



Technical Report

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Project

**Arkwright Road
Noise and Vibration Assessment**

Prepared for

**Adair Associates
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By

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Summary

Sound Research Laboratories has been commissioned by Adair Associates to assess the impact of noise and vibration from mechanical services at 9 Arkwright Road on neighbouring noise sensitive properties.

9 Arkwright Road has previously been used as offices, and it is proposed to change its use to a residential dwelling. This will include an indoor swimming pool with associated plant.

The noisiest plant proposed at the new property are three heat pump condenser units located south east of the site. The heat pump condensers have predicted operating noise pressure levels for the daytime and night time periods of 60dB @1m and 40dB @1m respectively.

Noise measurements were taken over 24hrs at the site to determine the current background noise levels around the site.

Noise from the plant has been assessed in accordance with both BS4142 and BS8233, both assessments show the proposed plant meets acceptable criteria within these standards.

Providing all plant is suitably mounted and isolated, vibration from any plant will not impact on neighbouring properties.

I therefore do not expect noise and vibration from plant to be an issue at this development.

Chris Wright

For and on behalf of
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Dave Clarke



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1.0 Noise Criteria

According to PPG24 (Planning and Noise), there are two main ways to assess the noise impact of plant on dwellings:

- BS4142, which essentially compares the plant noise with the existing ambient noise without the plant operating.
- BS8233 which gives guidance on absolute noise limits within buildings.

1.1 BS4142

BS 4142:1997, a method "Rating industrial noise affecting mixed residential and industrial areas". This method assess the likelihood of complaints by subtracting the measured background noise level (L_{A90}) from the rating level (L_{Aeq} of plant plus "acoustic feature" correction). In simple terms, the more the rating level exceeds the L_{A90} , the greater the likelihood of complaint. Complaints are unlikely when the rating level is below the L_{A90} .

1.2 BS8233

BS 8233:1999 "Sound Insulation and Noise Reduction for Buildings" sets out absolute noise levels within dwellings from external sources. Acceptable resting/sleeping conditions, as defined by BS 8233:1999, are set out below:-

- 30-35dB L_{Aeq} in bedrooms during the night-time (2300–0700)
- 30-40dB L_{Aeq} in living areas during the daytime (0700–2300)

Also BS 8233 requires that 45dB L_{Amax} should not 'normally' be exceeded in bedrooms during the night-time (2300–0700). L_{Amax} levels from heat pumps are generally much the same as the 'average' L_{Aeq} level so this limit will automatically be met if the L_{Aeq} limit is achieved.

2.0 Noise Impact Assessment

I understand the noisiest plant proposed at the new property are three heat pump condenser units located south east of the site. The heat pump condensers (e.g Mitsubishi PURY-EP300YHM-A) have predicted operating noise pressure levels for the daytime and night time periods of 60dB @1m and 40dB @1m respectively. Please see Appendices D & E showing the services scheme design highlighting locations of these and manufactures' specifications.

The three heat pump condensing units are located externally at the end of the basement floor at the furthest point from Arkwright Road, approximately 23m from the facade of the neighbouring property. Once internal plant design is established silencers will be provided to the pool intake and extract grilles to prevent noise disturbance. All other ventilation extracts are from domestic bathroom and toilet extract fans and are unlikely to impact on neighbouring noise sensitive properties.

2.1 BS4142

Background noise levels were measured continuously for 24hrs using equipment placed at the back of the property between 31st March and 1st April 2011. Manned measurements were made during the same period outside the front of the building (facing Arkwright Road) and at the back of the building.

The main noise source affecting the site is road traffic noise from Arkwright Road. There is distant railway noise to the South West of the site but this had no affect on the background noise level (L_{A90}). The closest noise sensitive property is the adjacent property north east of the site towards Fitzjohn's avenue.

Details of the noise survey, and measured noise data are shown in Appendices A and B.

The existing background noise levels are summarised in Table 2.1. Any plant noise must be assessed using BS4142 based on these L_{A90} 's. I have assessed the cumulative noise from the heat pumps below.

