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**Proposed Installation of  
Mechanical Plant**

**26 Netherhall Gardens,  
London, NW3 5TL**

**Environmental Noise Assessment**

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Proposed Installation of Mechanical Plant	
Project Address:	26 Netherhall Gardens, London NW3 5TL
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## 1. INTRODUCTION

- 1.1 Acoustics Plus Ltd (APL) is an independent firm of multi-disciplinary acoustic engineers. APL is engaged by both private and public sector clients. APL is a registered member of The Association of Noise Consultants (ANC) and the author is a corporate member of The Institute of Acoustics (IOA).
- 1.2 APL has been instructed by TG Studio, to consider and advise upon the noise implications of a proposed installation of mechanical plant.
- 1.3 It is understood that it is the intention to install 3No. new air source heat pumps (ASHP's) to service the three new flats at the site. The units are to be located on the second floor flat roof of the new extension.
- 1.4 It is understood the London Borough of Camden (LBC) require further information on noise levels from the proposed installation in order to fully assess the noise impact upon the surrounding neighbourhood. This report provides the response to the LBC, on behalf of the Applicant.
- 1.5 This report has been prepared by Acoustics Plus Limited (APL) with all reasonable skill, care, and diligence in accordance with generally accepted acoustic consultancy principles and taking account the services and terms agreed between APL and our client.
- 1.6 Any information provided by third-parties and referred to herein may not have been checked or verified by APL unless expressly stated otherwise. Certain statements made in the report are predictions based on reasonable assumptions and good industry practice.
- 1.7 Such statements involve risk and uncertainty which could cause measured and predicted results to differ materially. APL does therefore not guarantee or warrant any prediction contained in this report.

## 2. BASELINE SITUATION

- 2.1 The Application Site (the “site”) is situated at 26 Netherhall Gardens, London, NW3 5TL. A site location plan is shown in Diagram 1.

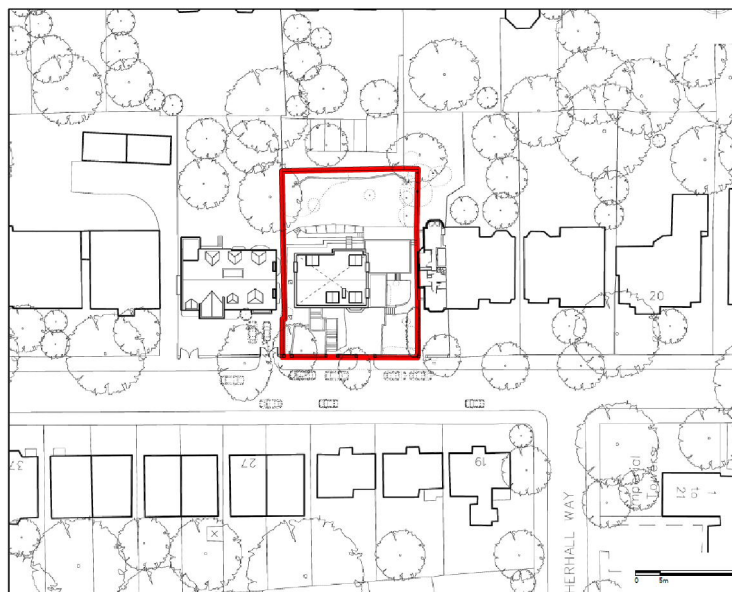
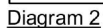


Diagram 1

- 2.2 The site is an existing residential building arranged over lower ground and three upper storeys. The application proposes the erection of a 3 storey side extension to provide 3No. self-contained flats with front cycle and refuse stores, following the demolition of the existing 2 storey side garage extension and 1No. bed flat.
- 2.3 The ASHP units will be mounted on the second floor flat roof of the site. The location can be seen highlighted in Diagram 2.



