LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

# LSHTM

## Design and Access Statement

July 2024

NAPPER

RIBA Chartered Practice

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**UNG LSHTM**

241014-NAP-ZZ-XX-RP-A-00001_UNG-LSHTM-Design And Access Statement

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## Preamble

This Design and Access Statement has been prepared by Napper Architects on behalf of UNG/ London School of Hygiene and Tropical Medicine to support an application for full planning permission for the development of 3No. external condensing units and the corresponding infrastructure within the external yard area to the north east of the site.

# Contents

# 1

# Introduction

## 1.1 Introduction

This Design and Access Statement has been prepaired in support of an application for planning permission for 3No. condenser units and associated acoustic dampening measures to be installed externally within the north eastern area of the school site.

15-17 Tavistock Place is not included on any statutory lists, however, occupies a prominent central-northern position within the Bloomsbury Conservation Area.

The London School of Hygiene & Tropical Medicine (LSHTM) is a specialist postgraduate institution with a global goal of improving health and health equity.

The school has recently completed the development of a high-quality teaching and learning facility (TP2) at Tavistock Place, directly adjacent to and connecting to the existing school (TP1). TP1 has since started refurbishment works to meet both aspirations and expected standards within the school.

The proposed works are to become an integral part of an improved mechanical engineering strategy to cool the IT facility for both TP1 and TP2 of Tavistock Place.

3No. Outdoor condenser units will sit adjacent to the perimeter wall, while the corresponding infrastructure/pipework will run beneath the block pavers, under the ACO drain running parallel to the building's envelope and then vertically up the face of the building - entering the building around 1000mm high.

Whilst some drawings are included within this document for reference, all drawings which form the full application exist as stand alone documents and should be referred to accordingly for any aspects of the design.

# 2

## Location, Constraints, Context

## 2.1 Location, Constraints, Context

LSHTM is located at 15-17 Tavistock Place, Camden, London, WC1H 9SH. 15-17 Tavistock Place is approximately 0.6km from Kings Cross Station.

TP1 is an early 19th Century building with an extension added sometime during the 1960s. TP2 was completed in 2010 and wholely transformed the rear of the school as well as the teaching capabilities.

The building is sited centrally within the London Borough of Camden's Bloomsbury Conservation Area, however, the building itself is not listed.

The recently completed extension (TP2) is to the north of the site, bedded into an area between existing buildings. The siting of the extension maintains the traditional frontages to the area.

The external courtyard/access to the site is bordered to the north, north east and north west by a single story brick wall.

The proposed works area is shown in red on the below plan.

The site can be accessed by either Tavistock Place or Marchmont Street.

