40B DYNE ROAD, LONDON NW6 7XE

BS4142 PLANT NOISE ASSESSMENT

30 July 2021

Rams Const Ltd

Aran Acoustics Ltd
20-22 Wenlock Road,
London N1 7GU

t: 0845 544 2695
e: info@aranacoustics.com
w: www.aranacoustics.com

Airtight Building Solutions Ltd
11 Imperial Drive North, Harrow,
Middlesex, HA2 7BP

t: +44 77 1486 6707
e: info@airtightbuildingsolutions.co.uk
w: www.airtightbuildingsolutions.co.uk

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London N1 7GU

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e: info@aranacoustics.com
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11 Imperial Drive North, Harrow,
Middlesex, HA2 7BP

t: +44 77 1486 6707
e: info@airtightbuildingsolutions.co.uk
w: www.airtightbuildingsolutions.co.uk

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Company Registration No. 08480500 | Registered Offices: 20-22 Wenlock Road, London N1 7GU, United Kingdom

ARAN ACOUSTICS

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1.0 INTRODUCTION

Aran Acoustics in collaboration with Airtight Building Solutions Ltd have been appointed to carry out a noise impact assessment for the proposed installation of an air condenser unit associated with the air conditioning system at Flat 40B Dyne Road, London.

A noise survey and assessment has been requested to ensure that noise levels from the proposed plant 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 the plant.

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 26 July 2021.

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 the maximum permissible noise levels for the proposed plant. Section 6.0 provides an assessment of plant noise levels based on the proposed location.

2.0 SITE DESCRIPTION

The site is located at 40 Dyne Road in the London Borough of Brent. The site contains an existing 3-storey building with residential flats on each floor level.

Proposals include the installation of an external air condenser unit to be located on the rear wall of the property at first floor level as indicated on the site photo within Appendix A.

The nearest noise sensitive receptors to the proposed location of condenser unit are the rear windows of the adjacent residential dwellings.

A subjective assessment on site determined that the predominant noise sources in the area to impact nearby noise sensitive receptors are background noise levels from road traffic on surrounding road along with overhead aircraft.

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

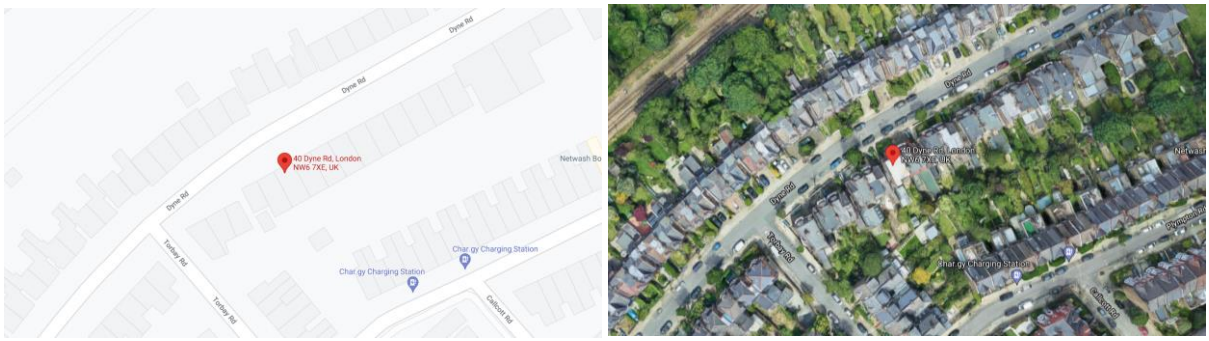


Table 2.1 – Location map and aerial photo of the site

3.0 ENVIRONMENTAL NOISE SURVEY

An environmental noise survey was carried out at the site between Tuesday 26 and Wednesday 27 July 2021. The survey incorporated both day and night time measurements.

A single noise monitor was placed at first floor level on the rear elevation of the property. The microphone was extended approximately 1m from the façade. Due to the location of the microphone there was no direct line of sight to passing road traffic on the streets below.