- | New flats at 26 Netherhall Gardens | Make & Model No.      | Operational hours |
|------------------------------------|-----------------------|-------------------|
| Flat 1 (ground floor)              | Mitsubishi QUHZ-W40VA | At any time       |
| Flat 2 (first floor)               | Mitsubishi QUHZ-W40VA | At any time       |
| Flat 3 (second floor)              | Mitsubishi QUHZ-W40VA | At any time       |

Table 1

- 
- Window of  
No.24/24A  
Netherhall Gdns

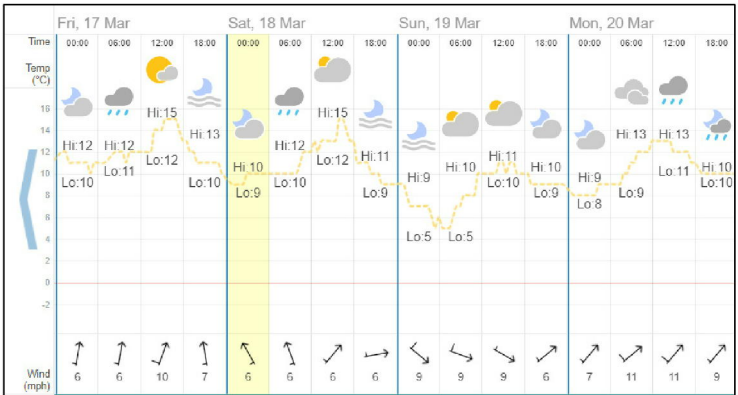
Photo 1

- 2.6 The nearest window with possible partial line of sight to the roof mounted ASHPs is located at No.24/24A Netherhall Gardens. This window is approximately 8m from the ASHPs.

3. NOISE OUTLINE

- 3.1 In order to produce an environmental noise assessment, consideration must be given to the prevailing background noise in the locality of the installation.
- 3.2 Measurements of background noise were obtained over a weekend period at a location deemed representative of background noise levels experienced at the nearest noise sensitive façade. The measurements obtained during the exercise were obtained at first floor level on the northern façade of the existing building.
- 3.3 The particulars of the measurement exercise are recorded below:

Date: 17<sup>th</sup> to the 20<sup>th</sup> March 2023  
Start Time: 13:15 hrs  
Location: First floor level, 26 Netherhall Gardens.  
Weather: Appropriate to monitor environmental noise



- 3.4 Minimum background and average noise levels obtained at the site are shown in Table 2 with the full level vs time history shown in Diagram 3 (L<sub>Aeq</sub> and L<sub>A90</sub>). As the site is currently being refurbished, the periods when construction noise was evident has been omitted from this assessment.

Measurements obtained at first floor level		
Time period	Lowest LA90,15min	Average LAeq,T
17 <sup>th</sup> March 2023 16.45-23:00hrs	37	48
17 <sup>th</sup> March 2023 23:00-07:00hrs	32	45
18 <sup>th</sup> March 2023 16.45-23:00hrs	36	46
18 <sup>th</sup> March 2023 23:00-07:00hrs	33	43
19 <sup>th</sup> March 2023 16.45-23:00hrs	35	46
19 <sup>th</sup> March 2023 23:00-07:00hrs	32	41

Table 2

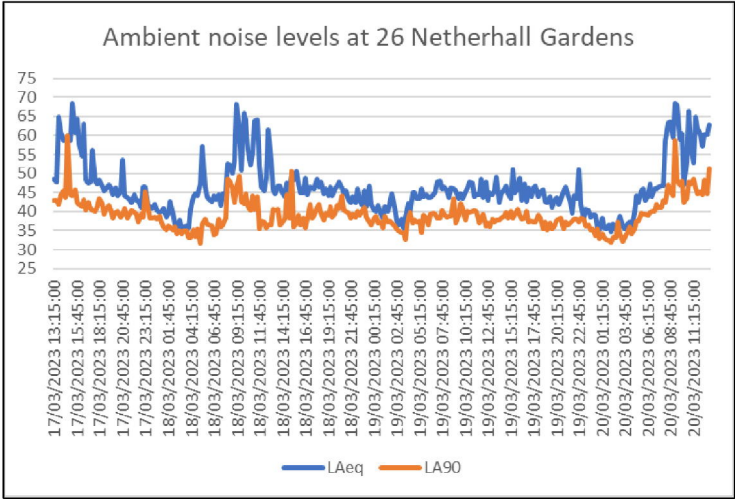


Diagram 3

## 4. DESIGN CRITERIA

- 4.1 Information regarding the noise levels not to be exceeded by the proposed installation was extracted from the London Borough of Camden's Local Plan Policy A4 adopted 3 July 2017 (Appendix 3 Noise thresholds).

### Industrial and Commercial Noise Sources

A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of 10 dB below background (15dB if tonal components are present) should be considered as the design criterion).