Table 2.1 BS4142 Assessment – Noise from the heat pumps

Time period	Cumulative Noise from 3 condenser units	Distance correction to nearest residential property (23m)	Correction Assuming Acoustic Feature	Plant rating level at nearest residential property	Lowest Background L_{A90} Measured
Daytime 07:00 -23:00	65dB	-27dB	+5dB	43dB	44dB
Night time 23:00-07:00	45dB	-27dB	+5dB	23dB	35dB

This assessment shows that the rating levels of the heat pumps for the daytime and night time at the nearest residential property are below the quietest daytime and night time background noise levels. According to BS4142, this rating indicates that “complaints are unlikely”.

I have not included any attenuation in noise due to acoustic screening from the fence along the boundary of the premises. This assessment therefore represents the “worst case”.

2.2 BS8233

Table 2.2 below shows our prediction for the “worst case” noise levels inside the closest noise sensitive property due to the heat pumps, assuming the 13 dBA reduction for open windows as given in PPG24.

Table 2.2 – summary of BS8233 assessment

Location	Cumulative Noise level from heat pumps at nearest noise sensitive property	Noise level inside noise sensitive property with open windows	BS8233 noise limits
Bedroom	13	0	30-35
Living Room	33	20	30-40

These results show that even with open windows, indoor ambient noise levels are well within acceptable noise limits defined in BS8233 for both daytime and night time.

2.3 Conclusion

Both assessment methods demonstrate that noise from the heat pumps in their proposed locations will not disturb the occupants within the closest residential property.

3.0 Vibration Impact Assessment

All plant must be isolated from the building structure using appropriate anti-vibration mounts / hangers, to reduce risk of vibration impact on the property and on neighbouring properties. These should have an isolation efficiency of at least 95 %. In practice, this means that plant running at 1440 RPM must be mounted on isolators with a nominal static deflection of 9 mm. Plant mounted in this way is unlikely to impact on neighbouring properties.

Appendix A - Survey Details

A1. Location of Survey

9 Arkwright Road, London

A2. Date of Survey

31st March 2011

A3. Personnel Present During Survey

A Ison-Jacques

A4. Instrumentation

Brüel and Kjaer

Type 2250 Sound Level Meter	(SRL No.750)
Type 4231 Sound Level Calibrator	(SRL No.753)

Norsonics

Type 140 Sound Level Meter	(Serial No.1404078)
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A5. Calibration Procedure

