
Wythenshawe Forum, Wythenshawe

Plant Noise Assessment Report

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1 Introduction

BDP Acoustics has been commissioned by Ameresco to assess proposed noise levels emanating from new mechanical plant equipment (Air Source Heat Pump (ASHP) unit) being installed at Wythenshawe Forum (referred to as “the site” throughout this report) to accompany the Planning submission for the project.

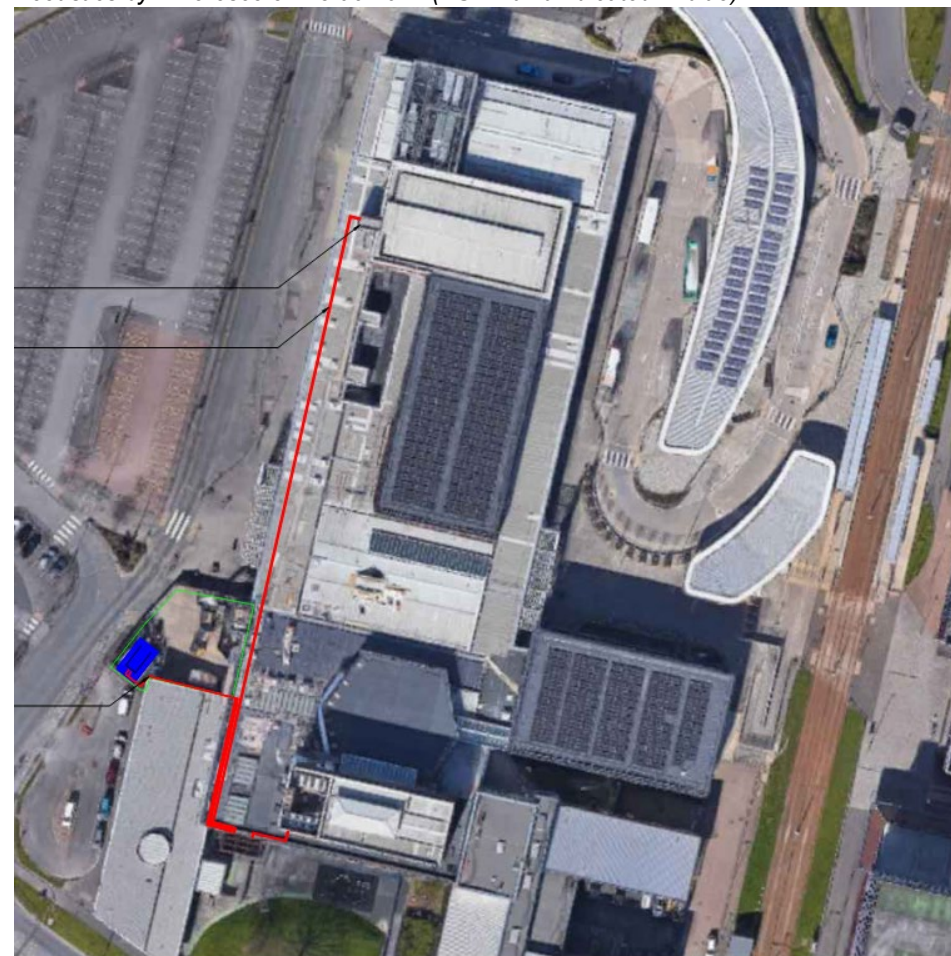
Based on ASHP location details provided to BDP Acoustics by Ameresco on 18/06/2021, we understand that it is proposed for the ASHP units to be located towards the south-west corner of the Wythenshawe Forum building, at Ground Floor level, within the south-west corner of the external bin store, as shown in Figure 1 and Figure 2.

This report details the acoustic assessment undertaken, and in summary includes the following:

- Review of the Local Planning Authority (LPA) requirements alongside other relevant guidance and acoustic standards;
- A summary of the environmental noise surveys undertaken;
- Proposed acoustic design criteria for noise relating to the proposed new equipment, based on Local Planning Authority requirements;
- Determination of the noise levels generated, compared to the proposed criteria;
- Where necessary, comments have been provided relating to proposed noise mitigation measures (namely acoustic barriers) surrounding the new equipment at the site, in order to achieve the proposed acoustic design criteria;
- Confirmation of compliance with relevant criteria when adopting the proposed mitigation measures.