Noise levels measured at the microphone location are considered representative of the existing environmental noise levels to impact the nearby noise sensitive receptors. Site photos of the microphone position are provided in Appendix A.

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	1404768	Oct 2020	Oct 2022
Norsonic Type 1209 Pre-amplifier	31313	Oct 2020	Oct 2022
Norsonic Type 1225 Microphone	157320	Oct 2020	Oct 2022
Rion Type NC-74 Acoustic Calibrator	35168026	Feb 2021	Feb 2022

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.

3.2 Weather Conditions

The weather was mainly fine and dry for the duration of the survey. Wind speed remained below 5 m/s. The temperature was approximately 17 - 22 ^{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 survey period are shown in Figure 4.1 below. The full set of acoustic data measured on site is available upon request.

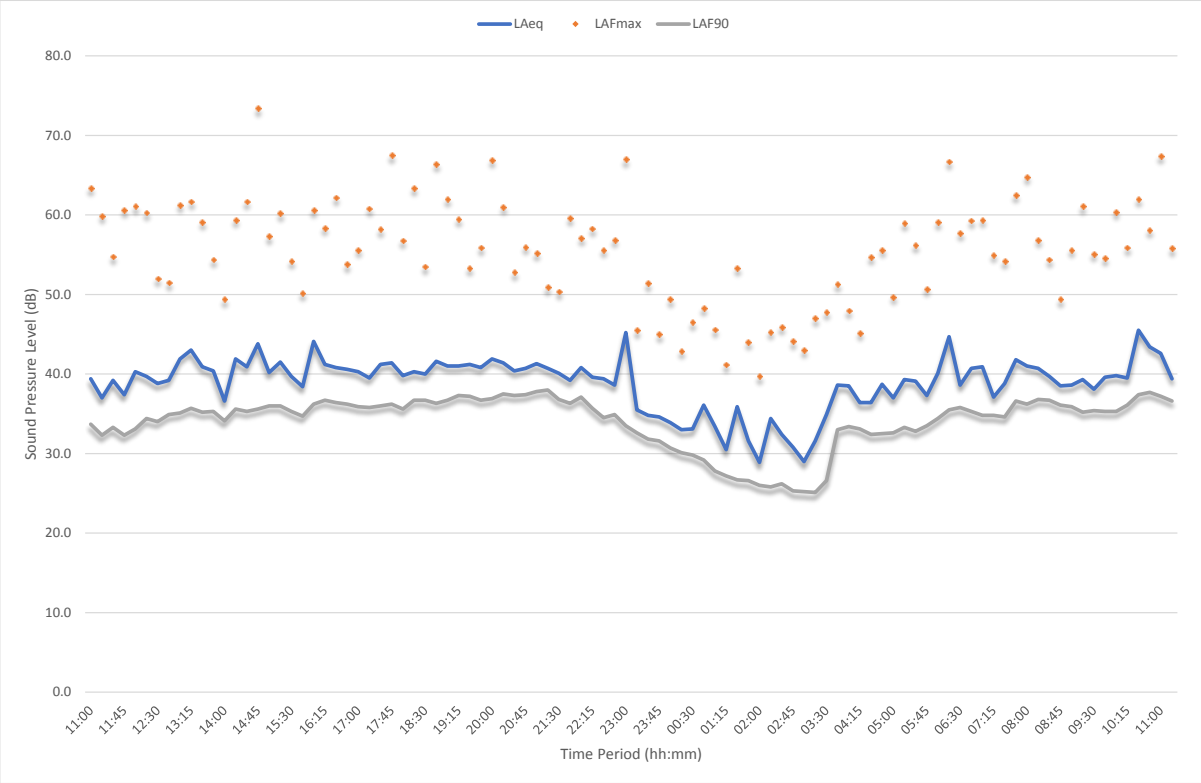


Figure 4.1 – Measured noise levels

The following table provides a summary of the noise levels measured on site at the fixed microphone position during the survey period including the equivalent continuous A-weighted sound pressure level; $L_{Aeq,T}$ and representative background noise level; $L_{A90,T}$.