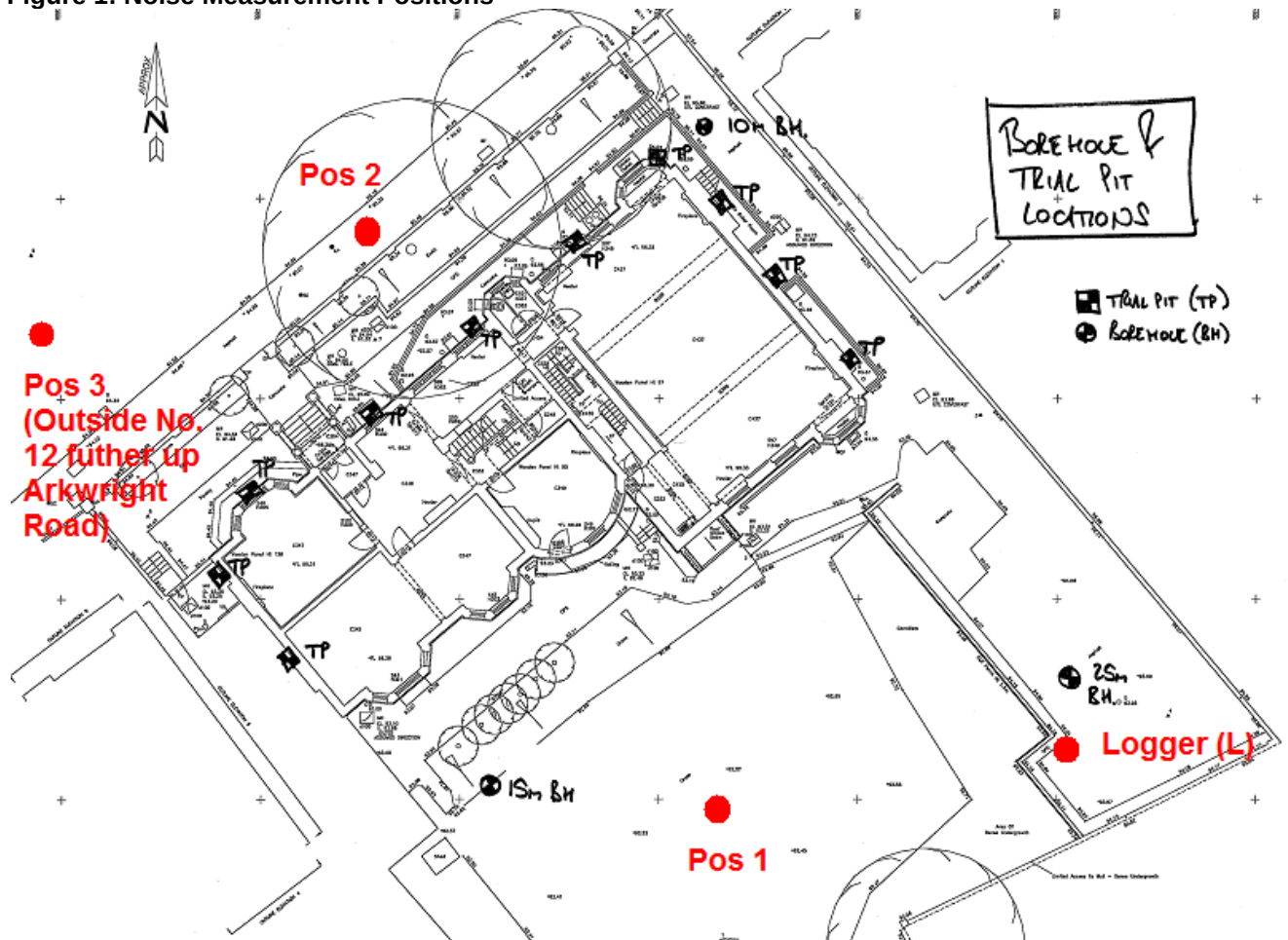
Brüel and Kjaer and Norsonics

Before and after the survey the measurement apparatus was checked calibrated to an accuracy of $\pm 0.3\text{dB}$ using the Type 4231 Sound Level Calibrator. The calibrator produces a sound pressure level of 94.0 dB re. 2×10^{-5} Pa at a frequency of 1 kHz.

A6. Survey Procedure

Ambient noise levels were measured at Positions L,1,2,3 and 4 as shown in Figure 1. The measurements taken are listed in Appendix B, and explanations of the parameters used are given in Appendix C.