A glossary of acoustic terms is presented in Appendix I – Glossary of Acoustic Terms.

Figure 1: Image of approximate proposed plant equipment location, provided to BDP Acoustics by Ameresco on 18/06/2021 (ASHP unit indicated in blue).



SITE PLAN VIEW

Figure 2: BDP Acoustics markup interpretation showing approximate proposed plant equipment location in context of wider surroundings (plant equipment indicated by red square).



2 Relevant Guidance and Standards

2.1 Noise Policy Statement for England

The NPSE provides guidance on the management of noise from sustainable development. The statement sets out three key aims in paragraph 1.7:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impact on health and quality of life;*
- Mitigate and minimise adverse impacts on health and quality of life; and*
- Where possible, contribute to the improvement of health and quality of life.”*

2.2 National Planning Policy Framework

The NPPF sets out the Government’s planning policies for England and how these are expected to be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

It advises that planning decisions should prevent new and existing developments from being put at unacceptable risks from, amongst other things, noise pollution. It goes on to advise that new development should be appropriate to its location and should mitigate and reduce to a minimum potential adverse impacts resulting from noise new development and avoid noise giving rise to significant adverse effects on health and quality of life.

2.3 BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

BS 4142:2014+A1:2019 (BS 4142) provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The impact assessment procedure described in BS 4142 is based on the comparison of rating sound level with the background sound level prevailing at the assessment locations.

2.4 Local Planning Authority (LPA)

Advice has been sought from Manchester City Council in regards to suitable noise level criteria and assessment methodology for noise egress from the proposed new ASHP equipment on the site. The following requirements are provided within Manchester City Council’s Planning & Noise Technical Guidance:

- “The noise assessment should be based on BS 4142: 2014 and any application for fixed plant, equipment or machinery must demonstrate that: ‘Externally mounted ancillary 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 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location’.”*

3 Environmental Noise Survey

3.1 Introduction

An environmental noise survey has been undertaken on 07/05/2021 at the nearest / most exposed noise sensitive receptor (NSR) properties to the proposed ASHP unit location on the site.

The data obtained has been used in order to assist in the following:

- Establishing the existing background noise climate at NSR properties;
- Establishing external noise limit criteria.

3.2 Survey Methodology

A series of manned short-term measurements were undertaken by BDP Acoustics at locations considered to be representative of the nearest / most exposed NSR properties to the proposed ASHP unit location at the site.

The approximate measurement positions at the site are presented in Figure 3 and were selected in order to encompass 'worst-case', i.e. quietest, night-time (0200 – 0400 hours) background noise levels at the NSR properties for the purposes of determination of plant noise emission limits, in line with LPA requirements.

Weather conditions during the survey were dry with southerly wind speeds approximately 1 m/s, temperatures varying around 3°C and 80% cloud cover.

The instrumentation used for measurements consisted of 1no. Bruel & Kjaer 2260 sound level meter, which was calibrated before and after the survey, with no significant drift in sensitivity observed. The sound level meter and calibrator used on site had been calibrated to traceable standards and calibration certificates can be provided upon request.

At each position octave band and A-weighted fast response levels were recorded for a comprehensive suite of noise level metrics.

All readings were taken at a height of 1.5m above local ground level in free-field conditions.

Measurements were carried out by Gavin Stevenson MIOA.

3.3 Results

The background noise climate at the NSR properties was dominated by road traffic noise from the M56 motorway to the distant West of the site.

A summary of the measured results from the survey are presented in Table 1 below. Full measured results are available upon request.