Time Period	Average Noise Level L_{Aeq}, dB	Representative Background L_{A90}, dB
Day (07:00 – 23:00 hours)	41	37
Night (23:00 – 07:00 hours)	38	34

Table 4.1 - Summary of measured noise levels

5.0 ASSESSMENT CRITERIA

Section 4.0 above provides a summary of measured noise levels on site. The following section provides a summary of guidance documentation relevant to this development.

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 Summary of Guidance Documentation

It can be concluded from BS4142 guidance document that noise levels from plant and equipment associated with the development should not generally exceed -10 dB below the background noise level when measured at the nearest noise sensitive location. This is a positive indication of low noise impact.

5.3 Target Plant Noise Levels

It is understood that the proposed air condenser unit will operate on a 24-hour basis daily. Calculations are therefore based on the lowest background noise level during the operating period. The lowest background noise level during the period of operation was determined to be 34 dB L_{A90} measured between 23:00 – 07:00 hours.

Following analysis of manufacturers sound level data, it is considered that the external condenser unit produces a broadband noise with no tonal features. The unit is also inverter driven, meaning that unit will gradually increase or decrease 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 acoustic feature correction need be applied.

Based on the lowest representative 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 residential receptor.

Representative Background, L_{A90}	Tolerance Factor	Correction Factor	Max Noise Level at Residential
34 dBA	-10 dB	-0 dB	**24 dBA**

Table 5.1 - Plant Noise Level Target

6.0 PLANT NOISE LEVEL ASSESSMENT

Proposals are to install 1 no. Panasonic CU-Z25VKE condenser unit on the rear wall of the property at first floor level as indicated on the site photo in Appendix A.

There are a number of nearby noise sensitive receptors including the second floor residential window directly above the proposed location of the unit and the first floor windows of the adjacent residential properties as identified on the ariel view photo in Appendix A.

Based on the location of the unit it will impact differently at each receptor depending on distance and any barriers along with directivity.

At distance, the unit of plant is considered a point source and noise levels will decay at a rate of 6dB per doubling of distance. Distance attenuation can be added to the attenuation provided by any barrier to give the overall attenuation.

The following table provides the calculated noise level from the condenser unit in operation when measured at the windows of nearby residential receptors.

	Octave Band Centre Frequency, dB							
Receiver Location	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1.0 K Hz**	**2.0 K Hz**	**4.0 K Hz**	**dBA**
No. 40 – Second Floor	35.5	39.0	35.0	37.0	32.0	25.5	19.0	**37**
No. 38 – First Floor	27.9	31.4	27.4	29.4	24.4	17.9	11.4	**30**
No. 42 – First Floor	14.2	17.7	13.7	15.7	10.7	4.2	-2.3	**16**

Table 6.1 – Calculated Plant Noise Levels

Calculations show that worst case noise levels from the condenser unit in operation would be approximately **37 dBA** when measured at the rear window of Flat 40C on the second floor. This exceeds the target plant noise level of **24 dBA** therefore further mitigation will be required to reduce the noise level from the unit.

6.1 Proposed Mitigation

The most suitable form of noise mitigation for wall mounted condenser units are acoustic enclosures. Calculations show that the acoustic enclosure should provide an overall attenuation of 14 dBA. The following insertion loss data is provided for the enclosure although this may vary slightly from one manufacturer to another.

Octave Band Centre Frequency, dB							
63 Hz	125 Hz	250 Hz	500 Hz	1.0 K Hz	2.0 K Hz	4.0 K Hz	dBA
-5.0	-6.0	-7.0	-14.0	-16.0	-20.0	-22.0	**37**

Table 6.2 – Acoustic Enclosure Insertion Loss

Care must be taken when selecting a suitable enclosure to ensure it provides an even sound reduction across the frequency range and achieve an overall sound reduction of 13 dBA. Manufacturers noise data sheets for the selected enclosure should be submitted to the Local Planning Authority for approval as a supplement to this report.