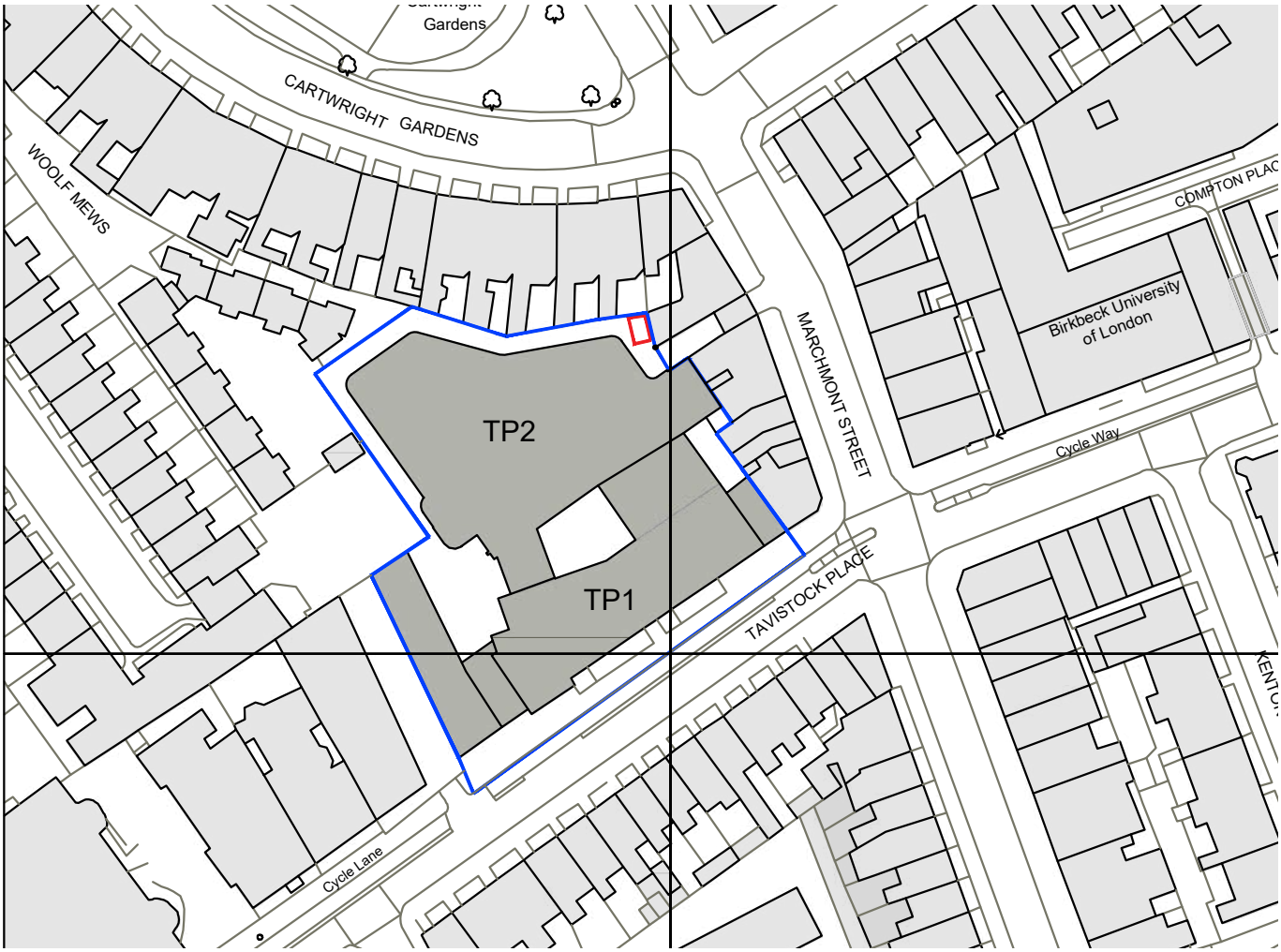



*Fig. 01: Site location and application boundary. Not to scale.*

## 2.2 Location


*Fig. 02: Google Earth imagery.*

## 2.3 Location


*Fig. 03: Google Earth imagery.*

## 2.4 Site Photographs

*Fig 04: Eastern view of external access area.*

*Fig 05: Proposed location of condenser units.*

*Fig. 06 View from eastern access to development.*

*Fig. 07: Access area in use.*

*Fig. 08 Standing seam cladding to be penetrated at ground floor ceiling level (internally).*

*Fig. 09: Bike storage along site boundary.*

## 2.5 Flood Risk

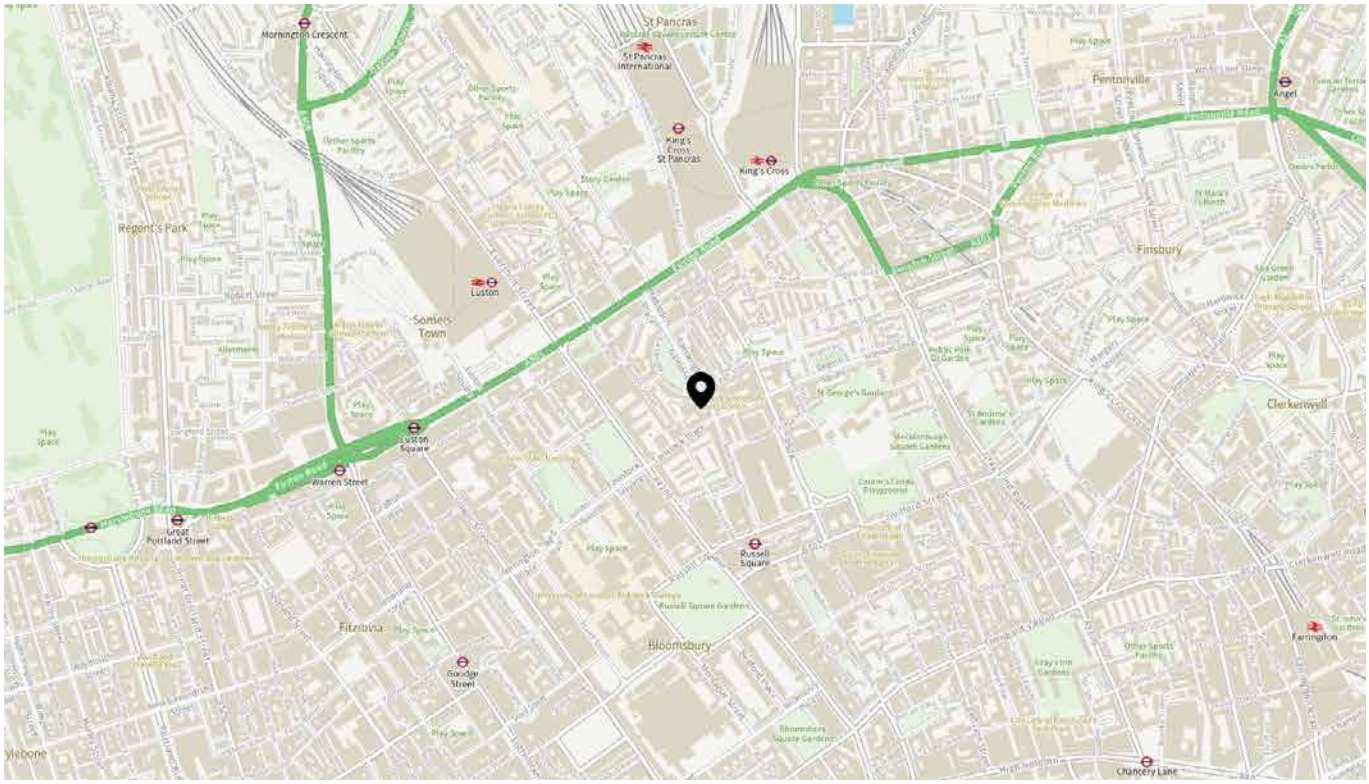



*Fig. 10: Flood risk (.gov.uk)*

As identified from the Environment Agency flood map from '.gov.uk', the site lies inside flood Zone 1 of the flood risk area - significantly distanced away from Zones 2 or 3.

The proposals do not create a significant increase in volume to the site, and therefore do not increase the flood risk.