Figure 1: Noise Measurement Positions



Appendix B – Measured Noise Levels

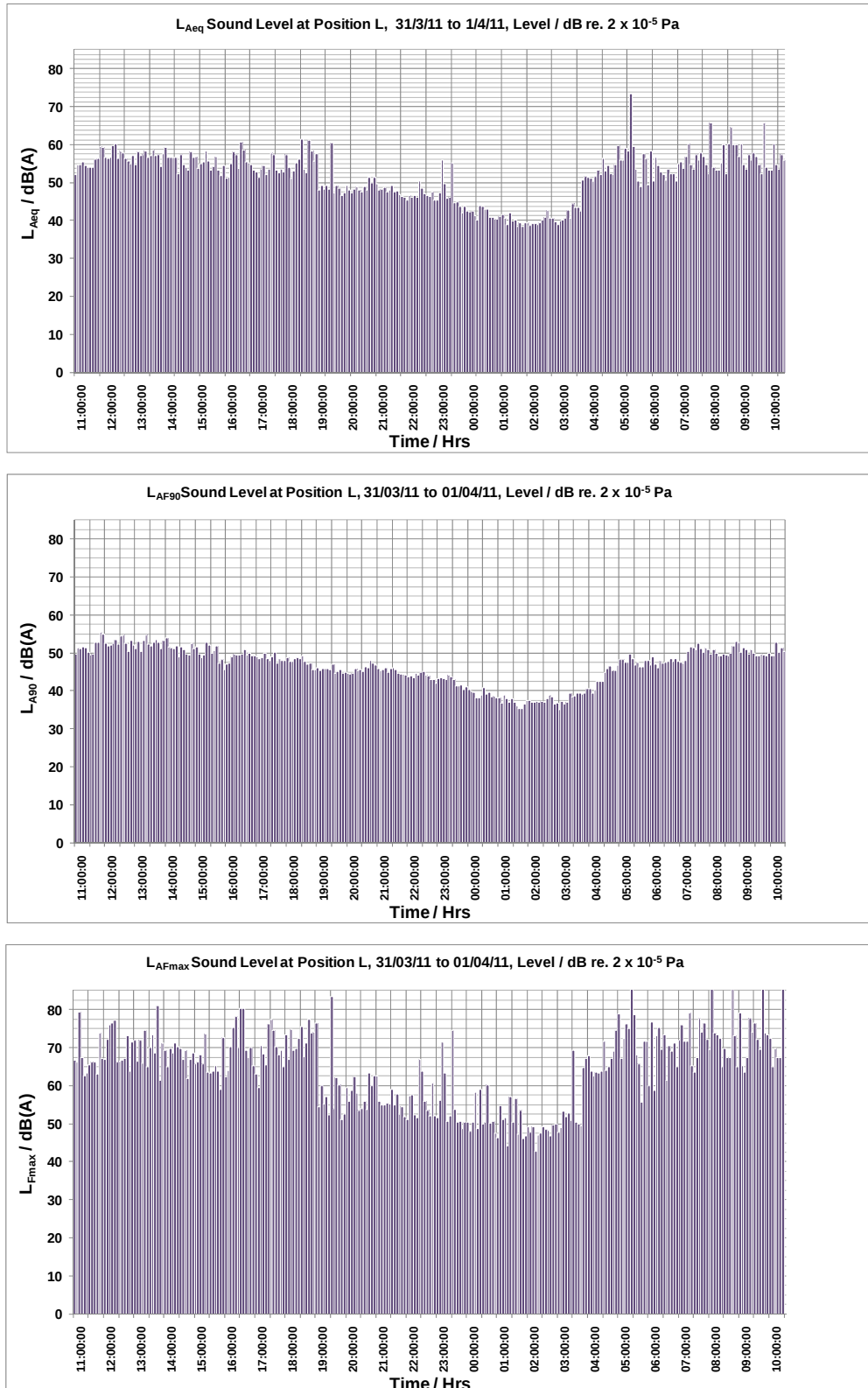
Table B1 - Measured Ambient Noise Levels (See Figure 1 for Measurement Positions)

Position	Start Time	L _{Aeq} (dB)	L _{A10} (dB)	L _{A90} (dB)	L _{AFmax} (dB)
L	1150	53	55	49	65
L	1208	54	57	51	62
1	1219	52	55	47	63
2	1231	71	76	60	80
3	1243	69	73	58	87
L	1258	57	59	52	75
2	1315	66	71	57	83
3	1328	69	73	55	84
L	1340	55	57	52	70
2	1355	66	71	56	82
3	1406	66	70	56	84
2	1418	67	71	56	86
L	1430	57	59	53	74
2	2252	63	67	48	81
2	2303	62	67	48	76
3	2314	62	66	48	82
2	0608	60	60	49	77
3	0618	63	64	47	83