Table 1: Summary of noise measurement results

Measurement Position	Start Time (hh:mm)	Duration (mm:ss)	L_{A90,5mins} Range (dB)	L_{Aeq,5mins} Range (dB)	L_{AFmax,5mins} Range (dB)
1	02:00	15:00	41 - 42	46 - 48	56 - 62
2	02:22	15:00	36 - 38	44 - 53	61 - 75

Figure 3: Approximate survey measurement positions



4 Assessment

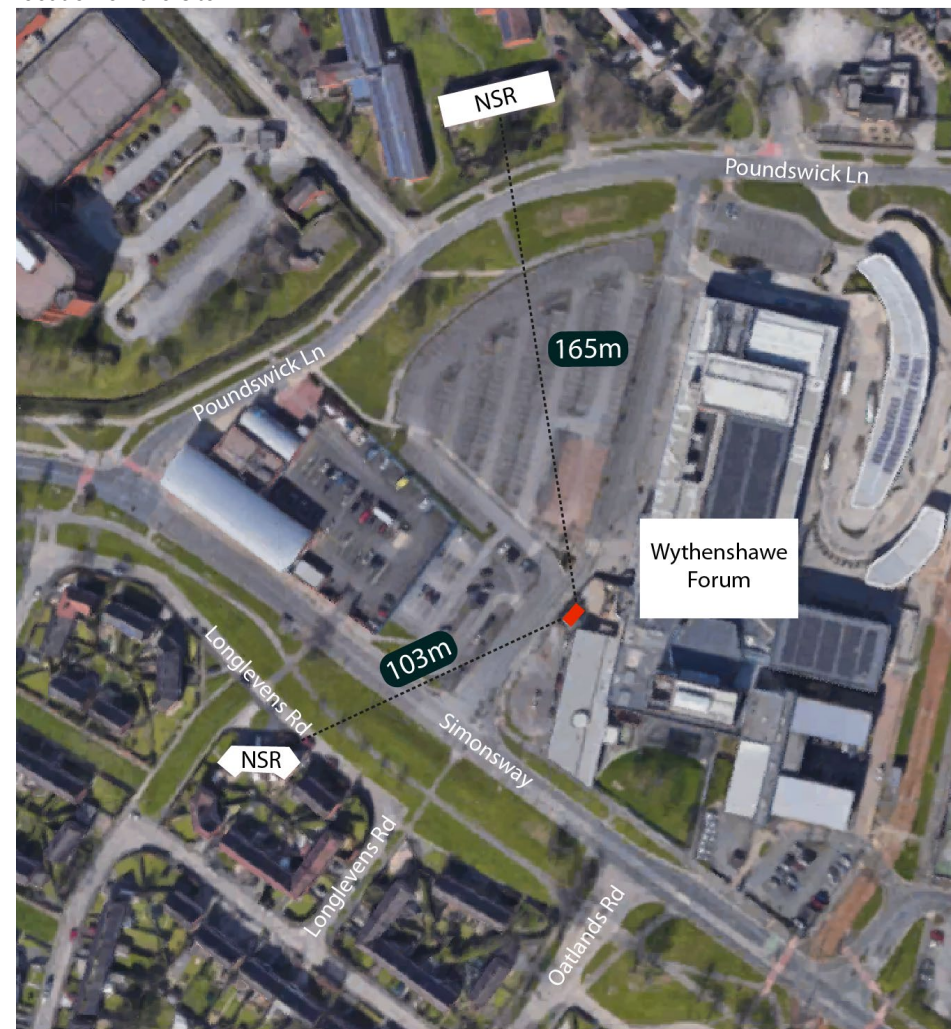
The following section provides an assessment of noise levels from the proposed ASHP unit at the nearest / most exposed NSR properties against proposed noise level criteria, based on LPA requirements.

4.1 Noise Sensitive Receptor (NSR) Properties

The nearest / most exposed NSR properties to the proposed equipment location at the site are identified to be:

- Residential properties on Poundswick Ln approximately 165 metres to the north-north-west of the ASHP unit location, as shown in Figure 4;
- Residential properties on Longlevens Rd approximately 103 metres to the south-west of the ASHP unit location, as shown in Figure 4.