## 2.6 Surface Water Risk

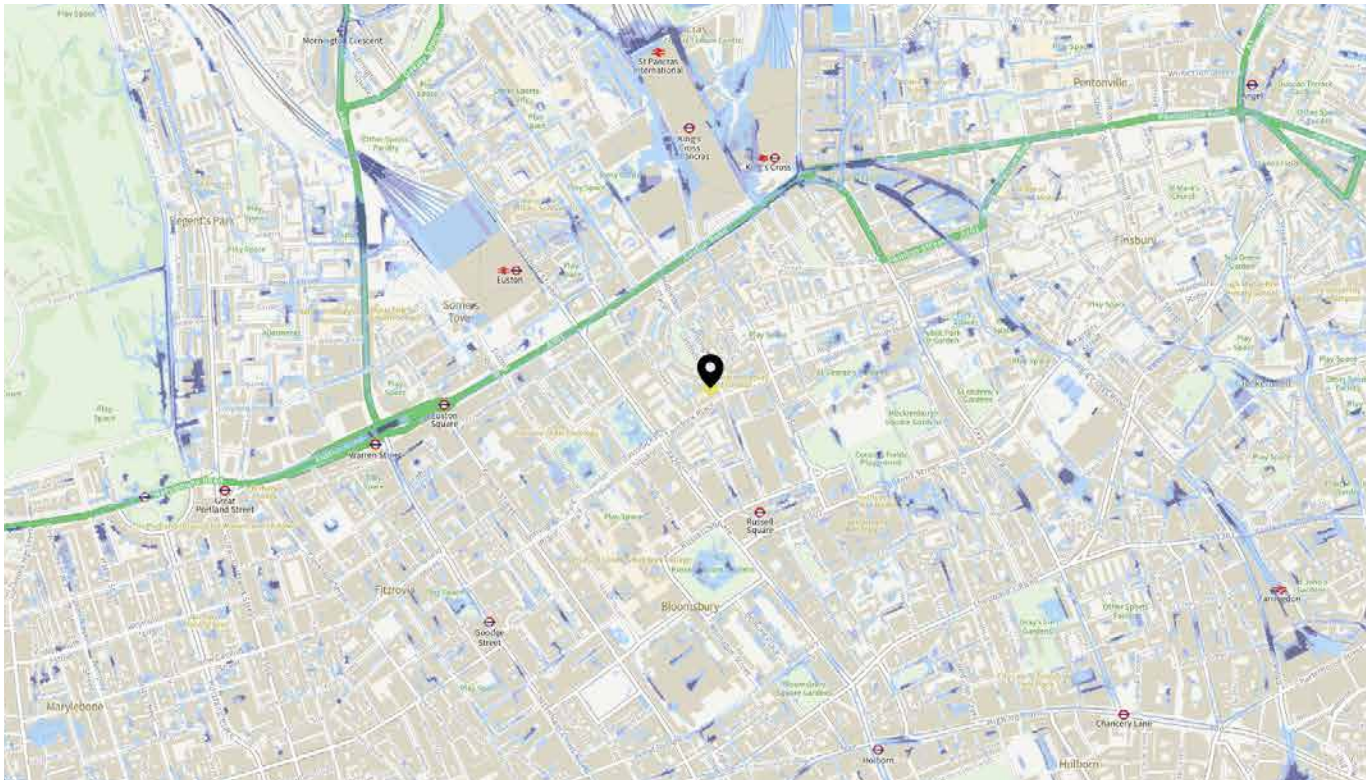



*Fig. 11: Surface water risk (.gov.uk)*

The surface water risk map (left) taken from the .gov website shows how minimal the risk of surface water flooding is to the site.

The proposed condensers and connecting infrastructure will add an insignificant amount of risk to the area.

# 3

# The Proposals

# 3.0 The Proposals

The proposals which form this submission build on the evolving client brief and the technical analysis noted in the sections below.

## 3.1 Amount

This planning application is for the provision of:

2 No. DMOUHM032 Condenser Units (see attached).
1 No. DMOUCD021 Condenser Unit (see attached).
2No. 10 Litre Dosing Pots.
1No. Acoustic, louvred lid.
2No. Acoustic panels, frame mounted and adjacent to neighbouring boundary walls.

Associated flow and return pipework transitting from condensers to IT/Data Centre area within basement of TP2 via underground ducting externally.

## 3.2 Layout

The 3 Condenser units are to be situated adjacent to one another, aligned parallel to the eastern boundary wall.

The 3 condenser units will be floor mounted on a 'Big Foot System' - an acoustic dampening frame system.

The condenser units will be sited in the access area/external courtyard and bike parking space, by the north eastern boundary of the site - nearby the eastern access gate, leading from Marchmont Street.

The acoustic panels to the rear of the condensers are to run parallel to the northern and eastern boundary walls. These panels will be fixed by a standalone frame with acoustic dampening feet (a secondary Big Foot Frame System). The acoustic louvred lid will also be fixed to the secondary frame.

The outdoor units require a clear minimum area of 1000mm between the unit and the rear acoustic panel (to allow for sufficient airflow).

## 3.3 Scale

The boundary walls adjacent to the units and running parallel to the perimeter of TP2 are at single storey height (to the north) and two storeys (east).

These are proprietary/bespoke units, sized for performance capacity; they are positioned to facilitate and directly cool new digital media apparatus.

2No. Condenser Units - 1274mm(w) x 880mm(d) x 1160mm(h).
1No. Condenser Unit - 973mm(w) x 506mm(d) x 901mm(h).

## 3.4 Appearance

All units and acoustic equipment to have a self finished powder coating. Units and equipment as technical drawings in planning application - refer to 6.2 and 6.3 Appendix.

The connecting pipework will not be visible horizontally as it will be concealed by paving externally and ceiling tiles internally.

## 3.5 Access

The plant installation requires only periodic maintenance, with full access required only during the installation period and for inspection of any damage or major technical faults that occur during operation. Direct access is possible via the service access pathway running round the building perimeter.

The access path around the perimeter of the building is not compromised by the position of the units, being located nearest to the gate. As the connecting pipework runs beneath the paving, no hazards will affect the movement of people/ cyclists.

