise level when measured at the nearest noise sensitive location. This target has been imposed upon similar developments and is seen as a suitable design target where complaints are deemed unlikely.

Based on the lowest measured background noise level during the proposed operating period and the suggested design targets including any tolerance or correction factors, the following table shows the maximum permissible noise level from the condenser unit when measured at the window of the nearest noise sensitive receptor.

Representative Background, L_{A90}	Tolerance Factor	Correction Factor	Max Noise Level at Residential
48 dBA	-5 dB	-0 dB	**43 dBA**

Table 5.2 - Plant Noise Level Target

6.0 PLANT NOISE LEVEL ASSESSMENT

Proposals are to install 2 no. Daikin RZAG71MV1 condenser units at roof top level in the existing mechanical plant area as shown on the site plans within Appendix A.

Based on the proposed location of the condenser units, the distance to the nearest noise sensitive window is estimated to be 31.5m. At this distance, the units of plant are considered a point source and noise levels will decay at a rate of 6dB per doubling of distance.

Due to the building heights there is no direct line of sight between the condenser units location and window of nearest noise sensitive receptor therefore a barrier correction has been included in our calculations. A barrier attenuation of 10 dB is expected when the noise source is not visible from the receiver position.

Distance attenuation can be added to the attenuation provided by any barrier to give the overall attenuation. The following table provides the calculated noise levels from the units of plant when measured at 1m from the nearest residential receptor.

	Octave Band Centre Frequency, dB							
Plant Description	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1.0 K Hz**	**2.0 K Hz**	**4.0 K Hz**	**dBA**
Daikin RZAG71MV1	53	52	46	45	39	35	29	**46**
Multiple Unit Correction	3	3	3	3	3	3	3	
Distance Attenuation	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	-30.0	
Barrier Attenuation	-10	-10	-10	-10	-10	-10	-10	
Noise Level at Receiver	16.0	15.0	9.0	8.0	2.0	-2.0	-8.0	**9**

Table 6.1 – Calculated Plant Noise Levels

Calculations show that the noise level from the condenser units will be approximately **9 dBA** when measured at the nearest residential window. This does not exceed the target plant noise level of **43 dBA** established in Section 5.0 above which is a positive indication that complaints are unlikely therefore no further mitigation is proposed at this stage.

Manufacturers noise level data sheets are provided in Appendix C.

7.0 SUMMARY AND CONCLUSION

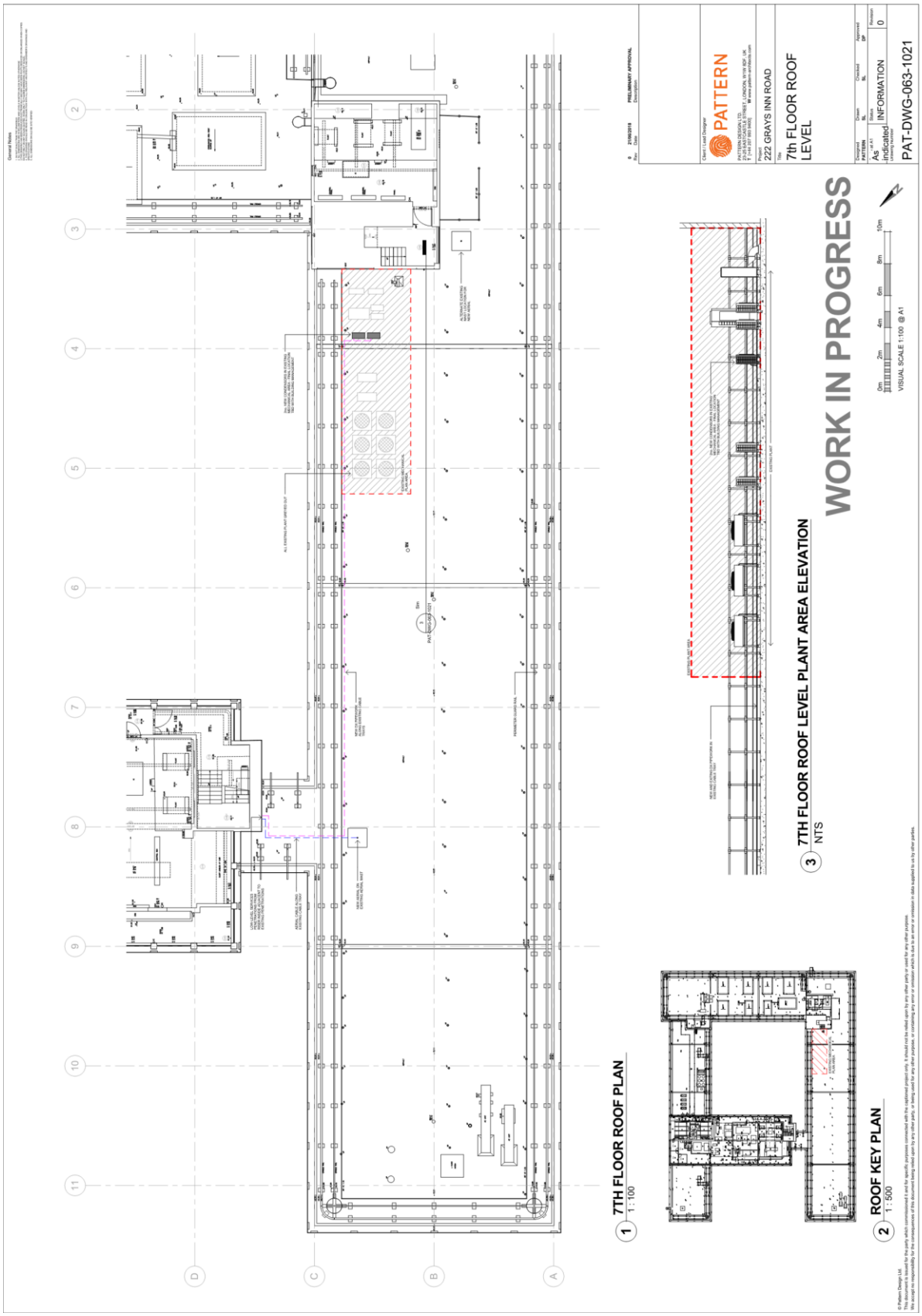
A noise survey was carried out at the location of proposed air condenser units to be installed at 222 Grays Inn Road, London on the 08 August 2018.

