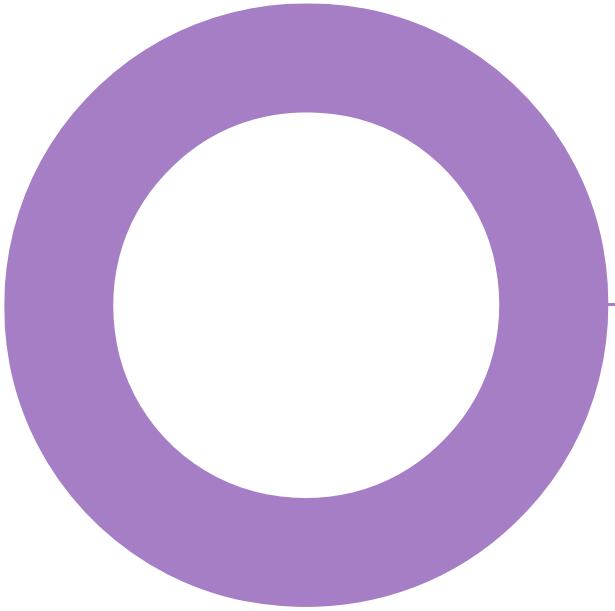
HOARE LEA

TMC Phase 2.
Manchester.
Willmott Dixon.

ACOUSTICS

PLANNING CONDITION 14A DISCHARGE REPORT

REVISION 01 – 02 OCTOBER 2024



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
00	24/05/2024	First issue	GK	AP	PM
01	02/10/2024	Updated following EHO comments	AP	PM	PM

This document has been prepared for Willmott Dixon only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

Project number: 1014837
Document reference: REP-1014837-5A-GK-20240524-Planning condition discharge report-Rev01.docx

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Executive summary

Hoare Lea has been appointed to act as acoustic consultant in relation to the proposed 'Phase 2' extension to the Manchester College's new City Centre Campus, Manchester.

An environmental noise survey was carried out over 4 days commencing Thursday 9 February 2023. This noise survey has been used as the basis of the noise assessment.

Details of the proposed external plant equipment have been received from the project mechanical engineers, including plant locations and noise data from the manufacturer.

Detailed plans and elevation drawings have been received from the project architects.

The resultant sound levels at the nearby residential receptors have been calculated based on the information received.

The assessment concludes that the rating levels from the proposed external plant equipment are calculated to achieve the noise limits stipulated with Planning Condition 14 during the day. It is understood that no plant will be running through the night-time period (23:00 – 07:00) and so achieves the stipulated noise limits without calculation.

This report is considered suitable for the discharge of Planning Condition 14a on this basis.

1. Introduction.

Hoare Lea has been appointed to act as acoustic consultant in relation to the proposed 'Phase 2' extension to the Manchester College's new City Centre Campus, Manchester.

This report provides details of the plant noise assessment undertaken and is considered suitable for the discharge of Planning Condition 14a.

2. Planning Condition 14.

Planning Condition 14 is presented below:

"Notwithstanding the Planning Noise Assessment Report prepared by Hoare Lea received by the City Council, as Local Planning Authority, on the 16 March 2023 (a) Prior to the first use of the development hereby approved, details of any externally mounted ancillary plant, equipment and servicing shall be submitted for approval. Externally mounted plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5 db (Laeq) below the typical background (La90) level at the nearest noise sensitive location.

(b) The approved scheme shall be implemented and prior to the first use of the development, a verification report will be required to validate that the work undertaken conforms to the recommendations and requirements approved as part of part (a) of this planning condition. The verification report shall include post completion testing to confirm the noise criteria has been met. In instances of non conformity, these shall be detailed along with mitigation measures required to ensure compliance with the noise criteria. Any mitigation measures shall be implemented in accordance with a timescale to be agreed with the City Council, as Local Planning Authority, and thereafter retained and maintained in situ."

3. Noise survey.

An environmental noise survey has been carried out on site over 4 days commencing on Thursday 9 February 2023. The full results are detailed in Hoare Lea report *REP-1014659-5A-AP-20230217-Noise assessment planning report-Rev01.*

The key parameter from the noise survey that is required for the assessment included herein is the background sound level (L_{A90}). This has been measured at the development site, and is presented below:

Period	Representative background sound level, $L_{A90,Tr}$ dB
Daytime (0700-2300)	49
Night-time (2300-0700)	42

Table 1: Representative background sound level measured on site.

4. Performance requirements.

The full wording of the planning condition is presented in Section 2. The key requirement within the condition is for noise from all external plant to achieve *5 dB below the typical background level at the nearest noise sensitive location*.

It is understood that all plant will not operate between 23:00 – 07:00 and so the night-time condition will be met without assessment. For completeness, both the daytime and night-time noise limits are presented below:

Period	Representative background sound level, $L_{A90,Tr}$ dB	Plant noise limit, $L_{Ar,Tr}$ dB
Daytime (0700-2300)	49	44
Night-time (2300-0700)	42	37

Table 2: Plant noise limits to be achieved to meet requirements of Planning Condition 14.

These limits are to be achieved with all the equipment running simultaneously and at maximum normal operational duty.

5. Proposed external plant.

The proposed development includes three items of plant proposed external to the building. These are presented below:

- 2no. AHUs
- 2no. Extract fans
- 19no. VRF condenser units
- 8no. DX condenser units
- 2no. ASHP units.

Manufacturers data for the proposed external plant equipment is provided in Appendix A.

The locations of the equipment, received February 2024, are presented in Figure 1.

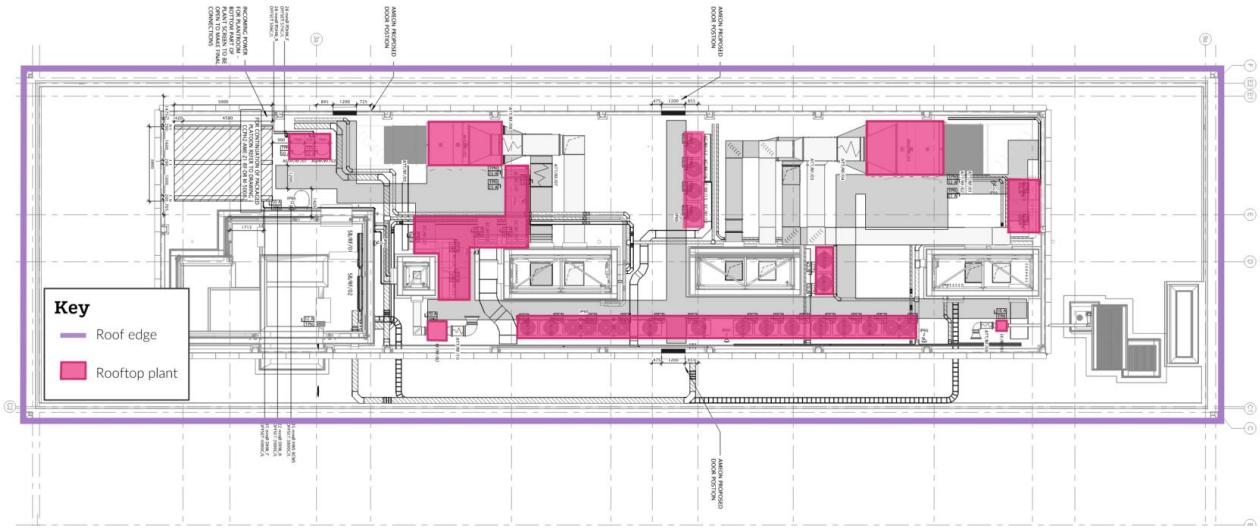


Figure 1: Proposed rooftop plant layout with plant units identified.

6. Closest noise-sensitive receptors.

The proposed development is located beside the Great Ducie Street site and the Old Brewery Gardens site which are currently under development. Further from the proposed development are the Travelodge Hotel and Beaumont Building which are pre-existing. These receptors are considered to be the closest noise-sensitive receptors. For the purposes of the assessment, only the Great Ducie Street site has been considered as it is the closest of the nearby noise-sensitive receptors and therefore if the criteria are met at this location, the additional distance attenuation and acoustic screening would ensure compliance at all other receptors.

A mark-up of the local area has been presented with Figure 2, showing the proposed development site and the nearby receptors.