**Table C: Noise levels applicable to proposed industrial and commercial developments (including plant and machinery)**

Existing noise sensitive receptor	Assessment Location	Design Period	LOAEL (green)	LOAEL to SOAEL (Amber)	SOAL (Red)
Dwellings**	Garden used for main amenity (free field) and outside living or dining or bedroom window (façade)	Day	'Rating level' 10dB* below background	'Rating level' between 9dB below and 5dB above background	'Rating level' greater than 5dB above background
Dwellings**	Outside bedroom window (façade)	Night	'Rating level' 10dB* below background and no events exceeding 57dB L <sub>Amax</sub>	'Rating level' between 9dB below and 5dB above background and/or noise events exceeding 57dB and 88dB L <sub>Amax</sub>	'Rating level' greater than 5dB above background and/or events exceeding 88dB L <sub>Amax</sub>

\*10dB should be increased to 15dB if the noise contains audible tonal elements. (day and night). However, if it can be demonstrated that there is no significant difference in the character of the residual background noise and the specific noise from the proposed development then this reduction may not be required. In addition, a frequency analysis (to include, the use of Noise Rating (NR) curves or other criteria curves) for the assessment of tonal or low frequency noise may be required.

\*\*levels given are for dwellings, however, levels are use specific and different levels will apply dependent on the use of the premises.

The periods in Table C correspond to 0700 hours to 2300 hours for the day and 2300 hours to 0700 hours for the night. The Council will take into account the likely times of occupation for types of development and will be amended according to the times of operation of the establishment under consideration.



- 4.2 The procedure contained in BS4142 is to quantify the *specific sound level*, which is the measured or predicted level of sound from the source in question over a one-hour period for the daytime and a 15 minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.
- 4.3 The specific sound level is converted to a rating level by adding penalties to account for either tonality or impulsivity. The standard sets out objective methods for determining the presence of tones or impulsive elements but notes that it is acceptable to subjectively determine these effects.
- 4.4 The penalty for tonal elements is between 0dB and 6dB, and the standard notes:  
*‘Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.’*
- 4.5 The penalty for impulsive elements is between 0dB and 9dB, and the standard notes:  
*‘Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.’*
- 4.6 The background sound level should be established in terms of the LA90 noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that:  
*‘A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value.’*
- 4.7 The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:  
*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.  
Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.’*
- 4.8 The standard goes on to note 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.’*

- 4.9 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

*"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."*

- 4.10 The background noise levels were assessed using statistical analysis of the measured data, as directed in BS4142. The histogram for the measurement period with the lowest instances of background noise can be seen in Diagram 4.

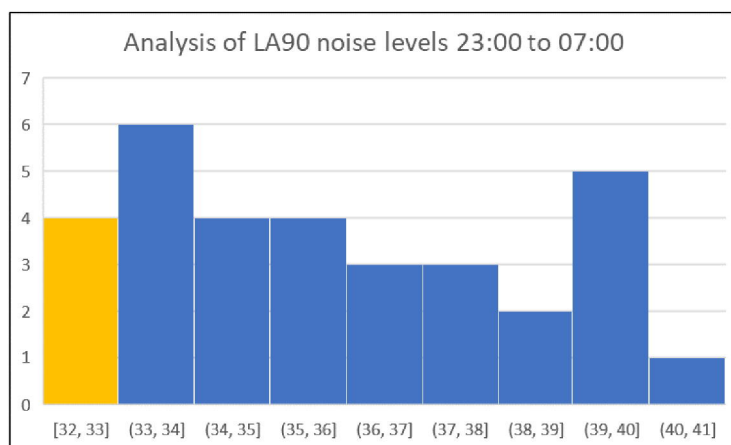


Diagram 4

- 4.11 In this instance the most commonly occurring background noise level during the night-time period was 1dB higher than the lowest background noise level. In the context in which the sound occurs, 32dB  $L_{A90,15min}$  is considered as representative for the most noise sensitive night-time period.
- 4.12 The plant noise emission criteria that should not be exceeded is therefore based on the statistical analysis and is shown in Table 3 below. This level should not be exceeded at the nearest noise sensitive façade and is representative of the LOAEL value.

Noise emission limit for mechanical plant
Night-time limit
$L_{Aeq} \leq 22dB$

Table 3

- 4.13 The noise level of the mechanical plant that is to be installed was established from the data sheet provided (Appendix A) as follows:

Plant item	Make & Model No.	Noise level
ASHP	Mitsubishi QUHZ-W40VA	43dBA @ 1m

Table 4

- 4.14 Based on the octave band sound levels of the unit (see Appendix A), it is not thought that this type of unit contains any tonal component. As the units are inverter driven, the units should not exhibit a marked onset of noise when the units turn on. Therefore, it is considered that no corrections are necessary for tonality or impulsivity.