Figure 4: Identified nearest / most exposed NSR property to the proposed new ASHP units' location on the site



4.2 Proposed Assessment Criteria

Local Planning Authority criteria relating to the proposed ASHP unit states that the following requirements must be achieved:

- “Externally mounted ancillary 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 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location”.

Based on the above requirements and guidance documents referenced in Section 2, proposed external noise limit criteria for noise from the proposed ASHP unit at the NSR properties identified in Section 4.1 are presented within Table 2.

4.3 Noise Level Assessment at NSR Properties

Manufacturer acoustic data, unit location details and attenuation measures for the proposed 1no. ASHP unit at the site have been provided to BDP Acoustics by Ameresco on 11/06/2021 and 18/06/2021, datasheet attached to this report. This information identifies that the proposed ASHP unit to be located at the site has a sound power level of 94 dBA.

This information identifies that the ASHP unit is proposed to be surrounded by acoustic barriers on all sides of the unit, and the barrier at the north-west side of the unit is to be lined with acoustic absorption material on the side facing the unit. Figure 5 and Figure 6 present excerpts from drawings provided to BDP Acoustics by Ameresco on 18/06/2021 detailing the locations and heights of the proposed ASHP unit and surrounding acoustic barriers.

Figure 5: Exert of drawing provided by Ameresco detailing the location of the proposed ASHP unit and surrounding acoustic barriers.

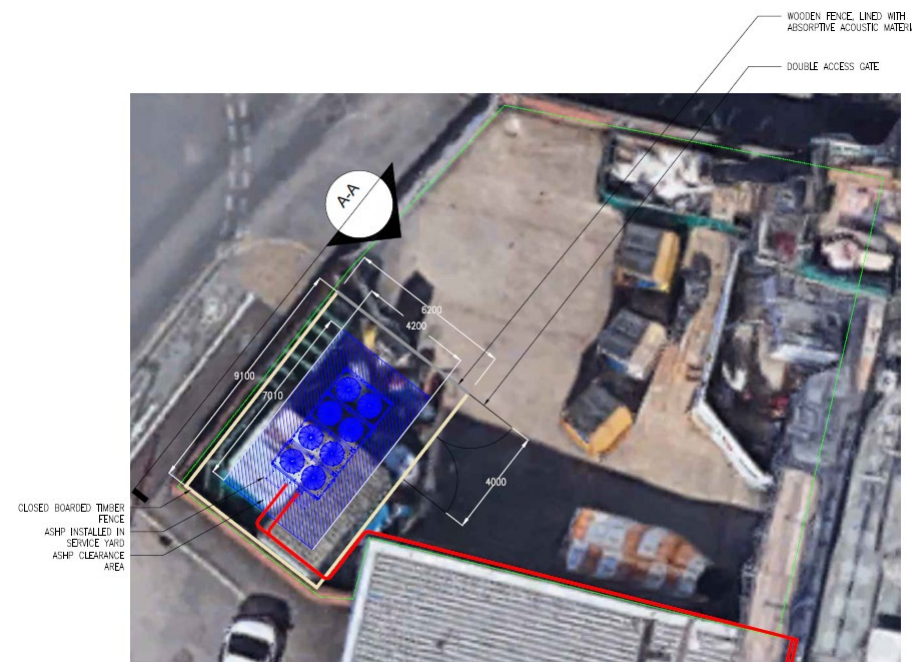
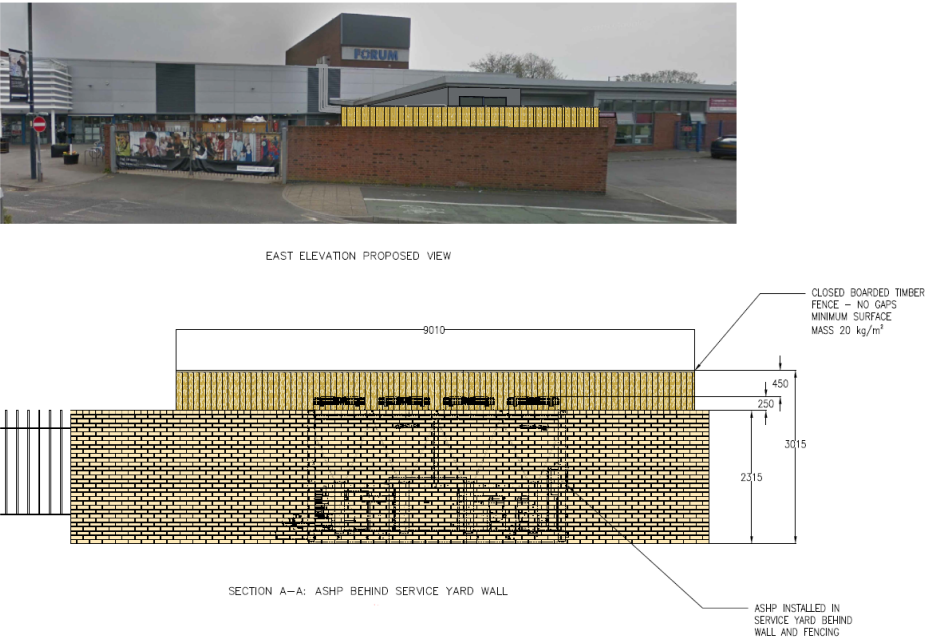