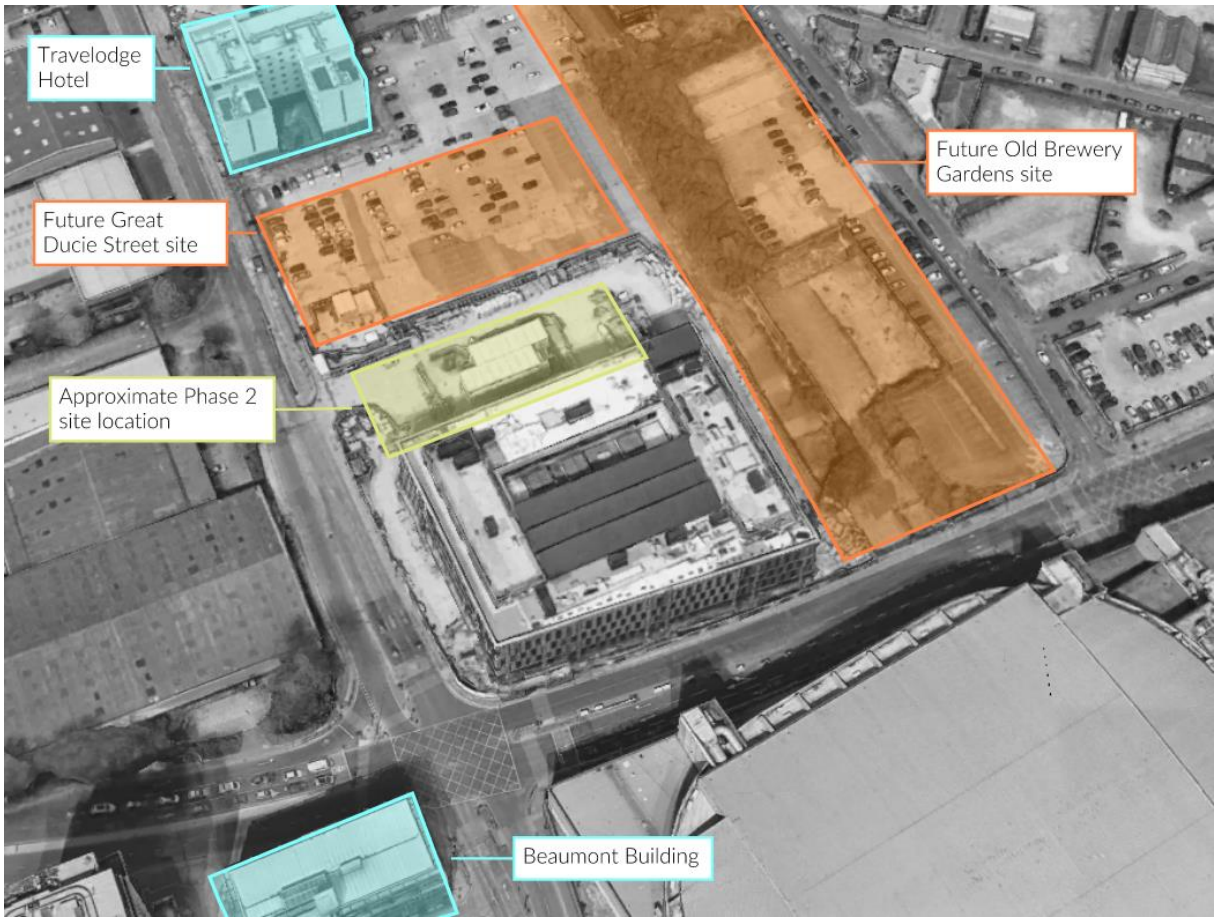


Figure 2: 3D rendered image of development site and nearby noise-sensitive receptors.

7. Noise assessment.

Based on the sound power levels taken from the manufacturers data in Appendix A, and the architect's drawings, the noise level at the closest noise-sensitive receptor has been calculated.

The calculations include the attenuation due to distance, directivity, and attenuators on plant units. Performances for the proposed attenuators received and included in the calculations are included in Appendix A.

The following operational considerations has been accounted for in the calculations based on discussions with the project MEP Engineer:

- VRF condensers will operate at a maximum capacity of 85%. A 5 dB reduction has been taken for each VRF unit based on data for similar units at such a reduced duty. All units are considered to be running at once in the calculations under the absolute worst case operating condition (i.e. all units at 85%), which is understood to be unlikely to occur in reality.
- DX condensers will operate at a maximum capacity of 50%. A 12 dB reduction has been taken for each DX unit based on data for similar units at such a reduced duty. All units are considered to be running at once in the calculations under the worst case operating condition (i.e. all units at 50%).
- As noted above, this only considers the daytime limits as it is understood that no plant will be running at night. This is understood to be achieved via a time scheduling functionality.

The resultant noise levels calculated at the Great Ducie Street residential site are presented in Table 3. Full calculations are presented in Appendix B.

Receptor	Plant noise limit, dB $L_{Ar,Tr}$	Calculated rating noise level, dB $L_{Ar,Tr}$	Difference, dB
Future Great Ducie Street site	44	42	-2
Future Old Brewery Gardens site	44	35	-9

Table 3: Calculated noise level at the closest noise-sensitive receptor.

As noted above, the noise level at all other identified noise sensitive receptors will be lower than the Great Ducie Street and Old Brewery Gardens sites due to additional distance and screening from the proposed new plant.

This shows that the rating levels from the proposed external plant equipment are calculated to achieve the noise limits stipulated under Planning Condition 14a.

Appendix A: Manufacturer's data.

The following pages are pertinent pages from the manufacturer's datasheet for each of the items of external plant equipment.

3-PIPE VRF

MMY-MAP_FT8P
SHRM-e



CAPACITY OPERATION

The SHRM-e, full Inverter heat recovery 3-pipe VRF, is the ultimate simultaneous heating & cooling solution for business applications.

8HP > **54**HP **-25**°C > **+46**°C

Features

Outdoor unit				MMY- MAP0806FT8P-UK	MAP1006FT8P-UK	MAP1206FT8P-UK	MAP1406FT8P-UK	MAP1606FT8P-UK	MAP1806FT8P-UK	MAP2006FT8P-UK
Capacity range		HP		8	10	12	14	16	18	20
Cooling capacity[1]	Rated	kW		22.4	28.0	33.5	40.0	45.0	50.4	56.0
Heating capacity[2]	Rated	kW		22.4	28.0	33.5	40.0	45.0	50.4	56.0
	Max			25.0	31.5	37.5	45.0	50.0	56.5	58.0
Power supply		V-ph-Hz		380/415-3-50	380/415-3-50	380/415-3-50	380/415-3-50	380/415-3-50	380/415-3-50	380/415-3-50
Efficiency	EER rated	W/W		3.76	3.51	3.43	3.14	3.23	3.15	3.01
	EER 50% load	W/W		7.32	7.035	6.162	5.666	6.233	6.79	5.091
	SEER	η/std		239.8%/6.07	238.2%/6.03	234.6%/5.94	221.4%/5.61	225.8%/5.72	232.6%/5.89	222.6%/5.64
Efficiency	COP rated	W/W		4.15	3.97	3.85	3.81	3.69	3.67	3.52
	COP 50% load	W/W		5.92	5.60	5.38	5.48	5.28	5.02	4.79
	COP -7°C 100% load	W/W		3.35	3.20	3.03	3.05	2.91	2.96	2.77
	SCOP	η/std		142.6%/3.64	138.2%/3.53	145.4%/3.71	139.8%/3.57	137%/3.50	140.6%/3.59	140.6%/3.59
Electrical characteristic	Running current	A	C	9.4	12.5	15.5	19.9	21.8	25.1	29.2
	Power input	kW	C	5.95	7.98	9.77	12.74	13.93	16.00	18.60
	Running current	A	H	8.6	11.1	13.8	16.5	19.1	21.5	24.7
	Power input	kW	H	5.40	7.05	8.70	10.50	12.20	13.73	15.91
Dimensions (h x w x d)		mm		1830 x 990 x 780	1830 x 990 x 780	1830 x 1210 x 780	1830 x 1210 x 780	1830 x 1600 x 780	1830 x 1600 x 780	1830 x 1600 x 780
Weight		kg		263		316			377	
Compressor	Type			Hermetic Twin Rotary						
	Motor output	kW		2.3x2	3.1x2	3.9x2	4.8x2	5.8x2	6.5x2	7.6x2
Fan unit	Type			Propeller fan						
	Motor output	W		1	1	1	1	2	2	2
	Air volume	m³/h		9700		12200		17300		17900
External static pressure available		Pa		60	60	50	40	40	40	40
R410A refrigerant charge		kg/CO_2Teq		11/23	11/23	11/23	11/23	11/23	11/23	11/23
Power supply wiring	MCA	A		21.5	26.1	31	35.8	40.6	44.9	49.3
	MCOP	A		25.0	32.0	40.0	50.0	50.0	50.0	63.0
Pipe connection	Suction line type - Diameter			Brazed - 7/8"	Brazed - 7/8"	Brazed -1-1/8"	Brazed -1-1/8"	Brazed -1-1/8"	Brazed -1-1/8"	Brazed -1-1/8"
	Discharge line type - Diameter			Brazed - 3/4"	Brazed - 3/4"	Brazed - 3/4"	Brazed - 7/8"	Brazed - 7/8"	Brazed - 7/8"	Brazed - 7/8"
	Liquid line type - Diameter			Flare - 1/2" or 3/8	Flare - 1/2" or 3/8	Flare - 1/2" or 3/8	Flare - 5/8" or 1/2	Flare - 3/4" or 1/2	Flare - 3/4" or 5/8	Flare - 3/4" or 5/8
	Balance diameter			Flare - 3/8"	Flare - 3/8"	Flare - 3/8"	Flare - 3/8"	Flare - 3/8"	Flare - 3/8"	Flare - 3/8"
Connectivity	Max. number of connected indoor units			18	22	27	31	36	40	41
	Diversity ratio	Min/Max					50/135%			
Sound pressure level	Cooling	dB(A)	C	59	59	60	62	61	61	61
	Heating	dB(A)	H	61	61	62	64	62	62	62
Sound power level	Cooling	dB(A)	C	80	80	80	81	83	83	83
	Heating	dB(A)	H	82	82	82	83	84	84	84
Operation temperature range	Cooling	CDB	C				-10/46			
	Heating	CWB	H				-25/15.5			

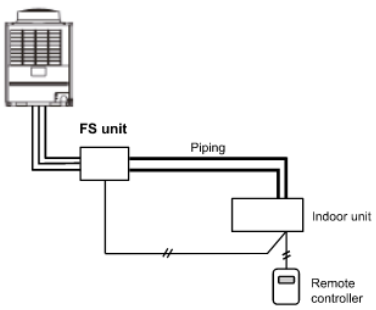
C = Cooling mode H = Heating mode
Connected indoor units : MMU-UP***1HP-E

Reduced liquid pipe size can be used for the less local refrigerant charge saving case.
- Refrigerant saving case will cause the following conditions.