1No. Sheffield cycle stand will be relocated.

## 3.1 Ground Floor Plan

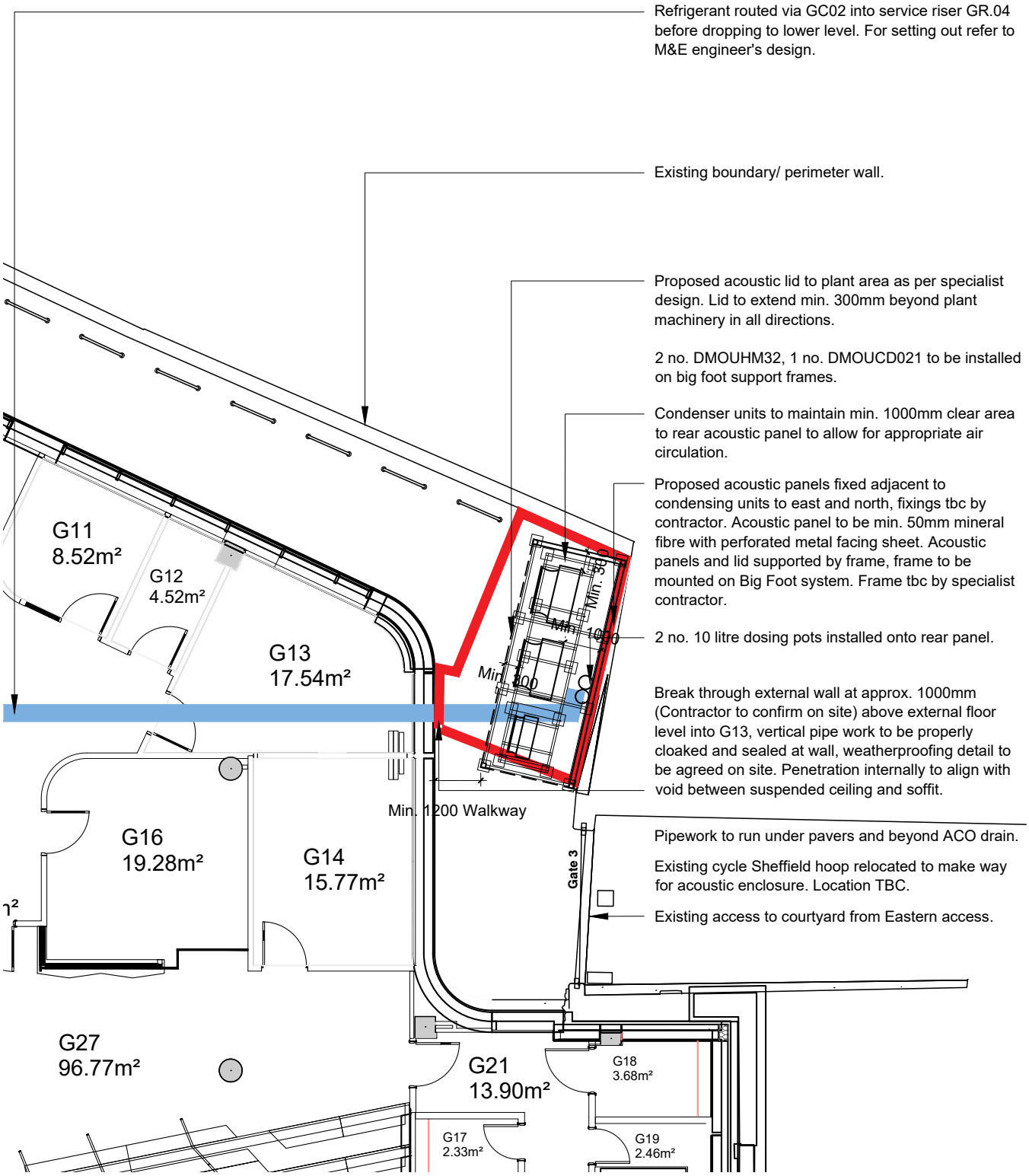



*Fig. 12: Ground floor plan (not to scale) showing the external access/courtyard area in which the condensers are proposed.*