Figure 6: Exert of drawing provided by Ameresco detailing the location and height of the proposed ASHP unit and surrounding acoustic barriers.



In order to effectively attenuate noise emanating from the proposed ASHP unit, the acoustic barriers at the site must be of sufficient construction and height to “block” sound from the unit. In order to achieve this the proposed ASHP units must have minimum constructions as follows:

- “Close boarded timber fence” (indicated by a white line to the east, south and west of the unit in Figure 5): Close-boarded timber fence without gaps (or equivalent construction) with a minimum surface mass of 20 kg/m².
- “Wooden fence lined with absorptive acoustic material” (indicated by a grey line to the north of the unit within Figure 5): Should be a proprietary acoustic barrier

which includes acoustic absorption on the side facing the ASHP units, to stop sound reflecting off of this new barrier to the residential properties to the south. The barrier construction should be a close-boarded timber fence without gaps (or equivalent construction) with a minimum surface mass of 20 kg/m².

Based on the information provided, and the required barrier constructions detailed above, a BS4142 Rating Noise Level due to the proposed ASHP unit at each of the identified NSR properties has been calculated. These noise levels have been presented and compared against the proposed external noise limit criteria at each NSR property within Table 2.

Table 2: Comparison of the calculated BS4142 Rating Noise Level at the nearest / most exposed NSR properties due to the proposed ASHP unit against the proposed external noise limit criteria based on Local Planning Authority (LPA) requirements

Identified NSR properties	Lowest “worst-case” measured existing background noise level at NSR (dB L _{A90,5min})	Proposed external noise limit criteria at the NSR façade location for the proposed new ASHP unit (dB L _{A,r,T,r})	Calculated Rating Noise Level at the NSR façade location due to the proposed new ASHP unit (dB L _{A,r,T,r})	Difference between Rating Level and proposed external noise limit criteria at NSR
Residential properties on Poundswick Lane	41	36	30	-6
Residential properties on Longlevens Road	36	31	31	0

As can be seen from Table 2 above, the calculated Rating Noise Levels at the nearest / most exposed noise sensitive receptor properties due to the proposed plant equipment achieve the proposed noise level criteria at each property, when the proposed acoustic barriers are installed at the proposed locations and heights. This assessment therefore indicates that the proposals relating to the new plant equipment at the site will comply with

Local Planning Authority (LPA) requirements. Calculations indicated that the relevant criteria would not be achieved without the proposed barriers in place.