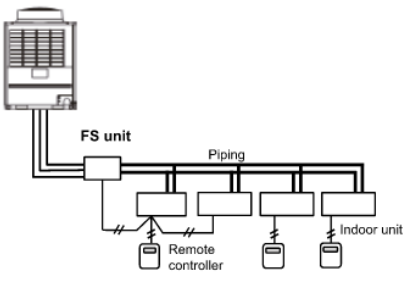
* Real length of main piping (L1) varies 15m ~ 50m by outdoor units capacity.
* Height difference between outdoor to indoor units(H1) is 30m or less

Installation flexibility

< In case of connecting one indoor unit>



<In case of connecting one group operation of indoor units and two indoor units>



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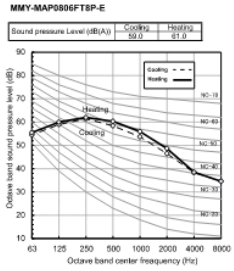
SHRM-e

CDU

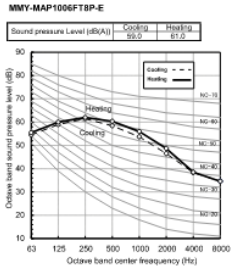
Sound pressure levels

Unit: dB(A)

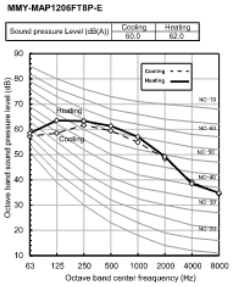
MMY-MAP0806FT8P-E



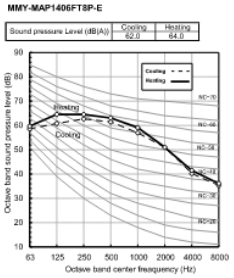
MMY-MAP1006FT8P-E



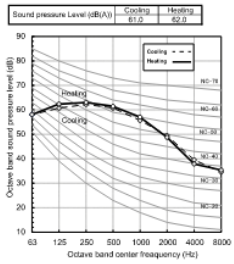
MMY-MAP1206FT8P-E



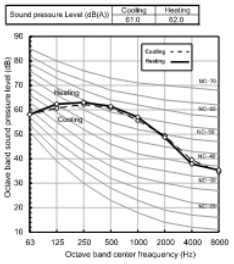
MMY-MAP1406FT8P-E



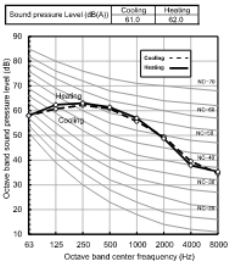
MMY-MAP1606FT8P-E



MMY-MAP1806FT8P-E



MMY-MAP2006FT8P-E

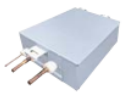


Night mode sound pressure level

Sound reduction and approximation capacity (reference)

Type	Night operation sound reduction dB (A)	Capacity	
		Cooling	Heating
0806	50	Approx. 85%	Approx. 85%
1006	50	Approx. 70%	Approx. 70%
1206	53	Approx. 80%	Approx. 80%
1406	53	Approx. 70%	Approx. 70%
1606	54	Approx. 65%	Approx. 65%
1806	54	Approx. 60%	Approx. 60%
2006	54	Approx. 55%	Approx. 55%

Accessories

	Name	Model name	Capacity	Appearance	Dimensions (mm)	Remarks
Branching joints and headers	Y-shape branching joint	RBM-BY55FE	Under 6.4hp			
		RBM-BY105FE	From 6.4 to 14.2hp			
		RBM-BY205FE	From 14.2 to 25.2hp			
		RBM-BY305FE	25.2hp or more			
	4-branching header	RBM-HY1043FE	Under 14.2hp			
		RBM-HY2043FE	From 14.2 to 25.2hp			
	8-branching header	RBM-HY1083FE	Under 14.2hp			
		RBM-HY2083FE	From 14.2 to 25.2hp			
	Branching joint for connection of outdoor units	RBM-BT14E	Under 26hp			
		RBM-BT24E	26hp or more			
Flow selector	3 series single output FS Box (Powered by IDUs)	RBM-Y1123FE	Under 4hp		190x320x160	1 output - From 1 to 5 IDU per output
		RBM-Y1803FE	From 4 to 6.4hp			1 output - From 1 to 8 IDU per output
		RBM-Y2803FE	From 6.4 to 10hp		200x470x200	1 output - From 1 to 8 IDU per output
	4 series single output FS Box (Up to 50m piping length from FS box to IDU)	RBM-Y1124FE	Under 4hp		180x425x300	1 output - From 1 to 6 IDU per output
		RBM-Y1804FE	From 4 to 6.4hp			1 output - From 1 to 10 IDU per output
		RBM-Y2804FE	From 6.4 to 10hp		180x425x350	1 output - From 1 to 16 IDU per output
	Multiple output	RBM-Y1801F4PE	Up to 6hp per output		215x730x567	4 outputs - From 1 to 10 IDU per output
		RBM-Y1801F6PE	Up to 6hp per output		215x1050x567	6 outputs - From 1 to 10 IDU per output
	Connection accessory	RBC-CBK15FE				15m Bus cable for 3 serie FS box
Optional PCB of outoor unit	Power peak-cut control board	TCB-PCDM4E				limit capacity of the VRF outdoor unit at 85%, 75%, 70% or 60% load or stop it. Dry contact
	External master ON/OFF control board	TCB-PCMO4E				Dry contact
	Output control board	TCB-PCIN4E				Operation output: The operation indicator is on while any indoor unit in the system is operating. Error output: The error indicator is on when an error has occurred on even one of the indoor or outdoor units in the system. Dry contact

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LIGHT COMMERCIAL > HIGH-WALL

HM_KRTP
HIGH-WALL

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Digital Inverter Classic



Compact, quiet with an attractive design, this high-wall is suitable for every kind of project in new construction or refurbishment.

Comfort
• Auto louver mode allows optimum and uniform air distribution.

Control
• Wireless remote control with pre-set functions accessible with dedicated buttons: hi-power mode, quiet mode, comfort sleep, eco-mode.

Healthy
• Self-cleaning feature to prevent mould formation on the heat exchanger coils.

SCOP MAX	CAPACITY	OPERATION
4.42 A+	2.5kW > 11.2kW	-20°C > +52°C

Comfort sleep function adjusts automatically the room temperature and the fan speed.



TOSHIBA R32 · CE · EUROVENT CERTIFIED PERFORMANCE



INDOOR UNITS

RAV-HM301KRTP-E
RAV-HM401KRTP-E
RAV-HM561KRTP-E/TR
RAV-HM801KRTP-E/TR
RAV-HM901KRTP-E
RAV-HM1101KRTP-E/TR

OUTDOOR UNITS

SDI



RAV-GP561ATW-E/TR
RAV-GP801AT-E/TR
RAV-GP1101AT(8)-E/TR

DI



RAV-GM301ATP-E
RAV-GM401ATP-E
RAV-GM561ATP-E/TR
RAV-GM801ATP-E/TR
RAV-GM901ATP-E
RAV-GM1101AT(8)P-E/TR

DIc



RAV-GV561ATP-E/TR
RAV-GV801ATP-E/TR
RAV-GV1101AT(8)P-E/TR

REMOTE CONTROLS



IR included



RBC-AMSU51E-ES(EN)
RBC-AMTU31-E
RBC-ASCU11-E

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HIGH-WALL

HIGH-WALL Performance data with Super Digital Inverter Series 1 1Ph & 3Ph

Outdoor unit	RAV-		GP561ATW-E/TR	GP801ATW-E/TR	GP1101ATP-E/TR	GP1101AT8-E/TR
Indoor unit (High-wall)	RAV-		HM561KRTP-E/TR	HM801KRTP-E/TR	GM1101KRTP-E/TR	GM1101KRTP-E/TR
Cooling capacity	kW		5.0	7.1	10.0	10.0
Cooling range (min. - max.)	kW		1.2 - 5.6	1.9 - 8.0	3.1- 12.0	2.6 - 12.0
Power input	kW	C	0.19 - 1.43 -1.98	0.26 - 2.06 - 3.17	0.55-2.77-3.90	2.86
EER			3.50	3.45	3.61	3.50
SEER			7.84	7.56	7.36	6.53
Energy efficiency class		C	A++	A++	A++	A++
Seasonal electricity consumption	kWh/a	C	223	329	475	536
Heating capacity	kW		5.6	8.0	11.2	11.2
Heating range (min. - max.)	kW		0.9 - 7.3	1.3 - 11.3	2.6 - 13.0	2.4 - 13.0
Power input (min. - rated - max.)	kW	H	0.16 - 1.39 - 2.67	0.20 - 2.25 - 3.50	0.52 - 3.13 - 4.40	3.25
COP	W/W		4.03	3.56	3.58	3.45
SCOP			4.19	4.16	4.42	4.22
Energy efficiency class		H	A+	A+	A+	A+
Seasonal electricity consumption	kWh/a	H	1268	1717	2911	3591