Plant noise calculation sheets are provided in Appendix B. Manufacturers noise level data sheets are provided in Appendix C.

6.2 Vibration

While the majority of noise from the proposed condenser unit is generated aerodynamically, it is important to note that structure-borne noise may also be generated. This may be transmitted through the building structure via the wall or floor mounts. It is therefore important to isolate the system from the building structure with the use of resilient mounts. Further guidance should be sought from the supplier to prevent structure-borne noise transmission.

7.0 SUMMARY AND CONCLUSION

A noise survey was carried out at the proposed location of an air condenser unit to be installed at the rear of Flat B at 40 Dyne Road, London on 26 July 2021.

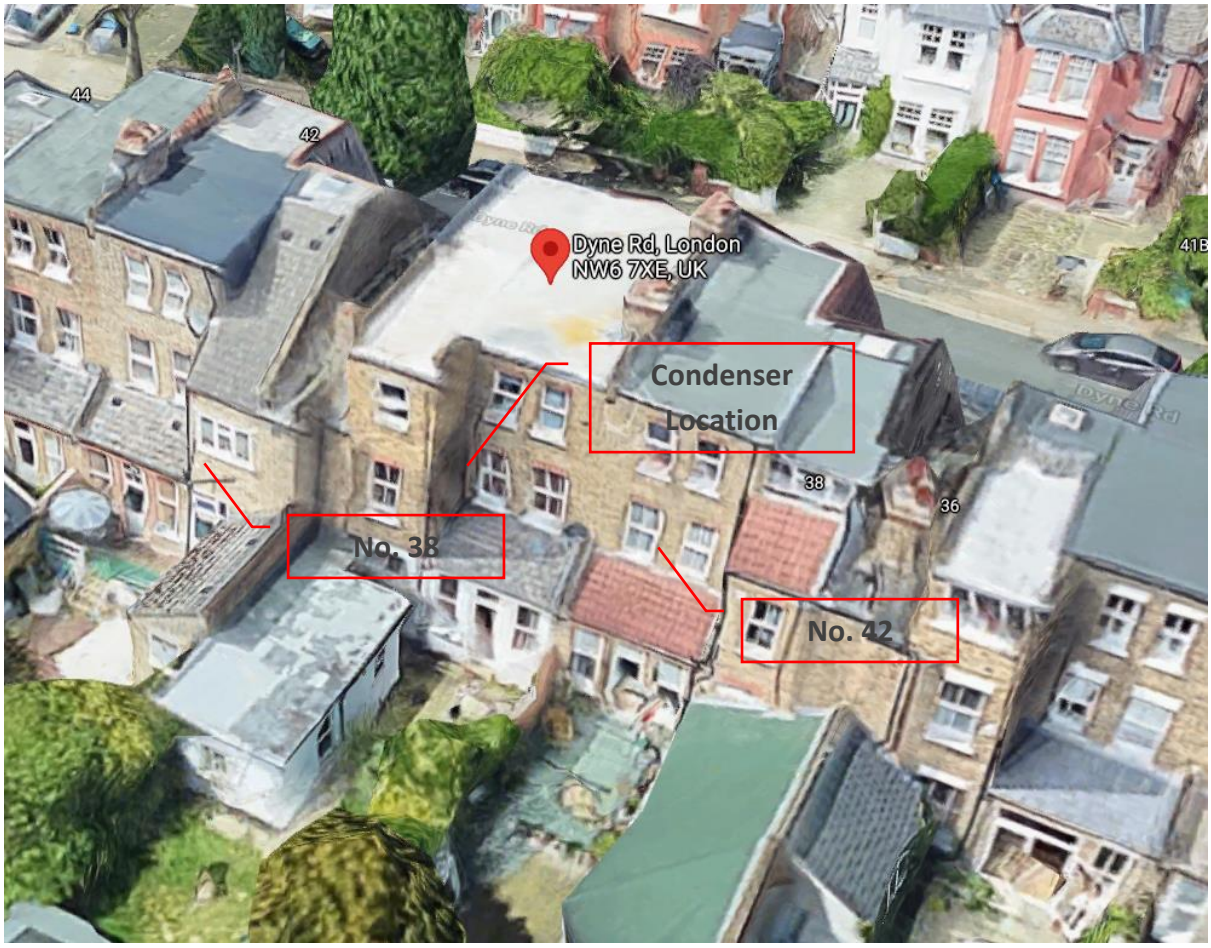
From this survey the minimum representative background noise level at the nearest sensitive property was found to be 34 dB LA90 during the proposed operational hours.