Table B2 - Measured octave band spectrums

Position	Param	Start Time	Octave bands, Frequency (Hz)							
			63	125	250	500	1k	2k	4k	8k
2	L _{eq}	1231	74	68	65	66	67	64	62	61
2	L _{eq}	2303	68	62	59	57	58	54	48	42
2	L _{max}	2303	84	81	75	72	73	69	65	62

Figure B1 - Noise Levels Measured at Position L



Appendix C

Noise Measurement Parameter Definitions

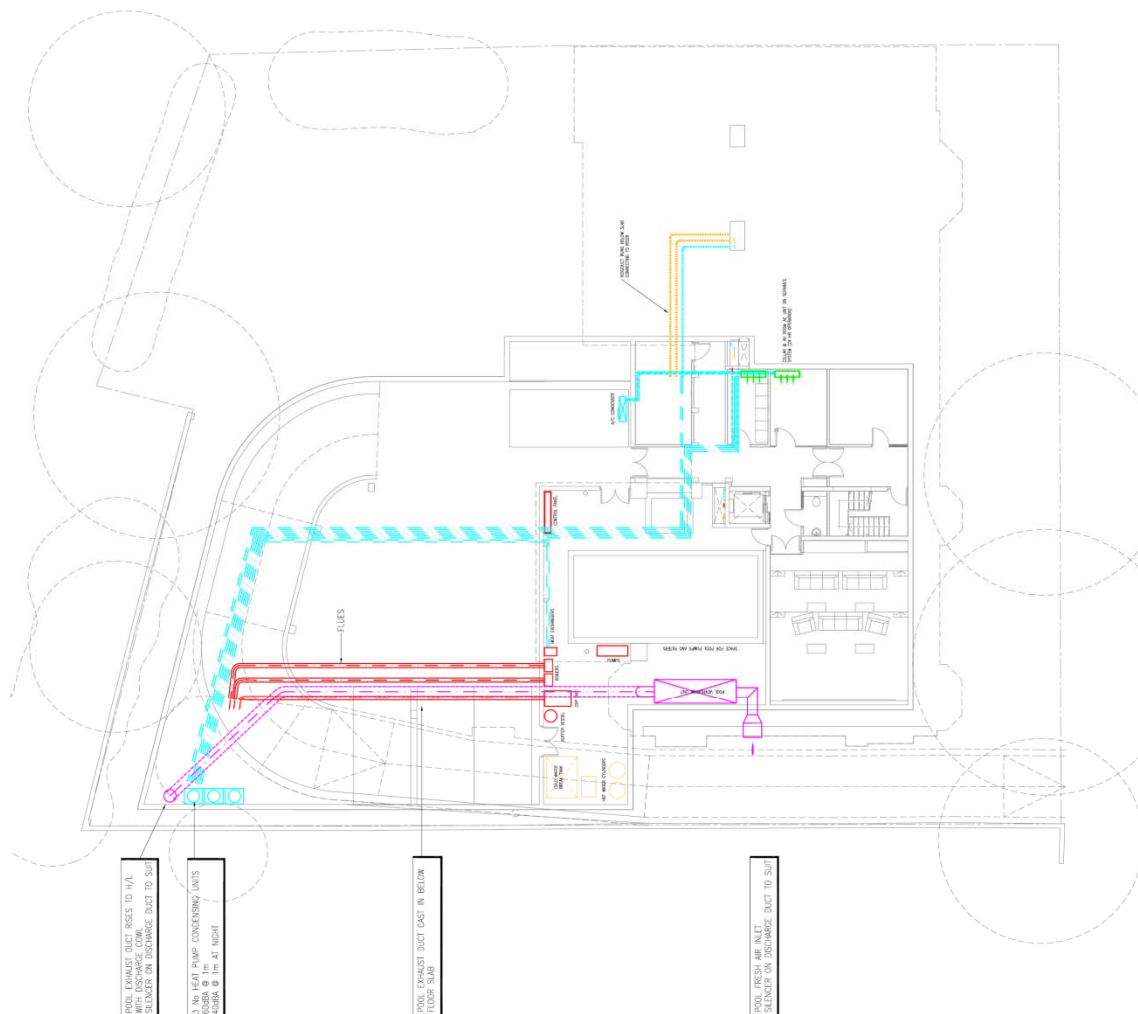
L_{A90} - The "A" weighted sound pressure level that is exceeded for 90% of the measurement period. It is commonly used as the "Background Noise Level".