## 3.2 Proposed Elevations

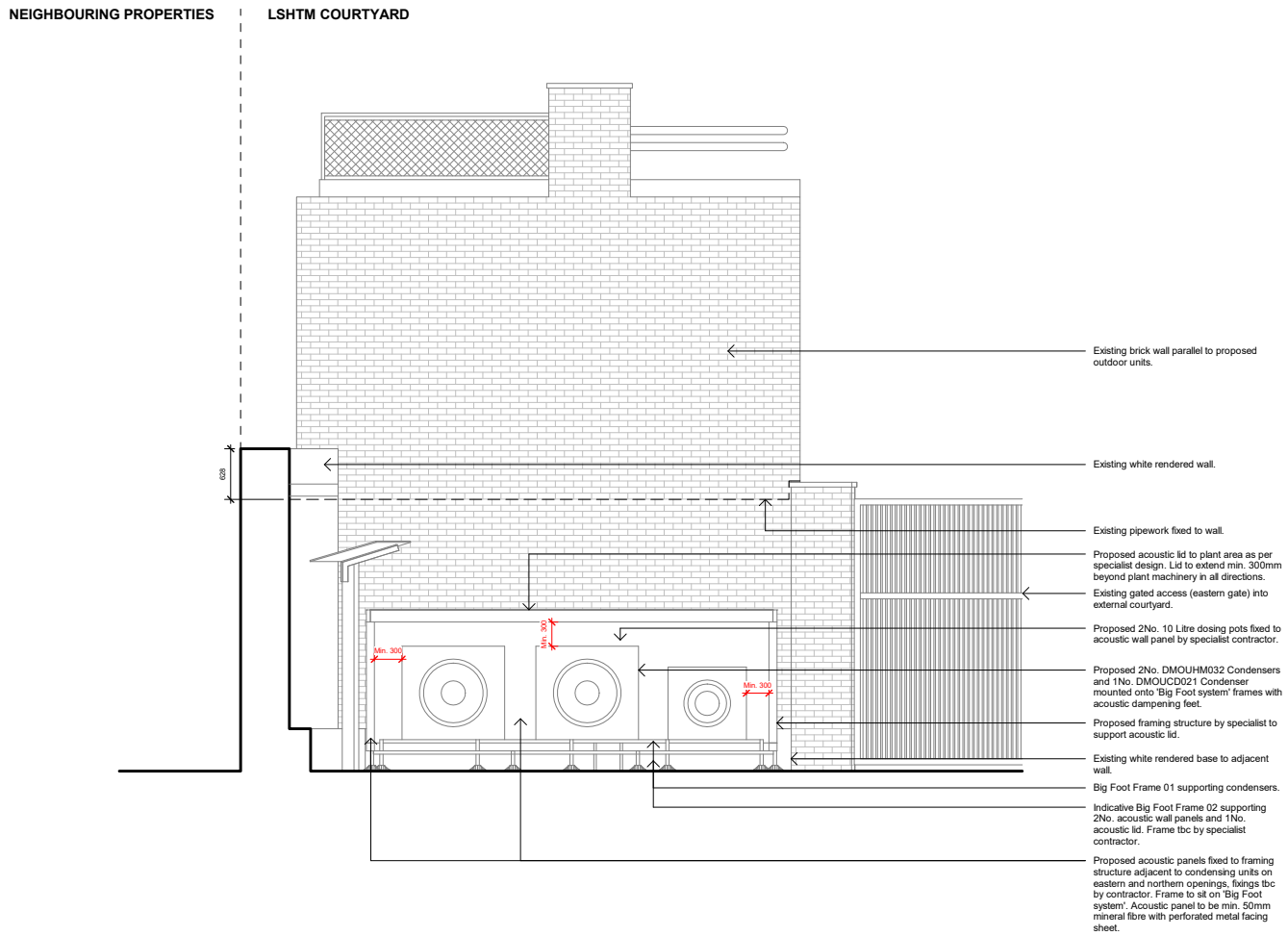



*Fig. 13: Elevation (not to scale) looking east and the perimeter wall, the condensers neatly stacked ahead of it.*

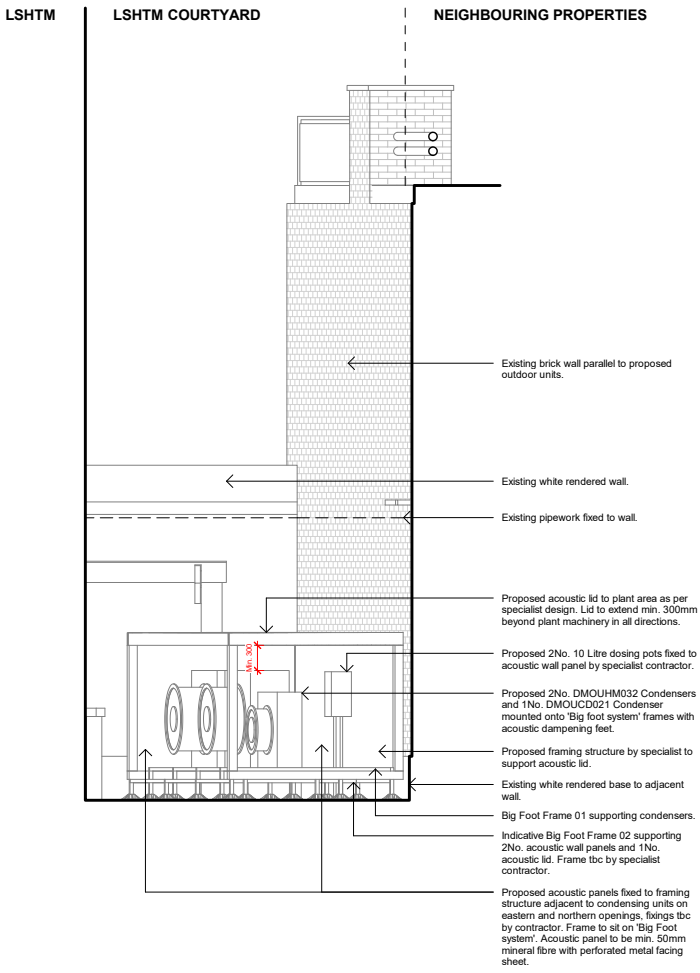



*Fig. 14: Elevation (not to scale) looking northwards from the eastern access/entrance toward the perimeter wall.*