HIGH-WALL Performance data with Digital Inverter Series 1 1Ph & 3Ph

Outdoor unit	RAV-		GM301ATP-E/TR	GM401ATP-E/TR	GM561ATP-E/TR	GM801ATP-E/TR	GM901ATP-E/TR	GM1101AT(8)P-E/TR
Indoor unit (High-wall)	RAV-		HM301KRTP-E/TR	HM401KRTP-E/TR	HM561KRTP-E/TR	HM801KRTP-E/TR	HM901KRTP-E/TR	HM1101KRTP-E/TR
Cooling capacity	kW		2.5	3.6	5.0	6.7	8.0	9.5
Cooling range (min. - max.)	kW		0.9 - 3.0	0.9 - 4.0	1.5 - 5.6	1.5 - 8.0	1.9 - 8.8	3.0 - 11.2
Power input	kW	C	0.25 - 0.61 - 0.82	0.18 - 1.13 - 2.00	0.30 - 1.66 - 1.86	0.31 - 2.44 - 2.85	2.67	0.60 - 2.97 - 4.30
EER			4.10	3.19	3.01	2.75	3.00	3.20
SEER			6.36	6.12	6.19	5.73	6.10	6.10
Energy efficiency class		C	A++	A++	A++	A+	A++	A++
Seasonal electricity consumption	kWh/a	C	138	206	383	409	459	545
Heating capacity	kW		3.4	4.0	5.3	7.7	9.0	11.2
Heating range (min. - max.)	kW		0.8 - 4.5	0.8 - 5.0	1.5 - 6.3	1.5 - 9.0	1.6 - 9.9	3.0 - 13.0
Power input (min. - rated - max.)	kW	H	0.17 - 0.85 - 1.40	0.14 - 1.12 - 1.70	0.30 - 1.55 - 2.40	0.31 - 2.61 - 3.30	2.9	0.60 - 3.47 - 4.70
COP	W/W		4.00	3.57	3.42	2.95	3.10	3.23
SCOP			4.10	4.22	4.00	4.01	4.10	4.20
Energy efficiency class		H	A+	A+	A+	A+	A+	A+
Seasonal electricity consumption	kWh/a	H	887	895	980	1780	2151	2665

HIGH-WALL Performance data with Digital Inverter Classic Series 1 1Ph & 3Ph *PRELIMINARY DATA*

Outdoor unit	RAV-		GV561ATP-E/TR	GV801ATP-E/TR	GV1101ATP-E/TR	GV1101AT8P-E/TR
Indoor unit (High-wall)	RAV-		HM561KRTP-E/TR	HM801KRTP-E/TR	HM1101KRTP-E/TR	HM1101KRTP-E/TR
Cooling capacity	kW		5.0	6.7	9.5	9.5
Cooling range (min. - max.)	kW		1.5 - 5.6	1.5 - 8.0	3.0 - 10.6	3.0 - 11.2
Power input	kW	C	1.45	2.20	3.80	3.40
EER			3.45	3.05	2.50	2.79
SEER			6.20	5.75	6.00	6.10
Energy efficiency class		C	A++	A+	A+	A++
Seasonal electricity consumption	kWh/a	C				
Heating capacity	kW		5.3	7.0	10.0	10.0
Heating range (min. - max.)	kW		1.5-6.3	1.5-9.0	3.0-13.0	3.0-13.0
Power input (min. - rated - max.)	kW	H	1.50	2.20	3.30	3.20
COP	W/W		3.53	3.18	3.03	3.13
SCOP			3.90	3.90	4.00	4.10
Energy efficiency class		H	A	A	A+	A+
Seasonal electricity consumption	kWh/a	H				

HIGH-WALL Physical data indoor

Indoor unit	RAV-		HM301KRTP-E/TR	HM401KRTP-E/TR	HM561KRTP-E/TR	HM801KRTP-E/TR	HM901KRTP-E/TR	HM1101KRTP-E/TR
Air flow (H/L)	m^3/h - l/s	C	670/450 - 186/125	700/450 - 229/125	960/680 - 266/189	1040/910 - 289/189	1180/ 680 - 328/189	1610/1180 - 447/328
Sound pressure level (H-M-L)	dB(A)	C	40-34-29	41-36-30	42-39-35	45-41-35	47-41-35	49-45-41
Sound power level (H-M-L)	dB(A)	C	55-49-44	56-51-45	57-54-50	60-56-50	62-56-50	64-60-56
Dimensions (HxWxD)	mm		293 x 798 x 230	293 x 798 x 230	320 x 1050 x 250	320 x 1050 x 250	320 x 1050 x 250	348 x 1200 x 280
Weight	kg		10	10	14	14	14	19

C: cooling mode
H: heating mode

LIGHT COMMERCIAL

Please contact us for full details on 0870 8430333 or email marketing-uk@toshiba-ac.com or visit our website www.toshiba-aircon.co.uk

CDL

Raising the standards in Air Conditioning Distribution

Toshiba Air Conditioning Data Sheet

GM2801AT8-E1
OUTDOOR UNIT



Model Reference		RAV-GM2801AT8-E1	
Nominal	Cooling Capacity	kW	22.5
	Heating Capacity	kW	27.0
	EER/COP	W/W	2.82/3.59
UK	Cooling Total/Sensible	kW	22.8/19.3
	Heating	kW	16.73
Cooling EN14825	Range Min. - Max.	kW	4.6-27.0
	Power Input	kW	7.98
	Pdesign	kW	22.5
	SEER/Energy Efficiency Class (or ηsc %)		4.61/181.4
	Seasonal Energy Consumption	kWh/a	2928
Heating EN14825	Range Min. - Max.	kW	4.6-31.5
	Power Input	kW	7.52
	Pdesign	kW	20.0
	SCOP/Energy Efficiency Class (or ηsc(A) %)		3.44/134.6
	Seasonal Energy Consumption	kWh/a	8136
Operating Range	Cooling/Heating	°C	-15 to 46/-20 to 15
Air Flow	High	m3/h - l/s	10890- 3025
Sound	Pressure High - Medium - Low	dB(A)	61 - 63
	Power High - Medium - Low	dB(A)	78 - 80
Unit	Height x Width x Depth	mm	1550 x 1010 x 370
	Weight	kg	142
Pipe Connection	Flare Connections (gas - liquid)	inch	1 1/8 - 1/2
	Min.-Max. Length	m	5-100
	Maximum Height Difference	m	±30
	Drain Port Connection	mm	16
Refrigerant Gas	Base Charge/Chargeless Length	m	R32 - 5.0/30
	Additional Charge Liquid Side	g/m	80
Run Current	Maximum	Amps	13.04
Power Cable	Outdoor to Indoor		3 core + earth
Power Supply	Suggested Fuse Size	V/ph/Hz-A	380-415/3/50-20

TOSHIBA

- Top Class EER/COP thanks to exclusive Toshiba's inverter twin-rotary compressor
- Wide capacity range down to 4.6kW to ensure continuous operation whatever the conditions and maximise efficiency
- Compliance with ERP directive Lot21
- Allows the connection of four indoor units (same type, same capacity)
- Compatible with a large choice of indoor units: 4-way cassette, 4-way compact cassette, slim duct, standard duct, high wall & ceiling
- Built-in leak detection system

www.cdlweb.info

UK capacities are based on the following conditions: Cooling: Indoor 23'C DB/16'C WB ~ Outdoor 29'C DB Heating: Indoor 20'C DB ~ Outdoor -5'C/100% RH Nominal capacities are based on NEMA Cooling: Indoor 27'C DB/19'C WB ~ Outdoor 35'C DB Heating: Indoor 20'C DB ~ Outdoor 7'C/100% RH 7.5m Pipe Run and High Speed. Data from Toshiba Air Conditioning July 2019



RBC-AHU1 Air Handling Unit Applications Digital Inverter - R32 (continued)