L_{A10} - The "A" weighted sound pressure level that is exceeded for 10% of the measurement period. This is often used for assessing traffic noise.

L_{Aeq} - The "A" weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise, over the measurement period. It can be considered as the "average" noise level.

L_{Amax} - The "A" weighted maximum sound pressure level in a given measurement period.

Appendix D – Service Scheme Design



NOTES: SCALE FROM THIS DRAWING IN EITHER PAPER OR DIGITAL FORM

P3	May/12	Planning
P2	Dec/11	Preliminary
P1	May/11	Preliminary
01	May/11	Preliminary
02	May/11	Preliminary
03	May/11	Preliminary
04	May/11	Preliminary
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99	May/11	Preliminary
100	May/11	Preliminary

MichaelPopper

Appendix E – System Manufacturers' Specifications

R2 Series High COP (8-24hp)

R410A Simultaneous Heating and Cooling with Heat Recovery Outdoor Unit

Improved for even higher efficiency

Throughout the year, many buildings require cooling in some areas and heating in others - even in adjacent rooms. The outstanding City Multi R2 system meets this requirement by distributing surplus heat from cooling operations (and vice versa) to rooms where it is needed. This efficiency can result in energy savings of up to 30% over conventional systems.

- Highest ever COP's / EER's due to new high efficiency inverter technology and wrap around coil for added efficiency
- Up to 50 indoor units connected to each outdoor unit
- Easy to install unique 2-pipe technology means minimal disruption, quicker installation and less connections than a 3 pipe equivalent
- Weight and size reduction compared to previous YGM-A models
- Improved pipe run of 165m with a total system pipe length of up to 800m
- 100% Inverter control with low start currents
- High Sensible Cooling Function - By raising the off coil temperature, a 10% increase in sensible cooling capacity over standard operation is achievable, the result being greater comfort for occupants