Using guidance in BS 4142, noise levels from the proposed condenser unit should not generally exceed 10 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 worst case noise levels at the nearby noise sensitive receptors would be approximately 37 dBA without any mitigation. This exceeds the maximum permissible noise level target of 24 dBA therefore further mitigation will be required. Mitigation can be in the form of an acoustic enclosure. The acoustic enclosure should be designed to reduce noise levels from the condenser unit by a minimum of 13 dBA.

APPENDIX A – SITE PHOTOS

Proposed Condenser Location



APPENDIX B – PLANT NOISE CALCULATION SHEETS

No. 40C - Second Floor	QTY	63 Hz	125 Hz	250 Hz	500 Hz	1.0 kHz	2.0 kHz	4.0 kHz	dBA
Panasonic CU-Z25VKE	1.0	44.5	48.0	44.0	46.0	41.0	34.5	28.0	**46**
Multiple Unit Correction	0	0	0	0	0	0	0	0	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Distance Atttenuation	2	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	-6.0	
Barrier Attenuation	0	0	0	0	0	0	0	0	
Directivity Correction	90	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Reflection Factor (Q)	1	0	0	0	0	0	0	0	
SPL at Receiver		35.5	39.0	35.0	37.0	32.0	25.5	19.0	**37**
Acoustic Enclosure	1	-5.0	-6.0	-7.0	-14.0	-16.0	-20.0	-22.0	
SPL at Receiver		30.5	33.0	28.0	23.0	16.0	5.5	-3.0	**24**

No. 38 - First Floor	QTY	63 Hz	125 Hz	250 Hz	500 Hz	1.0 kHz	2.0 kHz	4.0 kHz	dBA
Panasonic CU-Z25VKE	1.0	44.5	48.0	44.0	46.0	41.0	34.5	28.0	**46**
Multiple Unit Correction	0	0	0	0	0	0	0	0	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Distance Atttenuation	4.8	-13.6	-13.6	-13.6	-13.6	-13.6	-13.6	-13.6	
Barrier Attenuation	0	0	0	0	0	0	0	0	
Directivity Correction	90	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Reflection Factor (Q)	1	0	0	0	0	0	0	0	
SPL at Receiver		27.9	31.4	27.4	29.4	24.4	17.9	11.4	**30**

No. 42 - First Floor	QTY	63 Hz	125 Hz	250 Hz	500 Hz	1.0 kHz	2.0 kHz	4.0 kHz	dBA
Panasonic CU-Z25VKE	1.0	44.5	48.0	44.0	46.0	41.0	34.5	28.0	**46**
Multiple Unit Correction	0	0	0	0	0	0	0	0	
Acoustic Feature Correction	0	0	0	0	0	0	0	0	
Distance Atttenuation	7.3	-17.3	-17.3	-17.3	-17.3	-17.3	-17.3	-17.3	
Barrier Attenuation	-10	-10	-10	-10	-10	-10	-10	-10	
Directivity Correction	90	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0	
Reflection Factor (Q)	1	0	0	0	0	0	0	0	
SPL at Receiver		14.2	17.7	13.7	15.7	10.7	4.2	-2.3	**16**