## 3.3 Proposed Visual 01

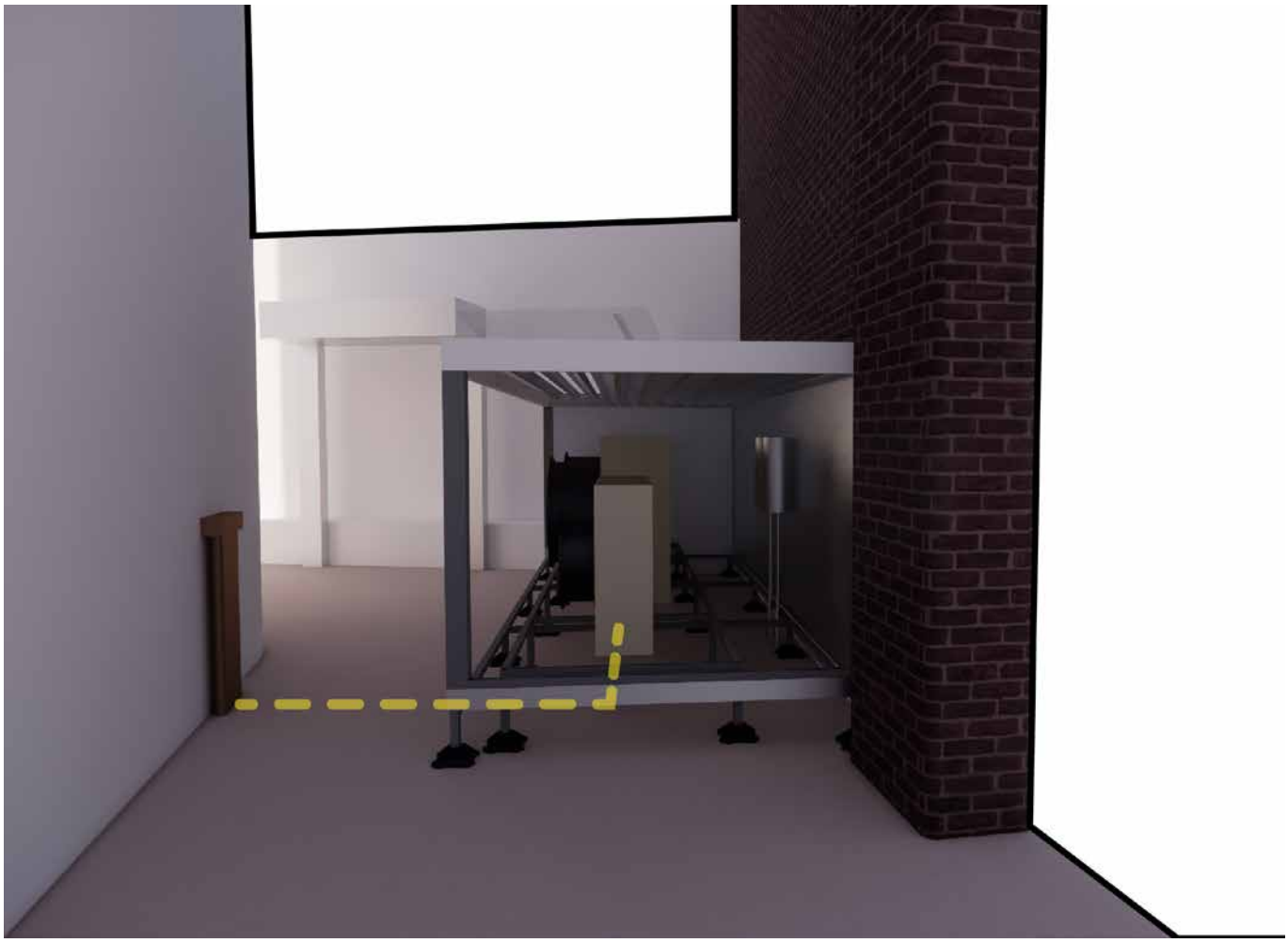


*Fig. 15: Visual of the access yard and the placement of the condensers. The dashed yellow line denotes the path of the pipework beneath the paving.*

## 3.4 Proposed Visual 02

*Fig. 16: Visual of the access yard and the placement of the condensers. The dashed yellow line denotes the path of the pipework beneath the paving.*

# 4

## Assessment Of The Proposals

## 4.1 Assessment Of The Proposals

### A. Site Analysis

The service access route is used predominantly for cycle storage, therefore, the site at the end of the access road (nearest the gate) minimises obstruction. Placement along the boundary wall, in a relatively quiet region of the perimeter access, and close to the IT room allowing for the shortest run of pipework.

### B. Context Analysis

The existing nature of the area externally to the building and the chosen siting limits obstruction. Please see the corresponding Noise Impact Assessment (A2149 R01 LSHTM TP2 Data Centre Plant Noise Assessment) for a complete assessment of the scheme.

### C. Planning Policy Context

Refer to section 5.0.

### D. Movement

No existing access arrangements to neighbouring properties or to the school are compromised by the proposal. The positioning away from the boundary wall allows for sufficient air movement.

### E. Amount

The number and size of the 3No. condensers are a sympton of the IT requirements of the building; the condenser requirements are then calculated from this.

### F. Layout

The location of the condenser units limits any views by neighbouring properties nor most of the users of the school. The units are laid out to create nominal impact to users of the access route.

### G. Scale

The scale of the proposal in comparison to the surrounding built environment is insignificant.

### H. Appearance

See item 3.4.

### I. Access

See item 3.5.

### J. Landscaping

Pavers will be removed to complete the works, being restored and relaid upon completion of the works.

### K. Community Safety

The area is covered by CCTV and while it sits at the end of a corridor, surveillance is provided. The condenser units will not affect community safety.

### L. Environmental Sustainability

The proposed condenser units provide a sustainable and essential means of cooling the IT facilities.

### M. Flood Risk

See item 2.5.

# 5

# Conclusion

## 5.1 Conclusion

The proposals would be an appropriate use of space and technology, providing an efficient and sustainable cooling method to the IT room - an essential room in the running of the school.

The impact of the condenser units will be negligible to both users of the school and neighbouring properties.

The scale and location of the units will have minimal effect on the service zone.

The Noise Impact Assessment completed by the acoustic engineers confirm the scheme and added acoustic measures do not breach the noise threshold required by Camden Council.