CODE			140	140	200	250
Outdoor Unit		RAV-	GM1601ATP-E	GM1601AT8P-E	GM2241AT8-E	GM2801AT8-E
Cooling Range (Min. - Max.)		kW	3.0 - 16.0	3.0 - 16.0	4.6 - 22.4	4.6 - 27.0
Heating Range (Min. - Max.)		kW	3.0 - 18.0	3.0 - 18.0	4.6 - 25.0	4.6 - 31.5
Ambient Operating Range Cooling/Heating		°C	-15 to 46/-15 to 15	-15 to 46/-15 to 15	52 to -15/15 to -27	52 to -15/15 to -27
Fan(s)	Motor Power	W	100+100	100+100	200 + 200	200 + 200
	Standard Air Flow	l/s	1916	1916	2550	3033
	Standard Air Flow	m³/min	115	115	153	182
	Standard Air Flow	m³/h	6900	6900	9150	10890
Sound	Pressure Level C/H	dB(A)	53/55	53/55	58/60	61/63
	Power Level C/H	dB(A)	70/72	70/72	76/76	78/80
Unit	Appearance		Silky Shade (Muncel 1Y 8.5/0.5)	Silky Shade (Muncel 1Y 8.5/0.5)	Silky Shade (Muncel 1Y 8.5/0.5)	Silky Shade (Muncel 1Y 8.5/0.5)
	Heat Exchanger		Finned tube	Finned tube	Finned tube	Finned tube
	Compressor Type		Hermetic Twin Rotary	Hermetic Twin Rotary	Hermetic Twin Rotary	Hermetic Twin Rotary
	Compressor Power	kW	3.75	3.75	5.6	5.6
	Height x Width x Depth	mm	1340 x 900 x 320	1340 x 900 x 320	1550 x 1010 x 370	1550 x 1010 x 370
	Total Weight	kg	95	94	142	142
Refrigerant	Control		Pulse motor valve	Pulse motor valve	Pulse motor valve	Pulse motor valve
	Gas Type		R32	R32	R32	R32
	Base Charge/Chargeless To	kg/m	2.4/30	2.4/30	5.0/30	5.0/30
	Additional Charge Main Liquid Side	g/m	35	35	80	80
	Replacement Technology	Yes	R22, R407C, R410A, R417A, R134a, R12	R22, R407C, R410A, R417A, R134a, R12	R22, R407C, R410A, R417A, R134a, R12	R22, R407C, R410A, R417A, R134a, R12
Pipe Connections	Min.-Max. Length	m	5-50	5-50	5-60	5-60
	Height Difference Outdoor To AHU	m	±30	±30	±30	±30
	Gas Side	inch	5/8	5/8	1-1/8*	1-1/8*
	Liquid Side	inch	3/8	3/8	1/2	1/2
	Drain Port Connector Hose Inner Diameter	mm	16	16	16	16
Electrical	Power Supply	V/ph/Hz	220-240/1/50	380-415/3/50	380-415/3/50-16	380-415/3/50-20
	Maximum Run Current	A	21.71	7.23	9.52	13.04
	Suggested Fused Supply	A	32	16	16	20

Control Panel		RBC-	AHU1	AHU1	AHU1	AHU1
Unit	Height x Width x Depth	mm	300 x 300 x 150	300 x 300 x 150	300 x 300 x 150	300 x 300 x 150
	Weight	kg	10	10	10	10
Electrical	Power Supply	V/ph/Hz	220-240/1/50	220-240/1/50	220-240/1/50	220-240/1/50
	Common Alarm Output		12 V DC 20 mA	12 V DC 20 mA	12 V DC 20 mA	12 V DC 20 mA
	Run Indication Output		12 V DC 20 mA	12 V DC 20 mA	12 V DC 20 mA	12 V DC 20 mA
	Remote START/STOP	V	0	0	0	0
	Wired controller ON/OFF Lock	V	0	0	0	0
	Suggested Fused Supply	A	6	6	6	6

AHU DX Coil Design (Third Party Supply)			AHU DX Coil	AHU DX Coil	AHU DX Coil	AHU DX Coil
Capacity	Cooling	kW	13.2	13.2	22.4	27.0
	Heating	kW	13.0	13.0	25.0	31.5
Design	Evaporating Temperature Range	°C	4 - 7	4 - 7	4 - 7	4 - 7
	Suction Superheat (Target)	K	5	5	5	5
Heat Exchanger	Air Volume Min. - Max.	m³/h	1260 - 3000	1260 - 3000	2880 - 4320	3360 - 5040
	Coil Pipe Diameter	mm - "	9.52 - 3/8	9.52 - 3/8	9.52 - 3/8	9.52 - 3/8
	Paths	No.	6 - 10	6 - 10	10 - 12	10 - 12
	DX Coil Burst Pressure (Greater Than)	mPa	12.45	12.45	12.45	12.45
	Maximum System Operating Pressure	mPa	4.15	4.15	4.15	4.15

AHU

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Please contact us for full details on 0870 8430333 or email marketing-uk@toshiba-ac.com or visit our website www.toshiba-aircon.co.uk

Commercial Heating | Technical Data

MITSUBISHI ELECTRIC

QAHV Sanitary Hot Water Heat Pumps

Project Name	City Centre College - Phase 2
Quote Reference	QUO-0005-399315/1
Prepared by	PB



les.mitsubishielectric.co.uk

Commercial Heating | Technical Data

MITSUBISHI ELECTRIC

Noise Level

QAHV-N560YA-HPB

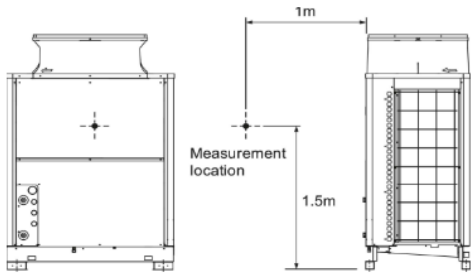
High Temperature Heat Pump for Sanitary Hot Water

Sound Pressure Level - Winter Condition								
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)
71	58	59.5	56	52	48	44	38	58

Sound Pressure Level - Spring & Autumn Condition								
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)
71	58	56	54	48.3	47.3	44	38	56

Sound Power Level - Winter Condition								
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)
85	72	73.5	71	66.7	62	58	53	72.5

Sound Power Level - Spring & Autumn Condition								
63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)
85	72	70.5	68.5	63	62	58	53	70.5



Measurment Position for Sound Pressure Level

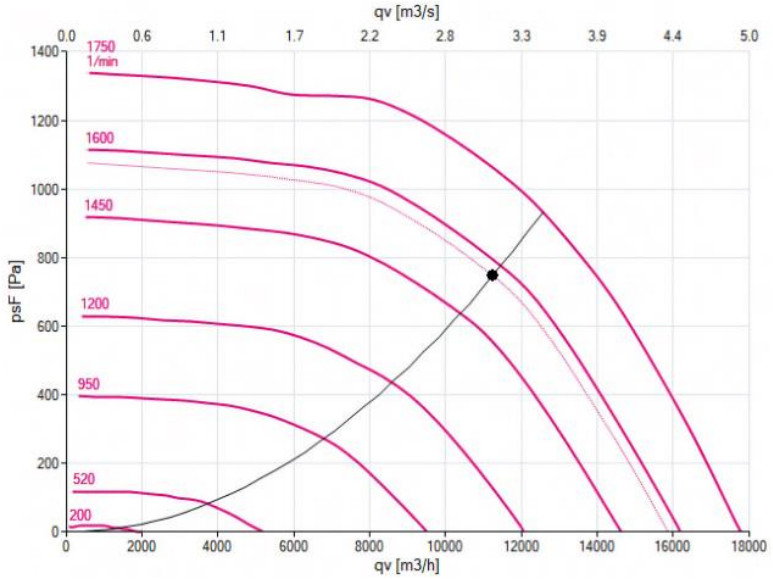
Spring, Autumn: Outdoor temp.: 16°CDB/12°CWB, Inlet water temp.: 17°C, Outlet water temp.: 65°C
Winter: Outdoor temp.: 7°CDB/6°CWB, Inlet water temp.: 9°C, Outlet water temp.: 65°C

No. : SO/24000875

Dated : 09/04/2024
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Your reference : 21142-1244673

K-factor	:	308
Requires a controller delivering a 0/10 V signal		
Material of fan impeller	:	Polypropylène
Diameter of fan impeller	:	0.56 m
Motor and fan efficiency	:	72%
Impeller rotation speed	:	1 570 rpm
Impeller rotation maximum speed	:	1 750 rpm
Total electrical power input at user conditions	:	10.53 kW
Total electrical power input	:	10.53 kW
Specific Fan Power	:	1 050 W/(m3/s), 0.29 W/(m3/h)
3 x Single motor		
Unit specifications:		
Rated current	:	8.00 A
Motor EC	:	5 kW
Voltage	:	TRI_400V_50HZ
Control voltage	:	8.97 V
Connections for power, fault, and standby control in motor terminal boxes (cables not supplied).		
Right face access in the direction of air		
Plug fan inlet guard		B508463
Hinged door, Max handles		B380636
Pressure pick-up for air flow control		B506379



Damper (external)			**B370858**
Airtight damper box			B370715
Opposed dampers with gaskets on the thin plates extremities			
Cog wheel drive			
Air pressure drop	:	1 Pa	
External spindle (actuator by others) (1x26 Nm)			B371364
Right face access in the direction of air			
Commands on the right in the direction of air			

ACOUSTIC OUTPUT SPECTRUM									
	Frequencies (Hz) / Levels per octave band (dB Lin)								Overall
	63	125	250	500	1000	2000	4000	8000	dB (A)
Radiated	66	73	68	61	53	45	36	27	64
Ducted air inlet	70	79	84	79	73	71	68	65	81
Ducted discharge	79	87	92	89	87	81	79	76	92

Tolerance on the global spectrum: +/- 3dB
Tolerance on the octave spectrum : +/-5 dB @ 63-125 Hz
Tolerance on the octave spectrum : +/-3 dB @ 250-8000 Hz

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Your reference : 21142-1244673

Galva./steel drain pan for condensates recovery B375619

Heating capacity : 59.2 kW
Heating fluid : Refrigerant R32
Condensing temperature : 50 °C
air inlet t° / rh % : 15 °C / 40 %(RH)
air outlet t° / rh % : 21 °C / 27.4 %(RH)