From this survey the minimum representative background noise level at the nearest sensitive property was found to be 48 dB L_{A90} during the proposed operational hours.

Using guidance in BS 4142 and Camden Development Policy – DP28, noise levels from the proposed external plant associated with the development should not exceed 5 dBA below the background noise level at the window of the nearest noise sensitive receptor.

Based on manufacturer's noise level data for the proposed plant, calculations show that noise levels at the nearest noise sensitive receptor would be approximately 9 dBA. This does not exceed the maximum permissible noise level target of 43 dBA which is a positive indication of low noise impact in accordance with BS 4142 therefore complaints are deemed unlikely.

APPENDIX A – PLANT LAYOUT DRAWING



APPENDIX B – SITE PHOTOS

APPENDIX C – TECHNICAL DATA SHEETS

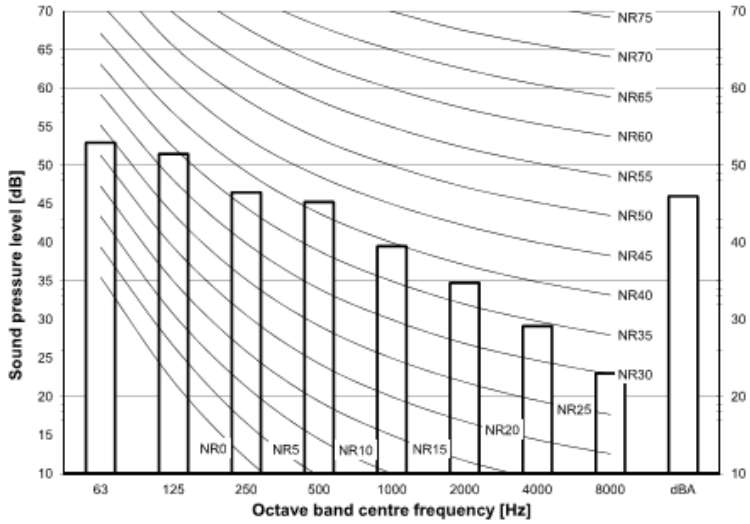
2 Specifications

2-8 Technical Specifications					RZAG71MV1	RZAG100MV1	RZAG125MV1	RZAG140MV1
Dimensions	Unit	Height		mm	990	1,430		
		Width		mm	940			
		Depth		mm	320			
	Packed unit	Height		mm	1,170	1,610		
		Width		mm	1,015			
		Depth		mm	422			
Weight	Unit			kg	70	92		
	Packed unit			kg	79	102		
Packing	Weight			kg	9	10		
Heat exchanger	Fin	Type			WF fin			
		Treatment			Anti-corrosion treatment (PE)			
Compressor	Quantity				1			
	Type				Hermetically sealed swing compressor			
	Starting method				Inverter driven			
Fan	Type				Propeller			
	Discharge direction				Horizontal			
	Quantity				1	2		
	Air flow rate	Cooling	Nom.	m^3/min	59	70	83	
		Heating	Nom.	m^3/min	50	62		
Fan motor	Quantity				1	2		
	Model				Brushless DC motor			
	Output			W	94			
	Drive				Direct drive			
	Speed	Cooling	Super low	rpm	-			
		Heating	Super low	rpm	-			
Sound power level	Cooling			dBA	64	66	69	70
	Heating			dBA	-			
Sound pressure level	Night quiet mode	Level 2		dBA	42	44		
	Cooling	Nom.		dBA	46	47	50	51
	Heating	Nom.		dBA	49	51	52	
Operation range	Cooling	Ambient	Min.	°CDB	-20			
			Max.	°CDB	52			
	Heating	Ambient	Min.	°CWB	-20			
			Max.	°CWB	18.0			
Refrigerant	Type				R-32			
	Charge			kg	2.95	3.75		
				TCO_2eq	1.99	2.53		
	Control				Expansion valve (electronic type)			
	GWP				675			
	Circuits	Quantity			1			

11 Sound data

11 - 2 Sound Pressure Spectrum - Cooling

RZAG71MV1



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

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