## 5. EQUIPMENT

- 5.1 All measurements were obtained using the following equipment:
- Svantek Svan 971 Sound Level Meter Class 1 Serial No. 51704
  - Rion Calibrator Type NC-74 Class 1 Serial No. 00410215
- 5.2 The relevant equipment carries full and current traceable calibration. The equipment, where necessary, was calibrated prior to and after the measurements were carried out.

## 6. NOISE IMPACT OF PLANT

- 6.1 The noise impact of the proposed installation of plant has been predicted. Where necessary, mitigation measures have been incorporated into the calculation exercise to ensure that compliance with the LBC criteria is obtained. These mitigation measures are identified separately in the body of the report and are an essential requirement in meeting the LBC criteria.
- 6.2 The calculation exercise utilised information provided by Mitsubishi Electric (copy of the data sheets is provided in Appendix A).
- 6.3 In order to predict the noise impact of the ASHP units, consideration has been given to noise egress from the units to the nearest noise sensitive façade. It has been assumed that the ASHP units will operate on demand as required.
- 6.4 A further correction to account for building edge diffraction provided by the façade of No.24/24A Netherhall Gardens has been included. Air source heat pumps may be installed under permitted development provided they comply with Microgeneration Certification Scheme Standard MCS020 (prepared by MCS, Defra, DECC and DCLG). The planning standard MCS020 states the following (Note 5):

*"Note 5: Barriers between the heat pump and the assessment position (STEP 5)*

*A correction should be made for attenuation due to barriers between the air source heat pump and an assessment position. A correction will be necessary if an MCS Contractor is unable to see an assessment position from the top edge of the air source heat pump. Use the following instructions to determine whether a correction is appropriate:*

- *For a solid barrier (e.g. a brick wall or a fence) that completely obscures an MCS Contractor's vision of an assessment position from the top edge of the air source heat pump attenuation of -10 dB may be assumed.*
- *Where a solid barrier completely obscures an MCS Contractor's vision of an assessment position from the top or side edges of the air source heat pump, but moving a maximum distance of 25 cm in any direction to the air source heat pump allows an assessment position to be seen, attenuation of -5 dB may be assumed.*
- *If it is possible for an MCS Contractor to see any part of an assessment position from the top or side edges of the air source heat pump no attenuation may be assumed. "*

- 6.5 A correction for the reflecting plane behind and below the units was accounted for in the calculation exercise.
- 6.6 The following acoustic feature corrections were used to determine a rating level:

Results	Penalty	Relevant clause	Commentary
Acoustic feature corrections BS4142	+3dB	9.2	Other acoustic characteristics

Table 5

6.7 The noise impact assessment of the proposed installation is shown in Tables 6-9.

ASHP 1	Noise impact calculation
Mitsubishi QUHZ-W40VA	43dBA @ 1m
Distance attenuation (8m)	-18dB
BS4142 Acoustic corrections	+3dB
Building edge diffraction (partial line of sight)	-5dB
Reflecting plane (x2)	+6dB
Acoustic enclosure	-9dB
<b>Total Rated Level</b>	<b>20dBA</b>
LPA requirement (based on daytime L <sub>A90</sub> )	≤22dBA

Table 6

ASHP 2	Noise impact calculation
Mitsubishi QUHZ-W40VA	43dBA @ 1m
Distance attenuation (8.5m)	-19dB
BS4142 Acoustic corrections	+3dB
Building edge diffraction	-10dB
Reflecting plane (x2)	+6dB
Acoustic enclosure	-9dB
<b>Total Rated Level</b>	<b>14dBA</b>
LPA requirement (based on daytime L <sub>A90</sub> )	≤22dBA

Table 7

ASHP 3	Noise impact calculation
Mitsubishi QUHZ-W40VA	43dBA @ 1m
Distance attenuation (9m)	-19dB
BS4142 Acoustic corrections	+3dB
Building edge diffraction	-10dB
Reflecting plane (x2)	+6dB
Acoustic enclosure	-9dB
<b>Total Rated Level</b>	<b>14dBA</b>
LPA requirement (based on daytime L <sub>A90</sub> )	≤22dBA

Table 8

All ASHP's combined	Noise impact calculation
ASHP 1	20dB
ASHP 2	14dB
ASHP 3	14dB
<b>Total Rated Level</b>	<b>22dBA</b>
LPA requirement (based on daytime L <sub>A90</sub> )	≤22dBA

Table 9

6.8 Any noise from the installation should not exceed a level of 22dBA at the nearest noise sensitive façade. The calculation exercise (Tables 6-9) demonstrates that the plant noise impact meets Local Plan Policy A4 adopted 3 July 2017 (Appendix 3 Noise thresholds) as reproduced in para 4.1 above. The noise impact meets the LOAEL LPA criteria.