5 Summary

- BDP Acoustics has been commissioned by Ameresco to assess proposed noise levels emanating from new mechanical plant equipment (Air Source Heat Pump (ASHP) unit) being installed at Wythenshawe Forum to accompany the Planning submission for the project.
- Environmental noise measurements have been completed at the nearest / most exposed noise sensitive receptor properties to the proposed ASHP unit location during the night in order to encompass 'worst-case', i.e. quietest, night-time background noise levels for the purposes of determination of plant noise emission criteria, in line with LPA requirements.
- Manufacturer acoustic data, unit location details and proposed acoustic barrier details for the proposed 1no. ASHP unit at the site have been provided to BDP Acoustics by Ameresco on 11/06/2021 and 18/06/2021, and are presented in Section 4.3.
- Based on information provided to BDP Acoustics, and required barrier constructions detailed within Section 4.3, calculated noise levels at the nearest / most exposed noise sensitive receptor properties have been found to achieve the proposed external noise limit criteria for the project. This assessment therefore indicates that the proposals relating to the proposed new ASHP unit at the site will comply with Local Planning Authority (LPA) requirements, when acoustic barriers achieving the barrier requirements detailed in Section 4.3 are installed at the proposed locations and heights.

Appendix I – Glossary of Acoustic Terms

A-Weighting

Normal hearing covers the frequency range from approximately 20Hz to 20kHz but sensitivity is greatest between about 500Hz and 8kHz. The "A-Weighting" is an electronic filters network incorporated in sound level meters which approximately corresponds to the frequency response of the ear. The unit of measurement of A-weighted sound level is dBA or dB(A).

Break-in

Noise transmission into a structure from the outside.

Break-out

Noise transmission from inside a structure to the outside.

Decibel, dB

This is a relative unit of measurement which in acoustics is the unit to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). The dB is a logarithmic unit used to describe a ratio between the measured level and a reference or threshold level of 0dB (re. 20 micro-Pascals). We therefore use a logarithmic scale to describe sound pressure level, intensities and sound power levels. Subjectively, an increase of 10dB corresponds to a doubling in the perceived loudness of sound.

Equivalent Continuous Sound Level, L_{eq} or L_{Aeq}

The equivalent continuous sound level, L_{eq} is a notional sound level. It is the sound level, which, if maintained for a given length of time, would produce the same acoustic energy as a fluctuating noise over the same time period. (The formula for the above is implemented electronically in all good sound level meters and it is customary to measure rather than calculate the equivalent continuous sound level.) L_{Aeq} (A-weighted L_{eq}) is widely used to measure any environmental noise which varies considerably with time.

Free Field

A sound field region with no adjacent reflecting surfaces.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of approximately 20Hz to 20kHz, and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands (continuous range of frequencies between two limiting frequencies), and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it. (For instance the octave bands above and below the 500Hz octave band are 1kHz and 250Hz respectively). For finer analysis, each octave band may be split into three one-third octave bands or in some cases, fine frequency bands.

Rating Level, $L_{Ar,Tf}$

The specific sound level plus any adjustment for the characteristic features of the sound, as described in BS 4142:2014+A1:2019.

Sound Insulation

Airborne sound insulation refers to the process of separating, by a physical barrier, a space to be protected from a noise source or space containing a noise source.

Statistical Level: L_{90} or L_{A90}

Sound pressure level that is exceeded for 90% of the measurement time. Consequently it is indicative of the general background noise level in the absence of any higher level short duration events that occur during the period.

Statistical Level: $L_{\max,T}$ or $L_{A\max}$

A noise level index defined as the maximum RMS sound pressure level measured during the measurement period, T. $L_{\max}$ is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

Time Weighting

One of the standard averaging times (Fast (F), Slow (S)) used for the measurement of RMS sound pressure level in sound level meters, specified in BS 5969.

Z-Weighting

Z-weighting or "zero weighting" is where no frequency weighting has been applied to the measured values.