NOTE:
- All fresh air operation is prohibitedwith discharge temperature control(faulty operating condition for the refrigerant unit)
- When using a variable air flow(multispeed motor or flow variator), make surethat the refrigerant unit has the necessary devices

Accessories
5 Weaterproof roof B370517

ACOUSTIC OUTPUT SPECTRUM									
	Frequencies (Hz) / Levels per octave band (dB Lin)								Overall
	63	125	250	500	1000	2000	4000	8000	dB (A)
Radiated	66	73	70	62	54	45	36	27	65
Ducted air inlet	66	76	82	77	70	64	60	55	78
Ducted discharge	76	85	92	88	84	76	71	66	89

Tolerance on the global spectrum: +/- 3dB
Tolerance on the octave spectrum : +/-5 dB @ 63-125 Hz
Tolerance on the octave spectrum : +/-3 dB @ 250-8000 Hz

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Your reference : 21142-1244673

Left face access in the direction of air
Commands on the left in the direction of air
Motor servo(s) location : Outside
Configuration B502203

ACOUSTIC OUTPUT SPECTRUM									
	Frequencies (Hz) / Levels per octave band (dB Lin)								Overall
	63	125	250	500	1000	2000	4000	8000	dB (A)
Radiated	68	77	65	56	54	49	48	32	64
Ducted air inlet	67	79	79	73	70	68	64	60	76
Ducted discharge	76	87	85	84	82	77	75	70	87

Tolerance on the global spectrum: +/- 3dB
Tolerance on the octave spectrum : +/-5 dB @ 63-125 Hz
Tolerance on the octave spectrum : +/-3 dB @ 250-8000 Hz

SUPPLY UNIT : Position 1HH

Damper (external)
Damper Class 1
Combined opposed dampers
Small rods driving
Air pressure drop : 1 Pa
Control to be motorised (1x20 Nm) B502584
Right face access in the direction of air
Commands on the right in the direction of air
Motor servo(s) location : Outside
Configuration B502203

Block B4 417 kg with
1 Baseframe B507915
9 Galvanised steel Z275 internal panel
10 Polyester coated external skin (C3 RAL 7035) B508249
1 Mounted block
1 T2/TB2 casing B511255

controls **B504808**
Length : 650 mm
Right face access in the direction of air

1 filtration section **B506923**
Track mounted, two stages, A + B B504541
8 Cells type M5C+ B504657
Filtration Class (EN 779-2012) : M5
Filtration Class (ISO16890) : ePM10 50%
Pressure drop on air according to PrEN 13053:2018 (1/2 fouled): 113 Pa
Pressure drop on the 3 fouling levels according to PrEN 13053:2018 : Start 63 Pa / 1/2 fouled 113 Pa / End 163 Pa
With pressure valves
8 Cells type F8HEERB B510362
Filtration Class (EN 779-2012) : F8
Filtration Class (ISO16890) : ePM1 70%
Pressure drop on air according to PrEN 13053:2018 (1/2 fouled): 108 Pa
Pressure drop on the 3 fouling levels according to PrEN 13053:2018 : Start 58 Pa / 1/2 fouled 108 Pa / End 158 Pa
With pressure valves
All filters must be equipped with a visual device or monitoring by the control
Right face access in the direction of air
Liquid manometer (supplied loose item) B504698
MAGNEHELIC pressure gauge (supplied loose item) B504700
Pressure tappings (fitted) B504297
Hinged door 550 mm B503511

Block B2 589 kg with
1 Baseframe B507915
5 Galvanised steel Z275 internal panel
5 Polyester coated external skin (C3 RAL 7035) B508249
1 Mounted block
1 T2/TB2 casing B511255

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Your reference : 21142-1244673

1 DX Reversible Coil			**B509981**
4 Row(s), Fin space 2.1 mm			
Access door to the separator			
Copper tubes / Aluminium fins			
Fluid	:	Refrigerant R32	
SUMMER			
Cooling capacity	:	62.3 kW	
Evaporating temperature / Sub-cooling	:	7 °C / 5 °C	
air inlet t° / rh %	:	30 °C / 40 %(RH)	
air outlet t° / rh %	:	21 °C / 68.3 %(RH)	
Compute on air flow	:	6.158 m3/s (20 °C / 50 %(HR))	
WINTER			
Heating capacity	:	55.3 kW	
Condensing temperature / Superheat	:	44 °C / 35 °C	
air inlet t° / rh %	:	14 °C / 100 %(RH)	
air outlet t° / rh %	:	22 °C / 60.4 %(RH)	
Compute on air flow	:	6.158 m3/s (20 °C / 50 %(HR))	
Air pressure drop wet	:	57 Pa	
Air pressure drop dry	:	54 Pa	
Air speed	:	2.56 m/s	
Droplet separator with galvanised frame, aluminium medium			
Air pressure drop	:	19 Pa	B506174
Slide mounting			
Number of refrigerant circuit(s)	:	3	
connection circuit (1) in / out	:		
connection circuit (2) in / out	:		
connection circuit (3) in / out	:		
Right face access in the direction of air			
Pipings on the right in the direction of air			
Batterie spéciale pour fluide R32 (diamètre collecteur <= 28)			NO_CODE
Plaquage R32			NO_CODE
Runners			B510021
Galva./steel drain pan for condensates recovery			B506111

Accessories		
4	Painted roof	B507394
43	28 kg/m3 glass wool insulation	
7	Painted horizontal raceway C3 RAL 7035	B507414

ACOUSTIC OUTPUT SPECTRUM									
	Frequencies (Hz) / Levels per octave band (dB Lin)								Overall
	63	125	250	500	1000	2000	4000	8000	dB (A)
Radiated	70	74	71	60	57	53	51	35	66
Ducted air inlet	65	73	80	74	69	64	59	53	76
Ducted discharge	76	81	88	85	82	75	66	62	87

Tolerance on the global spectrum: +/- 3dB
Tolerance on the octave spectrum : +/-5 dB @ 63-125 Hz
Tolerance on the octave spectrum : +/-3 dB @ 250-8000 Hz



Northern Fan Supplies Ltd
Technical Data Sheet
Woods Twin Fan (EC)

NFAN

Quotation Number	:	KP75875r1	Project Code	:	
Project Name	:	Manchester City Centre Phase 2	Customer	:	Ameon
Item Reference:	:	EF-RF--01	Date:	:	Thursday, January 4, 2024

Fan Code	Woods EC Twin Box 150
Fan Diameter / Size	150
Velocity	4.4 m/s
Installation Type / Form of Running	D / B (Horizontal)
Requested Duty (8.8V)	0.08m³/s @ 172 Pa (static)
Actual Duty	0.08m³/s @ 174 Pa (static)
Control Adjustment	8.8V
Outlet Dynamic Pressure	12 Pa
Input Power	0.04 kW
Full Load Current	0.4 A
Motor Frame	Integral [Class F]
Motor Rating	0.052 kW (Maximum Power)
Electrical Supply	220-240 Volts ±10% 50 Hz 1 Phase
Regulation 1253/2014	
UVU Efficiency	38.0%
Effective Input Power	0.047 kW
Internal Fan Efficiency	38%
SFP value	0.50 W/(l/s) @ Requested Duty
Power from mains	0.04 kW
Energy Consumption	119 kWh (3000 h/year)
Running Cost / Year	£14
Air Density	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Product Number	EC150202

Air Performance curves have been determined in a test chamber using the inlet test method according to DIN 24163

Noise levels are tested in accordance with DIN 45635. Sound Pressure levels dB(A) are quoted @ 3m distance under free field conditions. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum. FWL therefore recommend using an auto transformer speed controller for noise sensitive applications.

Acoustic figures for adjusted running speeds have been interpolated and are for reference only.

This Offer is made subject to the latest version of our A100-19 Terms and Conditions, a copy of which can be made available on request. Our lead times will be re-confirmed on receipt of manufacturing release and may be subject to change.

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	57	61	63	64	61	59	60	51	70	47
Outlet*	63	66	68	69	66	64	65	56	74	52
Breakout*	54	55	55	41	32	30	31	20	48	27

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa
Sound data at requested duty.

Description	Qty
Fan	
EC150202 - Woods EC Twin Box 150	1
Accessories	

Unit E1 Longford trading Estate
Thomas Street, Stretford, Manchester, , M32 0JT
Tel: 0161 864 1777 Fax: 0161 864 2777
Website: www.nfan.co.uk
Email: kyle@nfan.co.uk
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Northern Fan Supplies Ltd
Technical Data Sheet
Woods Twin Fan (EC)

NFAN

Quotation Number	: KP75875r1	Project Code	:
Project Name	: Manchester City Centre Phase 2	Customer	: Ameon
Item Reference:	: EF-RF-02	Date:	: Thursday, January 4, 2024

Fan Code	Woods EC Twin Box 350
Fan Diameter / Size	350
Velocity	8.9 m/s
Installation Type / Form of Running	D / B (Horizontal)
Requested Duty (9.3V)	0.85m³/s @ 293 Pa (static)
Actual Duty	0.86m³/s @ 296 Pa (static)
Control Adjustment	9.3V
Outlet Dynamic Pressure	48 Pa
Input Power	0.46 kW
Full Load Current	2.9 A
Motor Frame	Integral [Class F]
Motor Rating	0.450 kW (Maximum Power)
Electrical Supply	220-240 Volts ±10% 50 Hz 1 Phase
Regulation 1253/2014	
UVU Efficiency	48.0%
Effective Input Power	0.446 kW
Internal Fan Efficiency	59%
SFP value	0.53 W/(l/s) @ Requested Duty
Power from mains	0.46 kW
Energy Consumption	1368 kWh (3000 h/year)
Running Cost / Year	£164
Air Density	1.2 kg/m³ / 20 °C / 0 m / 50% RH
Product Number	EC350202

Air Performance curves have been determined in a test chamber using the inlet test method according to DIN 24163

Noise levels are tested in accordance with DIN 45635. Sound Pressure levels dB(A) are quoted @ 3m distance under free field conditions. When an electronic controller is incorporated, enhanced motor noise can occur - particularly when the operating speed is well below maximum. FWL therefore recommend using an auto transformer speed controller for noise sensitive applications.