APPENDIX C – TECHNICAL DATA SHEETS

Kit Silver			KIT-XZ20-VKE	KIT-XZ25-VKE	KIT-XZ35-VKE	—	KIT-XZ50-VKE	—
Kit Pure White Matt			KIT-Z20-VKE	KIT-Z25-VKE	KIT-Z35-VKE	KIT-Z42-VKE	KIT-Z50-VKE	KIT-Z71-VKE
Cooling capacity	Nominal (Min - Max)	kW	2,05 (0,75 - 2,40)	2,50 (0,85 - 3,20)	3,50 (0,85 - 4,00)	4,20 (0,85 - 5,00)	5,00 (0,98 - 6,00)	7,10 (0,98 - 8,50)
Cool. seasonal efficiency SEER & energy rank [2]			7,50 A+++	8,50 A+++	8,50 A+++	6,90 A++	7,90 A++	6,50 A++
Heating capacity	Nominal (Min - Max)	kW	2,80 (0,70 - 4,00)	3,40 (0,80 - 5,00)	4,00 (0,80 - 5,50)	5,30 (0,80 - 6,80)	5,80 (0,98 - 8,00)	8,60 (0,98 - 10,20)
Heat. seasonal efficiency SCOP & energy rank [2]			4,70 A++	5,10 A+++	5,10 A+++	4,00 A+	4,70 A++	4,20 A+
Indoor unit Silver			CS-XZ20VKEW	CS-XZ25VKEW	CS-XZ35VKEW	—	CS-XZ50VKEW	—
Indoor unit Pure White Matt			CS-Z20VKEW	CS-Z25VKEW	CS-Z35VKEW	CS-Z42VKEW	CS-Z50VKEW	CS-Z71VKEW
Power source		V	230	230	230	230	230	230
Air volume	Cool / Heat	m³/min	9,9 / 10,7	10,2 / 11,2	11,0 / 12,0	11,2 / 12,0	19,1 / 20,5	19,8 / 21,5
Moisture removal volume		L/h	1,3	1,5	2,0	2,4	2,8	4,1
Sound pressure [4]	Cool (Hi / Lo / Q-Lo)	dB(A)	37 / 24 / 19	39 / 25 / 19	42 / 28 / 19	43 / 31 / 25	44 / 37 / 30	47 / 38 / 30
	Heat (Hi / Lo / Q-Lo)	dB(A)	38 / 25 / 19	41 / 27 / 19	43 / 33 / 19	43 / 35 / 29	44 / 37 / 30	47 / 38 / 30
Dimension / Net weight	HxWxD	mm / kg	295 x 919 x 194 / 9	295 x 919 x 194 / 10	295 x 919 x 194 / 10	295 x 919 x 194 / 10	302 x 1120 x 236 / 12	302 x 1120 x 236 / 13
Outdoor unit			CU-Z20VKE	CU-Z25VKE	CU-Z35VKE	CU-Z42VKE	CU-Z50VKE	CU-Z71VKE
Air volume	Cool / Heat	m³/min	26,9 / 24,1	28,7 / 27,2	30,6 / 30,6	31,3 / 30,9	39,8 / 36,9	44,7 / 45,8
Sound pressure [4]	Cool / Heat (Hi)	dB(A)	45 / 46	46 / 47	48 / 50	49 / 51	47 / 47	52 / 54
Dimension [5] / Net weight	HxWxD	mm / kg	542 x 780 x 289 / 27	542 x 780 x 289 / 31	542 x 780 x 289 / 31	619 x 824 x 299 / 31	695 x 875 x 320 / 42	695 x 875 x 320 / 50
Pipe length range		m	3 ~ 15	3 ~ 15	3 ~ 15	3 ~ 15	3 ~ 30	3 ~ 30
Elevation difference (in/out) [6]		m	15	15	15	15	15	20
Refrigerant (R32)		kg / TCO_2 Eq.	0,70 / 0,473	0,85 / 0,574	0,85 / 0,574	0,89 / 0,601	1,15 / 0,776	1,37 / 0,925
Operating range	Cool Min ~ Max	°C	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43	-10 ~ +43
	Heat Min ~ Max	°C	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24	-15 ~ +24