## 7. CONCLUSION

- 7.1 The foregoing assessment indicates that the proposed installation will meet the specific noise threshold requirements from Appendix 3 of Camden Council's Local Plan referenced in Policy A4. Further mitigation measures, other than those identified, will not be required. The mitigation measures that must be implemented are as follows:
- Use of proprietary acoustic enclosures to house the ASHP's to mitigate the noise output by a minimum 9dB. Acoustic enclosure manufacturers detailed below:  
  
<https://www.environ.co.uk/domestic/>  
<https://www.environgroup.uk/environ-acoustic/>  
<https://www.wakefieldacoustics.co.uk/products/acoustic-enclosures/>
- 7.2 If an alternative supplier or manufacturer of ASHP unit is chosen, the acoustic performance should be checked prior to installation to ensure that the installation will still meet the requirements imposed by the LPA.
- 7.3 It is imperative that the enclosures are located at the distances considered within the calculation exercises. If the units are located nearer the noise sensitive façade considered, the acoustic performance should be checked prior to installation to ensure that the installation will still meet the requirements imposed by the LPA.
- 7.4 It is also recommended that the ASHP's units are positioned on suitable vibration isolation mounts to minimise structural borne vibration and re-radiated noise via the structure of the enclosure and/or building.

## Figures



**26 Netherhall Gardens, London, NW3 5TL**



Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



## **Appendix A**

# Heating

## Product Information

### QUHZ-W40VA / EHPT20Q-VM2EA

Ecodan Monobloc 4kW Air Source Heat Pump  
With Thermal Store

Making a  
World of  
Difference



Our new 4kW monobloc Ecodan heat pump system combines market leading efficiency in hot water production with reliable and renewable heat provision all year round.



The Ecodan QUHZ is the ideal solution for new build homes where strict building regulations drive down the space heating demand, making the production of hot water the dominant load.

The Ecodan QUHZ operates with a market leading low noise output and built in energy monitoring as standard. The thermal store has been specifically designed to work with this system, giving high hot water output without the need to pasteurise the water.

#### Key Features

- High efficiency hot water heating performance
- Class leading low noise operation
- Energy monitoring as standard
- No stored water, no risk of legionella
- High hot water capacity for larger dwellings
- Pre-plumbed and wired for faster installation
- Compatible with Mitsubishi Electric wireless room controllers
- Wi-Fi control available