Acoustic figures for adjusted running speeds have been interpolated and are for reference only.

This Offer is made subject to the latest version of our A100-19 Terms and Conditions, a copy of which can be made available on request. Our lead times will be re-confirmed on receipt of manufacturing release and may be subject to change.

	Sound Spectrum (Hz)								Overall	
	63	125	250	500	1k	2k	4k	8k	Lw*	LpA @ 3 m**
Inlet*	66	70	74	70	65	64	65	53	78	52
Outlet*	71	75	79	75	70	70	70	58	83	57
Breakout*	62	64	66	47	36	36	36	22	69	38

* Lw dB re 10^{-12} W ** dBA re $2x10^{-5}$ Pa
Sound data at requested duty.

Description	Qty
Fan	
EC350202 - Woods EC Twin Box 350	1
Accessories	

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Attenuator Schedule

Manchester City Centre Campus Phase 2 TMC

Schedule Date
15/04/2024
Caice Reference
123493/Q00013

Notes

1. All products shall be supplied by Caice or equal and approved, as per their file reference 123493, contact Frazer Robinson on frazer.robinson@caice.co.uk or call 07585 441669.
2. The Contractor shall order the attenuators scheduled below, and shall send finalised drawings and equipment noise levels to the attenuator supplier to check the selections prior to manufacture.
3. The attenuator supplier shall then undertake acoustic calculations to ensure that the attenuators achieve the specified noise criteria, based upon the finalised information.
4. A Technical Submittal comprising acoustic calculations and a finalised schedule of attenuators shall then be issued to the Consultant for final approval.
5. If an alternative attenuator supplier is proposed then the Contractor shall allow for them to undertake witnessed tests to prove their claimed insertion loss performance in a UKAS accredited BS EN ISO 7235: 2009 test facility, for two sample units. This shall be undertaken prior to order.
6. Pressure losses are stated in accordance with ISO 7235, which is based on laminar airflow conditions. The system designer shall make allowance for increased attenuator pressure losses where turbulent airflow conditions exist on the attenuator entry or exit.
7. Unless stated otherwise all attenuators shall be constructed as follows: Galvanised sheet steel casings with 30mm profile flanges that are fully compliant with DW/TM1 at a high pressure rating (+2000/-750Pa). Profile flanges shall be compatible with Doby, Mez & Metu flanging systems. Elements shall be installed in the vertical plane, with side elements provided as standard, and all elements shall have aerodynamic inlet and outlet fairings. Element facings shall be constructed from expanded galvanised steel mesh with fibre glass tissue bonded to the inner face. Mineral wool infill shall be overpacked to minimise voids due to settlement. Attenuator ends shall be protectively wrapped, and all attenuators shall be delivered to site on pallets and individually labelled.

Product Reference	Product Description	Product Code	Dimensions (mm)			Insertion Loss (dB)								Air Volume (m^3/s)	Pressure Loss (Pa)	Quantity	Features
			Width	Height	Length	63	125	250	500	1k	2k	4k	8k				
ATT/RF/01	AHU/RF/01 Fresh Air Atmosphere side	Modular MG02H/3C/L/S	2510	1860	750	5	7	14	21	15	11	8	6	8.89	9	1	Modular attenuator, Horizontal elements & Unit delivered in 2 sections, split 2 in width
ATT/RF/02	AHU/RF/01 Exhaust Atmosphere side	Modular MG04V/2C/L/S	2510	1860	1500	9	13	26	52	55	46	29	22	9.38	40	1	Modular attenuator, Unit delivered in 4 sections, split 2 in width & 2 in length & Medium pressure rating (+1000/-750Pa)
ATT/RF/03	AHU/RF/01 Supply	Rectangular SG02H/3C/L/S	1500	1425	1800	9	13	21	40	55	38	28	24	8.89	27	1	Rectangular attenuator, Unit delivered in 2 sections, split in length & Horizontal elements
ATT/RF/04	AHU/RF/01 Extract	Rectangular SG02H/2C/L/S	1700	1250	1500	8	13	23	40	44	34	27	22	9.38	39	1	Rectangular attenuator, Unit delivered in 2 sections, split in length, Horizontal elements & Medium pressure rating (+1000/-750Pa)
ATT/RF/05	AHU/RF/02 Fresh Air Atmosphere side	Rectangular SG01H/2C/L/S	1925	1210	600	4	6	12	18	13	9	8	5	5.42	12	1	Rectangular attenuator, Horizontal elements & Medium pressure rating (+1000/-750Pa)
ATT/RF/06	AHU/RF/02 Exhaust Atmosphere side	Rectangular SG01V/3C/L/S	1925	1210	1200	8	13	25	45	45	34	23	17	4.76	48	1	Rectangular attenuator
ATT/RF/07	AHU/RF/02 Supply	Rectangular SG01H/3C/L/S	1100	1150	1500	8	13	23	40	44	34	27	22	5.42	37	1	Rectangular attenuator & Horizontal elements
ATT/RF/08	AHU/RF/02 Extract	Rectangular SG01V/3C/L/S	1100	1150	1200	8	13	22	38	45	39	32	28	4.78	50	1	Rectangular attenuator
ATT/RF/09	EF/RF/02 Exhaust Atmosphere side	Rectangular LG01H/3C/L/S	500	500	600	3	6	10	17	19	18	11	7	0.85	55	1	Rectangular attenuator & Horizontal elements

ATT/RF/10	EF/RF/01 Exhaust Atmosphere side	Rectangular LG01H/3C/L/S	400	400	600	2	5	7	13	19	16	11	7	0.08	1	1	Rectangular attenuator & Horizontal elements
ATT/00/05	Cleaner CTA Ducted - Partition integrity user defined	Circular CG01U/2K/L	100	dia	600	1	2	11	19	35	35	22	19	0.02	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/00/06	Male WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.11	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/00/07	Male WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.11	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/00/08	Male WC CTA	Circular CG01U/2K/L	125	dia	600	1	2	11	19	35	35	22	19	0.02	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/00/13	Hygiene CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.07	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/00/17	FM Store CTA	Circular CG01U/2K/L	100	dia	600	1	2	11	19	35	35	22	19	0.01	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/01/03	Acc WC CTA	Circular CG01U/2K/L	100	dia	600	1	2	11	19	35	35	22	19	0.01	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/01/04	Acc WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.03	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/01/05	Acc WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.16	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/01/06	Male WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.08	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/01/07	Male WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.05	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/02/01	Acc WC CTA	Circular CG01U/2K/L	100	dia	600	1	2	11	19	35	35	22	19	0.01	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/02/02	Acc WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.03	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/02/03	Acc WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.16	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/02/04	Male WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.08	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/02/05	Male WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.05	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/03/01	Acc WC CTA	Circular CG01U/2K/L	100	dia	600	1	2	11	19	35	35	22	19	0.01	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/03/02	Acc WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.03	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium

																pressure rating (+1000/-750Pa)
ATT/03/03	Acc WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.16	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/03/04	Female WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.08	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/03/05	Female WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.05	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/04/01	Acc WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.16	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/04/02	Acc WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.03	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/04/03	Acc WC CTA	Circular CG01U/2K/L	100	dia	600	1	2	11	19	35	35	22	19	0.01	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/04/04	Female WC CTA	Circular CG01U/2K/L	150	dia	600	1	3	9	18	33	29	19	18	0.08	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)
ATT/04/05	Female WC CTA	Circular CG01U/2K/L	200	dia	600	1	3	7	14	29	20	16	15	0.05	0	1	Circular attenuator, Un-podded, 40mm long spigots & Medium pressure rating (+1000/-750Pa)

Appendix B: Plant noise calculations.