Technical Information

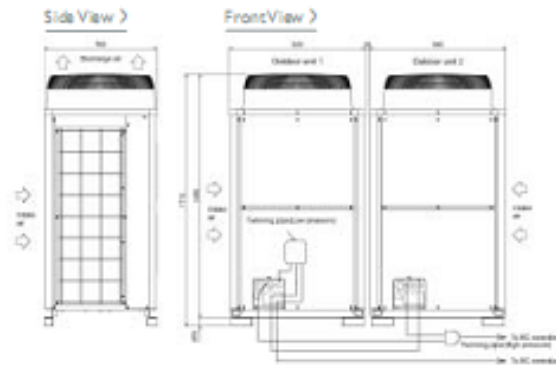
R2 SERIES HIGH COP OUTDOOR UNIT 8-24hp								
MODEL REFERENCE		PURV8P200YHMA	PURV8P240YHMA	PURV8P300YHMA	PURV8P360YHMA	PURV8P420YHMA	PURV8P480YHMA	PURV8P540YHMA
CAPACITY (kW)	Heating (nominal)	11.0	17.5	20.0	24.0	28.0	33.0	36.5
	Cooling (nominal)	11.4	17.5	20.0	24.0	28.0	33.0	36.5
	Heating (UK)	11.0	17.5	20.0	24.0	28.0	33.0	36.5
	Cooling (UK)	11.2	17.5	20.0	24.0	28.0	33.0	36.5
POWER INPUT (kW)	Heating (nominal)	2.81	4.37	1.171	1.377	1.511	1.717	1.911
	Cooling (nominal)	2.31	4.37	1.017	1.109	1.170	1.319	1.500
	Heating (UK)	2.75	4.09	1.126	1.311	1.455	1.661	1.740
	Cooling (UK)	2.34	4.14	1.01	1.14	1.259	1.477	1.190
COP (kW)		4.30 / 4.19	4.00 / 4.01	4.34 / 4.35	4.04 / 4.01	4.10 / 4.09	3.97 / 3.94	4.00 / 4.01
MAXIMUM OF CONNECTABLE INDOOR UNITS		10	10	10	10	10	10	10
PIPEWORK (m/ft)	High	165	165	165 / 165	165 / 165	165 / 165	165 / 165	165 / 165
NOISE (dB(A))		67	67	67	67	67	67	67
WEIGHT (kg)		115	145	115 + 115	115 + 115	145 + 115	145 + 115	145 + 145
DIMENSIONS (mm)	Width	610	1100	610 + 610	610 + 610	1100 + 610	1100 + 610	1100 + 1100
	Depth	740	740	740 + 740	740 + 740	740 + 740	740 + 740	740 + 740
	Height	1710	1710	1710 + 1710	1710 + 1710	1710 + 1710	1710 + 1710	1710 + 1710
ELECTRICAL SUPPLY		180W (5, 20 Hz)	180W (5, 20 Hz)	180W (5, 20 Hz)	180W (5, 20 Hz)	180W (5, 20 Hz)	180W (5, 20 Hz)	180W (5, 20 Hz)
PHASE		1	1	1	1	1	1	1
STARTING CURRENT (A)		8	8	8 / 8	8 / 8	8 / 8	8 / 8	8 / 8
RUNNING CURRENT (A)	Heating	69	14.4	16.1	11.3	11.4	14.6	14.5
	Cooling	80	13.6	14.3	10.3	11.1	13.3	14.3
FLUENTING (MCS) (m/s) (M4) (A)		10	11	10 / 10	11 / 10	11 / 10	11 / 11	11 / 11
PIPE CALCULATION CODE		4 + 4000	4 + 4000	4 + 4000	4 + 4000	4 + 4000	4 + 4000	4 + 4000

Note: For piping restrictions for PURV8P200-600Y(S)HMA please see page 158

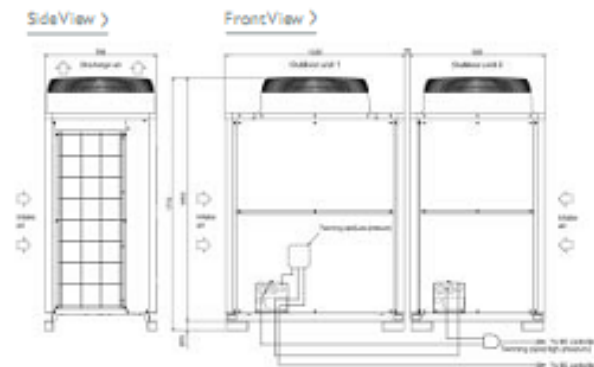
PURY-EP200, 300YHM-A

PURY-EP200YHM-A schematic is the same as PURY-P250, 300YHM-A on page 153
PURY-EP300YHM-A schematic is the same as PURY-P350, 400YHM-A on page 153

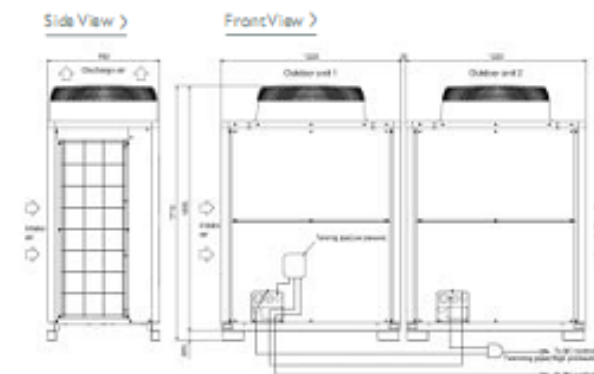
PURY-EP400, 450YSHM-A



PURY-EP500, 550YSHM-A



PURY-EP600YSHM-A



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