Accessories	
CZ-CAPRA1	RAC interface adapter for integration into P Link

Accessories	
CZ-RD514C	Wired remote controller for Wall Mounted and Floor Console

1) EER and COP calculation is based in accordance with EN14511. 2) Energy Label Scale from A+++ to D. 3) The annual energy consumption is calculated in accordance to EU/626/2011. 4) The sound pressure of the units shows the value measured of a position 1m in front of the main body and 0,8m below the unit. The sound pressure is measured in accordance with Eurovent 6/C/006-97 specification. Q-Lo: Quiet mode. Lo: The lowest fan speed. 5) Add 70mm for piping port. 6) When installing the outdoor unit at a higher position than the indoor unit.
* Tentative data.

New Panasonic Comfort Cloud. More than a control in your phone.

Advanced smartphone control for domestic range.

Control air to air heat pump operation with Panasonic Comfort Cloud plus additional functions only available through the Cloud from wherever and whenever. One user can manage up to 200 units and also set up different user and rights. Also energy monitoring is possible giving the chance to learn how to reduce operating costs even further.

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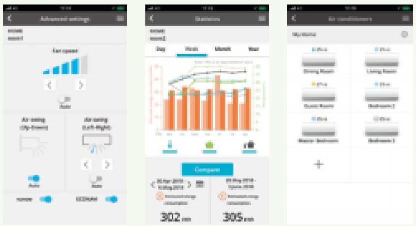

- **R32** — ur heat pumps ontaining the efrigerant R32 how a drastic eduction in the alue of Global Warming otential (GWP) ompared with R410a efrigerant.
- **8,50 SEER** — Seasonal efficiency in cooling will bring you saving all year while heating. Energy efficiency rank from A+++ to D.
- **5,10 SCOP** — Seasonal efficiency in heating will bring you saving all year while heating. Energy efficiency rank from A+++ to D.
- **Inverter+** — Inverter Plus System classification highlight the Panasonic highest performing systems.
- **R2 ROTARY COMPRESSOR** — Panasonic R2 Rotary Compressor. Designed to withstand extreme conditions, it delivers high performance and efficiency.
- **nanoe X** — nanoe™ X helps you deodorise, inhibit certain growth of bacteria and viruses that are harmful to you and your family's general well-being.
- **19dB(A)** — With Super Quiet technology our devices are much more quiet than a library (30dB(A)).
- **HUMIDITY CONTROL MILD DRY** — The Perfect Humidity Air controls the humidity level in the air to prevent over-dryness.
- **AEROWINGS** — More comfort with Aerowings. Direct airflow to ceiling to create shower cooling effect by twin flap built in indoor.
- **R22/R410A RENEWAL** — The Panasonic renewal system allows good quality existing R410A or R22 pipe work to be re-used whilst installing new high efficiency R32 systems.
- **INTEGRATION TO P LINK** — The communication port can be integrated into the indoor unit and provides easy connection to, and control of, your Panasonic heat pump to your home or building management system.
- **BUILT-IN WLAN** — This unit is ready to connect to internet and be managed by smartphone, with a powerful and user friendly App to manage the comfort wherever you are.
- **BMS CONNECTIVITY** — Communication port to integrate the unit to home and building management systems most known standards.

SEER and SCOP: For KIT-XZ25-VKE, KIT-XZ35-VKE, KIT-Z25-VKE and KIT-Z35-VKE. SUPER QUIET: For KIT-XZ20-VKE, KIT-XZ25-VKE, KIT-XZ35-VKE, KIT-Z20-VKE, KIT-Z25-VKE and KIT-Z35-VKE. INTERNET CONTROL: Built-in WLAN.

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