#### Application Examples

- New Build UK homes
- Cafes and Restaurants
- Dental / Doctor's Surgeries



Air Conditioning | Heating  
Ventilation | Controls



**ecodan**<sup>®</sup>  
Renewable Heating Technology

# Heating

## Product Information

### QUHZ-W40VA / EHPT20Q-VM2EA

Ecodan Monobloc 4kW Air Source Heat Pump  
With Thermal Store

Making a  
World of  
Difference

OUTDOOR UNIT		QUHZ-W40VA	THERMAL STORE		EHPT20Q-VM2EA
HEAT PUMP COMBINATION HEATER - 55°C	ErP Rating	A <sup>1</sup>	NOMINAL THERMAL STORE WATER VOLUME (LITRES)		200
	$\eta_{L}$	117%	WATER TEMPERATURE RANGE		40-70°C
	SCOP	2.90	DHW Mode (°C)		25-60°C
HEAT PUMP COMBINATION HEATER - Large Profile <sup>1</sup>	ErP Rating	A	MECHANICAL ZONES		DHW and 1 Heating Zone (2 Zone capability with 3rd party 2-port valves)
	$\eta_{L,HP}$	129%	OPERATING AMBIENT TEMPERATURE (°C DB)		0 - +35°C (RH<80%)
	COP	3.00	SOUND PRESSURE LEVEL AT 1M (dBA)		30
HEATING <sup>2</sup> (A-3W55)	Capacity (kW)	4.32	SOUND POWER LEVEL (dBA) <sup>4</sup>		40
	Power Input (kW)	2.18	STANDING HEAT LOSS (kWh/24hours)		1.63
	COP	1.98	WATER DATA		Primary Pump Grundfos Solar PML 25-145 180
OPERATING AMBIENT TEMPERATURE (°C DB)		-15 ~ +35°C	Sanitary Hot Water Pump Grundfos Solar PML 25-145 180		
SOUND PRESSURE LEVEL AT 1M (dBA) <sup>3</sup>		43	Connection Size (mm) Heating / DHW		22 / 22
SOUND POWER LEVEL (dBA) <sup>4</sup>		53	Primary Expansion Vessel (Litres)		18
WATER DATA	Pipework Size (mm)	15	Charge Pressure (MPa (Bar))		0.1 (1)
	Flow Rate (l/min)	3 to 8	Pressure relief valve (Mpa (Bar))		0.3 (3) - 2 No. devices
	Height Difference	5	Flow sensor (supplied)		Min. flow 1.3 L/min
DISTANCE BETWEEN OUTDOOR UNIT AND THERMAL STORE (M) DIMENSIONS (mm)	Piping Length	15	Manual reset thermostat		85°C
	Width	809+70*	Width		595
	Depth	300+20*	Depth		680
DIMENSIONS	Height	715	Height		1600
	Weight (kg)	57	WEIGHT EMPTY / FULL (kg)		77 / 263
	ELECTRICAL DATA	Powered from indoor unit	ELECTRICAL DATA		Electrical Supply 220-240V, 50Hz
			Phase		Single
			Maximum Running Current (A)		15
			Fuse Rating - MCB Sizes (A) <sup>5</sup>		20
			OPTIONAL SIMPLIFIED WIRELESS ROOM THERMOSTAT AND WIRELESS RECEIVER		PAR-WT50-E Controller and PAR-WR51-E Receiver

<sup>1</sup> Combination with EHPT20Q-VM2EA Thermal Store.

<sup>2</sup> Under normal heating conditions at outdoor temp: -3°CDB / -4°CWB, outlet water temp 55°C, inlet water temp 47°C.

<sup>3</sup> Under normal heating conditions at outdoor temp: 7°CDB / 8°CWB, outlet water temp 55°C, inlet water temp 47°C as tested to BS EN14511.

<sup>4</sup> Sound power level tested to BS EN12102.

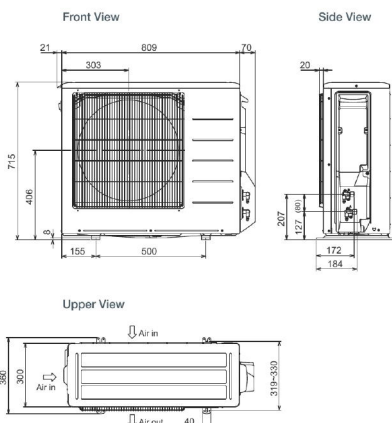
<sup>5</sup> Grille or pipe cover.

<sup>6</sup> MCB Size BS EN60898-2 & BS EN60947-2.

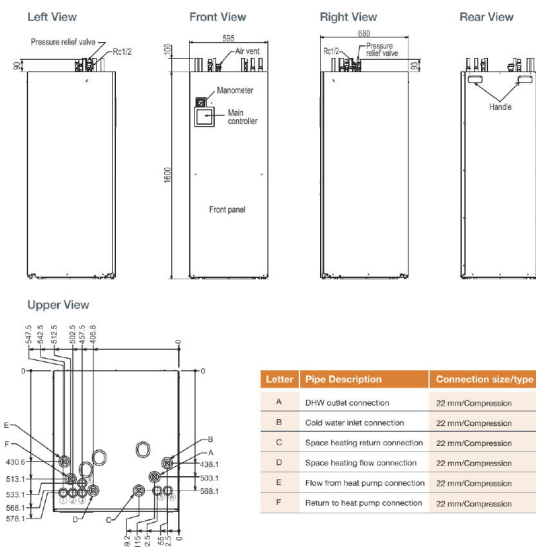
$\eta_{L,HP}$  is the seasonal space heating energy efficiency (SPHEE)  
 $\eta_{L}$  is the water heating energy efficiency

## DIMENSIONS

### QUHZ-W40VA



### EHPT20Q-VM2EA



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