Air-Sourced Scroll Multi-pipe Units

CMAF 110 SE SN

Manufactured in: Charnes, France

Fully customized (non-standard) product

General Information

Refrigerant Type	R410A	Pdesign, h	387.5 kW
Ecodesign - $\eta_{s,c}$ (SEER)	183.2% (4.65)	Ecodesign - $\eta_{s,h}$ (SCOP)	146.0% (3.72)
Operation Temperature	Standard Cooling	Unit Application	Low Ambient
Fan Type	AC	Fan Speed Cooling/HP (RPM)	900/900
Number of Condenser Fans	8	Number of Refrigerant Ckts	2
Nr of Compressors Ckt1/Ckt2	2 / 2	Charge Ckt1/Ckt2	45 kg / 46 kg
Chilled Loop Hydraulic Module	Signal On/Off Pump	Hot Loop Pump Hydraulic Module	Signal On/Off Pump
Evaporator Buffer Tank	No Tank		

Cooling Only Performance

Gross Cooling Capacity	386.9 kW	Gross EER	2.99 kW/kW
Net Cooling Capacity	386.5 kW	Net EER	2.96 kW/kW
Evap Entering Temp	12.0 °C	Air Temperature	35.0°C
Evap Leaving Temp	7.0 °C	Evap Fouling Factor	0 m².K/W
Evap Flow Rate	18.4 L/s	Evap Fluid Type	Water
Evap Pressure Drop	40.4 kPa	Evap Fluid Concentration	0

Heat Pump Only Performance

Gross Heating Capacity	297.5 kW	Gross COP	2.55 kW/kW
Net Heating Capacity	297.8 kW	Net COP	2.54 kW/kW
Cond Entering Temp	40.0°C	Air Temperature (Dry / Wet)	-5.0°C / -6.0°C
Cond Leaving Temp	45.0 °C	Cond Fouling Factor	0 m².K/W
Cond Flow Rate	14.4 L/s	Cond Fluid Type	Water
Cond Pressure Drop	16.7 kPa	Cond Fluid Concentration	0

Heat Recovery Performance

Gross Cooling Capacity	399.0 kW	Gross Heating Capacity	504.0 kW
Net Cooling Capacity	398.5 kW	Net Heating Capacity	505.3 kW
Project TER	7.68 kW/kW	Eurovent TER	7.88 kW/kW
Evap Entering Temp	12.0 °C	HR Entering Temp	40.0 °C
Evap Leaving Temp	7.0 °C	HR Leaving Temp	45.0 °C
Evap Fluid Type	Water	HR Fluid Type	Water
Evap Fluid Concentration	0	HR Fluid Concentration	0
Evap Fouling Factor	0 m².K/W	HR Fouling Factor	0 m².K/W
Evap Flow Rate	19.0 L/s	HR Flow Rate	24.3 L/s
Evap Pressure Drop	42.6 kPa	Cond Pressure Drop	58.9 kPa

Electrical Information

Unit Voltage	400/50/3	Max. Unit Power Input	173 kW
Gross Unit Power - Cooling	129.4 kW	Max. Current	299 A
Gross Unit Power - Heating	116.7 kW	Max. Starting Current,	631 A
Gross Unit Power - HR	114.1 kW	Direct Start	

Physical Information

Length	4520 mm
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Width	2200 mm
Height	2530 mm
Cooling Sound Power	94 dB(A)
Cooling Sound Pressure @ 10m	62 dB(A)
Shipping Weight	3105 kg
Operating Weight	3295 kg



Disclaimer Notes:

The data provided is preliminary and subject to change.

Unit performances are without considering hydraulic modules/accessories.

Sound data is according ISO 9614:2009. Eurovent conditions, with 1pW reference sound power.

Project TER: Calculated at the project specific water temperature conditions.

Eurovent TER: Calculated at standard Eurovent conditions, being +/-7°C (chilled LWT) and +/-45°C (hot LWT) with water flow rates as determined at the standard rating conditions of EN14511-2.

Units operating with ambient air temperatures below +7°C, and high relative humidity, may be subject to ice formation and defrosting.

General Note:

During operation there is always a constant water flow on the hot water and chilled water loops.

The delta T varies based upon the heat transfer (return water temperature) of each operating mode with a fixed leaving water set point.

The CMAF controls on fixed leaving chilled/hot water temperature set points.