AHU 01

		63	125	250	500	1000	2000	4000	8000	
	Extract discharge	79	87	92	89	87	81	79	76	
	Radiated	66	73	68	61	53	45	36	27	
	Supply intake	66	76	82	77	70	64	60	55	
	Radiated	66	73	70	62	54	45	36	27	
	Lw, Radiated total	69	76	72	65	57	48	39	30	
	Distance atten (5 sided box)	-19								
	Lp, 1m [5sb]	50	57	53	46	38	29	20	11	48
FAI	ATT/RF/01	-5	-7	-14	-21	-15	-11	-8	-6	
	Lw, attenuated	61	69	68	56	55	53	52	49	
	Lw, regen	62	57	57	61	59	61	60	55	
	Lw, after attenuaor	65	69	68	62	60	62	61	56	
	Directivity - 80 degress	-4	-4	-4	-4	-4	-4	-4	-4	
	B) direct (dist = 1m)	-11	-11	-11	-11	-11	-11	-11	-11	
	Lp, 1m	46	54	53	41	40	38	37	34	48
Exhaust	ATT/RF/02	-9	-13	-26	-52	-55	-46	-29	-22	
	Lw, attenuated	70	74	66	37	32	35	50	54	
	Lw, regen	47	40	46	41	42	46	33	31	
	Lw, after attenuaor	70	74	66	43	42	46	50	54	
	Directivity - 45 degress	5	5	5	5	5	5	5	5	
	B) direct (dist = 1m)	-11	-11	-11	-11	-11	-11	-11	-11	
	Lp, 1m	64	68	60	37	36	40	44	48	56

	Great Ducie (Receptor 1)	Great Ducie (Receptor 2)	Old Brewery Gardens
Distance (m)	47	20	59
FAI	15	22	13
Exhaust	23	30	21
Radiated	15	22	13
TOTAL	**24**	**31**	**22**

AHU 02

		63	125	250	500	1000	2000	4000	8000	
	Extract discharge	76	87	85	84	82	77	75	70	
	Radiated	68	77	65	56	54	49	48	32	
	Supply intake	65	73	80	74	69	64	59	53	
	Radiated	70	74	71	60	57	53	51	35	
	Lw, Radiated total	72	79	72	61	59	54	53	37	
	Distance atten	-18.1								
	Lp, 1m [5sb]	54	61	54	43	41	36	35	19	50
FAI	ATT/RF/05	-4	-6	-12	-18	-13	-9	-8	-5	
	Lw, attenuated	61	67	68	56	56	55	51	48	
	Lw, regen	62	57	57	61	59	61	60	55	
	Lw, after attenuaor	65	67	68	62	61	62	61	56	
	Directivity - 80 degress	0	0	0	0	0	0	0	0	
	B) direct (dist = 1m)	-11	-11	-11	-11	-11	-11	-11	-11	
	Lp, 1m	50.00	56.00	57.00	45.00	45.00	44.00	40.00	37.00	52
Exhaust	ATT/RF/06	-8	-13	-25	-45	-45	-34	-23	-17	
	Lw, attenuated	60	64	40	11	9	15	25	15	
	Lw, regen	47	40	46	41	42	46	33	31	
	Lw, after attenuaor	60	64	47	41	42	46	34	31	
	Directivity - 45 degress	5	5	5	5	5	5	5	5	
	B) direct (dist = 1m)	-11	-11	-11	-11	-11	-11	-11	-11	
	Lp, 1m	54	58	41	35	36	40	28	25	46

	Great Ducie (Receptor 1)	Great Ducie (Receptor 2)	Old Brewery Gardens
distance	23	40	80
FAI	25	20	14
Exhaust	19	14	8
Radiated	23	18	12
TOTAL	28	23	17

EF01

	63	66	68	69	66	64	65	56	
Extract discharge	63	66	68	69	66	64	65	56	
Radiated	54	55	55	41	32	30	31	20	
Distance atten	-13								
Lp, 1m [5sb]	41	42	42	28	19	17	18	7	35
ATT/RF/10	2	5	7	13	19	16	11	7	
Lw, after attenuator	61	61	61	56	47	48	54	49	
A) direct FLSH (a= 0.100m²)	4	5	6	7	8	8	9	9	
B) direct (dist = 1m)	-11	-11	-11	-11	-11	-11	-11	-11	
Lp, 1m	54	55	56	52	44	45	52	47	56

	Great Ducie (Receptor 1)	Great Ducie (Receptor 2)	Old Brewery Gardens
distance	50	30	68
Exhaust	23	27	20
Radiated	1	5	-2
Lp, tot	23	27	20

EF02

	63	72	76	74	72	70	68	59	
Extract discharge	66	72	76	74	72	70	68	59	
Radiated	57	61	63	46	38	36	34	23	
Distance atten	-13								
Lp, 1m [5sb]	44	48	50	33	25	23	21	10	42
ATT/RF/09	3	6	10	17	19	18	11	7	
Lw, after attenuator	63	66	66	57	53	52	57	52	
A) direct FLSH (a= 0.100m²)	4	5	6	7	8	8	9	9	
B) direct (dist = 1m)	-11	-11	-11	-11	-11	-11	-11	-11	
Lp, 1m	56	60	61	53	50	49	55	50	60

	Great Ducie (Receptor 1)	Great Ducie (Receptor 2)	Old Brewery Gardens
distance	32	45	92
Exhaust	30	27	21
Radiated	12	9	3
Lp, tot	30	27	21

	Great Ducie (Receptor 1)	Great Ducie (Receptor 2)	Old Brewery Gardens
Lp, total all AHUs and fans	33	34	26

Condensers and ASHPs

						Great Ducie (Receptor 1)			Great Ducie (Receptor 2)			Old Brewery Gardens		
Unit	Unit	Lp, 1m (100% duty)	Proposed maximum duty	Correction to proposed duty	Lp, 1m (proposed duty)	Distance	Distance correction	Noise level at receptor	Distance	Distance correction	Noise level at receptor	Distance	Distance correction	Noise level at receptor
EC/RF/01	MMY-MAP1006FT8P-UK	61	85%	-5	56	35	-31	25	37	-31	25	67	-37	19
EC/RF/02	MMY-MAP1206FT8P-UK	62	85%	-5	57	35	-31	26	37	-31	26	67	-37	20
EC/RF/03	MMY-MAP2006FT8P-UK	62	85%	-5	57	44	-33	24	30	-29	28	75	-37	20
EC/RF/04	MMY-MAP2006FT8P-UK	62	85%	-5	57	35	-31	26	37	-31	26	67	-37	20
EC/RF/05	MMY-MAP2006FT8P-UK	62	85%	-5	57	35	-31	26	37	-31	26	67	-37	20
EC/RF/06	MMY-MAP1406FT8P-UK	64	85%	-5	59	44	-33	26	30	-29	30	75	-37	22
EC/RF/07	MMY-MAP1206FT8P-UK	62	85%	-5	57	44	-33	24	30	-29	28	75	-37	20
EC/RF/08	MMY-MAP1406FT8P-UK	64	85%	-5	59	35	-31	28	37	-31	28	67	-37	22
EC/RF/09	MMY-MAP1206FT8P-UK	62	85%	-5	57	39	-32	25	33	-30	27	72	-37	20
EC/RF/10	MMY-MAP1006FT8P-UK	61	85%	-5	56	44	-33	23	30	-29	27	75	-37	19
EC/RF/11	MMY-MAP1406FT8P-UK	64	85%	-5	59	39	-32	27	33	-30	29	72	-37	22
EC/RF/12	MMY-MAP1406FT8P-UK	64	85%	-5	59	32	-30	29	26	-28	31	78	-38	21
EC/RF/13	MMY-MAP1006FT8P-UK	61	85%	-5	56	32	-30	26	26	-28	28	78	-38	18
EC/RF/14	MMY-MAP1406FT8P-UK	64	85%	-5	59	40	-32	27	27	-29	30	77	-38	21
EC/RF/15	MMY-MAP1006FT8P-UK	61	85%	-5	56	40	-32	24	27	-29	27	77	-38	18
EC/RF/16	MMY-MAP1006FT8P-UK	61	85%	-5	56	32	-30	26	26	-28	28	78	-38	18
EC/RF/17	MMY-MAP1406FT8P-UK	64	85%	-5	59	32	-30	29	26	-28	31	78	-38	21
EC/RF/18	MMY-MAP1206FT8P-UK	62	85%	-5	57	39	-32	25	33	-30	27	72	-37	20
EC/RF/19	MMY-MAP1006FT8P-UK	61	85%	-5	56	39	-32	24	33	-30	26	72	-37	19
EC/RF/20	RAV-GP801AT-E	50	85%	-5	45	27	-29	16	37	-31	14	67	-37	8
EC/RF/21	RAV-GP801AT-E	50	85%	-5	45	27	-29	16	37	-31	14	67	-37	8
EC/RF/22	RAV-GP801AT-E	50	85%	-5	45	27	-29	16	37	-31	14	67	-37	8
EC/RF/23	RAV-GM2801AT8-E	63	50%	-12	51	48	-34	17	22	-27	24	82	-38	13
EC/RF/24	RAV-GM2801AT8-E	63	50%	-12	51	48	-34	17	22	-27	24	82	-38	13
EC/RF/25	RAV-GM2801AT8-E	63	50%	-12	51	29	-29	22	40	-32	19	64	-36	15
EC/RF/26	RAV-GM2801AT8-E	63	50%	-12	51	29	-29	22	40	-32	19	64	-36	15
EC/RF/27	RAV-GM2801AT8-E	63	50%	-12	51	29	-29	22	40	-32	19	64	-36	15
ASHP/RF/01	QAHV-N560YA-HPB	58	100%	0	58	22	-27	31	43	-33	25	68	-37	21
ASHP/RF/02	QAHV-N560YA-HPB	58	100%	0	58	22	-27	31	43	-33	25	68	-37	21
							TOTAL	40		TOTAL	41		TOTAL	34

ALL PLANT TOTAL

Great Ducie (Receptor 1)	Great Ducie (Receptor 2)	Old Brewery Gardens
41	42	35

HOARE LEA

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ASSOCIATE

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