# 6.0 Appendix

## 6.1 Drawings

Refer to the following drawings for details:

241014-NAP-ZZ-XX-DR-A-00001-P1_Location Plan

241014-NAP-ZZ-XX-DR-A-00002-P1_Site Plan

241014-NAP-ZZ-00-DR-A-01000-P2_Proposed Ground Floor Plan

241014-NAP-ZZ-B1-DR-A-01001-P1_Proposed Basement Floor Plan

241014-NAP-ZZ-XX-DR-A-02000-P2_Proposed Elevations

241014-NAP-ZZ-00-DR-A-81000-P1_Existing Ground Floor Plan

241014-NAP-ZZ-B1-DR-A-81001-P1_Ground Floor Plan

## 6.2 Cooling System Data Sheets

**ESTIMATED ANNUAL PUE**

UNG for Data Centres

**The following cooling systems have been selected;**

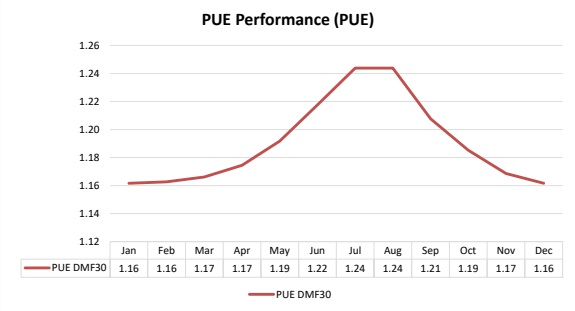
- 2Nr. Denco Combicool DMF030s
- 1Nr. Denco DX CRAC DMA018 (+1 module)

The cooling systems proposed are dual cool systems which include for a chilled water circuit operating in an N+1 configuration. Thes systems have a chilled water and glycol mixed cooling circuit which provides indirect free cooling benefit when ambient temperature allows.

Free cooling coils are provided to reduce the energy consumption by reducing the requirement for compressors during cooler ambient conditions. The system will continuously monitor the external ambient conditions to check if free cooling is feasible and be optimised to minimise the overall power consumption of the system.

The below graph is the estimated monthly PUE over 1-year profile based on the weather profile within the region of London.

Average Annualised rPUE – 1.19




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PUE DMF30 | 1.16 | 1.16 | 1.17 | 1.17 | 1.19 | 1.22 | 1.24 | 1.24 | 1.21 | 1.19 | 1.17 | 1.16 |

**UNG Data Centres is a trading division of Upnorth Engineering Services Ltd**
T: 0191 414 2882| E: info@upnorthgroup.com | www.upnorthgroup.com
Merlin House, Princesway, Princes Park, Team Valley Trading Estate, Gateshead, Tyne & Wear, NE11 0NF

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**Project:** LSHTM London
**Quotation :** SQ-1130267

**1 DMF030DLCIN4PN1 2 Pcs**

**MULTI-DENCO®**
Direct expansion air-cooled unit combined an energy efficient FreeCool circuit inside of a single unit. The compressors for the direct expansion circuit are installed in the indoor unit. Both the direct expansion and FreeCool circuits are matched to a single hybrid condenser / drycooler.

**DOWNFLOW UNIT**
Top air inlet and front low-level door mounted steel discharge grille(s) with vertical blades.

**G4 FILTER**
Disposable pleated panel filter made of synthetic fleece with moisture-resistant cardboard frame.
Efficiency rating G4 on cooling-coil air inlet.
ISO 16890: Coarse 65%
Filter condition is monitored by an adjustable differential-pressure switch to generate dirty-filter maintenance alarm.

**FAN**
Direct-driven variable-speed high efficiency EC Plug fan with 7 backward curved three dimensional profiled blades made of high-performance composite material.
Motor efficiency class in accordance with IE4.
Fan impellers are balanced in accordance with DIN ISO 21940-11, balance quality grade G6,3 or better.
No additional anti-vibration features are used for mounting the fan.
Minimum and maximum air volumes to be set during commissioning.
In the event of fan failure all other unit functions are disabled.

Fan speed modulates on temperature.

**AIR-VOLUME FLOW MONITORING**
Measurement of air volume with fan inlet ring pressure tappings connected to a pressure sensor.
Live air-volume flow reading on the unit display.

**REFRIGERATION CIRCUIT**
Internal refrigeration pipework complete with liquid line shut-off ball valve with Schrader, filter drier, electronic expansion valve with sight glass and filter, Schrader charging valve.
Suction and hot-gas line insulated and vapor sealed.
Electronic expansion valve closes on mains failure.
High-pressure safety switch with manual reset.
The refrigerant circuit can operate in partial load along with the FreeCool circuit or it can provide 100% redundancy backup in case of failure or high ambient temperatures.
Front Schrader, hot-gas, suction and liquid line service connections.
Pipework suitable for brazed connections.
Pipework terminated at the bottom of the unit.

**COMPRESSORS**
Variable-speed high efficiency fully hermetic discharge gas cooled scroll compressor operating on R410A.
High-efficiency, permanent-magnet, brushless DC motor.Periodical oil-reclaim cycle.
Speed controlled on cooling demand, with operational thresholds to avoid coil freeze up and high-pressure trip.
Neoprene anti-vibration mounts.
Motor protected against overcurrent and thermal overload.
Suction and discharge line shut-off ball valves with Schrader for compressor isolation.

**EVAPORATOR**
Inclined high-performance coil with rippled aluminium fins spaced at 1.8mm.
Internally-grooved copper tubes 3 rows deep.
Aluminium intermediate drip tray to avoid droplet break-off.
Stainless-steel condensate drain tray with U trap.



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**Project:** LSHTM London
**Quotation :** SQ-1130267

Pipework terminated at the bottom of the unit.

**FREECOOL COOLING COIL(S)**
Inclined high-performance cooling coil with rippled aluminum fins spaced at 1.8mm.
Smooth-bore copper tubes 3 rows deep.
Aluminium intermediate drip tray to avoid droplet break-off.
Stainless-steel condensate drain tray with U trap.

**INTEGRATED FREECOOL EC WATER PUMP**
A compact, wet-rotor variable speed, scroll type pump body, EC water pump to operate the indirect FreeCool circuit, positioned inside the Multi-DENCO indoor unit.
Pre-configured at dispatch from the factory, the pump is controlled by the unit's microprocessor through 0-10V control to provide freecooling based on the unit's demand, reducing operating time of the direct expansion circuit and reducing energy consumption. The pump can circulate water or water glycol.
The compact pump includes an inbuilt control panel with OLED display and can be adjusted and configured with inbuilt buttons.

**EXPANSION VESSEL**
High strength steel shell with a replaceable EPDM rubber membrane with a long service life.

**CASING**
Anodized-aluminum profile frame.
Color Black RAL 9005.
Additional black steel base
Front service access doors with key-entry locks and easily removable doors without tools.
Flat flush-fitting rear and side panels.
Pre coated scratch and dirt resistant steel doors and panels. Lined with 15 mm thick, non-eroding, non-combustible insulation with thermal and acoustic properties.
Hot-dip galvanized internal panels and sheet metal components.
Panel color white RAL 9010.

**SWITCH CABINET**
Integral switch cabinet wired in accordance with EN60204 complete with the following components:
- Circuit breakers to protect individual components
- Contactors
- Color-coded and numbered cabling
- Transformer and control-circuit fuse
- Volt-free critical and maintenance alarm terminals
- 24V AC fire shutdown terminals, switched remotely, closed for unit run
- Volt-free run indication
- Circuit breaker and connectors for the power supply of condensate pump and air damper
- Front-door interlocked incoming mains isolator with supply terminals

**AIR SENSORS**
Return-air temperature and humidity plus supply-air temperature with 10m lead for remote mounting.

**WATER-LEAK DETECTION**
1 spot sensor to be installed below unit plus condensate tray high-level sensor.

**ENERGY MONITORING**
Power meter with current transformer for each phase with the controller monitoring voltage, current, power and energy consumed.

**ELECTRONIC CONTROLS**
Type C5-12
Main control functions:
- Temperature return or supply air °C
- Return-air humidity %RH or moisture content g/kg

- Optimization of fan speed
- Optimization of compressor operating conditions
- Optimization of humidifier output
- Auto restart after power failure

Monitoring of all digital and analogue inputs and outputs including:
- Fan speed
- Low and high-side compressor operating pressures
- Suction and discharge compressor temperatures.

Alarms:
- High and low temperature
- High and low humidity or moisture content
- Airflow failure, filter blocked, refrigeration system fault
- Humidifier fault, electric heating fault, DencoNet communication and sensor failure.

Networking:
Up to 15 units can be networked using a 2 core 22AWG stranded twisted pair screened cable (e.g. Belden 8761) in a serial configuration to allow:
- Sensor averaging
- Auto change over

**TOUCH SCREEN DISPLAY**
4.3" color touch screen display facial mounted on unit front door. 3 levels of password protection.
Plots:
- Temperature °C
- Humidity %RH

Features:
- Multi-lingual (English, German, Polish, Russian, French, Thai, Romanian, Chinese, Dutch)
- Alarms are displayed in plain text
- Saving and loading of commissioning settings
- Refrigerant pressure gauges
- Refrigeration circuit monitoring

**INTERFACE**
- Inbuilt Modbus (RS485) connectivity
- BACnet I/P, SNMP, Webpage interface and e-mail alarm facility. Ethernet interface plug in card (pCOWeb)

**CONDENSER FAN SPEED CONTROL**
0 to 10 volt control signal from the controller in air handling unit plus terminals for condenser wiring.

**GENERAL**
The air handling unit is CE marked according Machinery-, LV- EMC- and the Pressure equipment directive.
Documentation including the operating manual is supplied with the unit.

**PACKAGING**
Air handling unit screwed to a pallet, enveloped in cardboard with edge protection in a timber crate.

**Technical Data**

| | | |
|---|---|---|
| **Selection** | | |
| Gross total capacity | kW | 26.8 |
| Gross sensible capacity | kW | 26.8 |
| Net total capacity | kW | 26.0 |
| Net sensible capacity | kW | 26.0 |





| | | |
|---|---|---|
| Dehumidification capacity | kW | 0.0 |
| Sensible heat ratio | | 1.00 |
| Heat of rejection | kW | 35.5 |
| EER efficiency ratio | | 2.55 |
| **Air quality** | | |
| Air inlet temperature | °C | 33.0 |
| Air inlet relative humidity | % | 30 |
| Air inlet absolute humidity | g/kg | 9.4 |
| Air outlet temperature | °C | 21.0 |
| Air outlet absolute humidity | g/kg | 9.4 |
| **General** | | |
| Air path | | Downflow (bottom discharge) |
| **Filter** | | |
| Filter type | | Filter G4 |
| **Fan** | | |
| Type | | EC plug fan |
| Air volume flow | $m^3/s$ | 1.80 |
| External static pressure | Pa | 50 |
| Fan motor exhaust heat | kW | 0.8 |
| Fan Speed | 1/min | 982 |
| Control voltage | V | 6.3 |
| Power consumption | kW | 0.8 |
| Current consumption | A | 1.4 |
| Current consumption max. | A | 5.4 |
| **Refrigerating circuit** | | |
| Refrigerant type | | R410A |





| | | |
|---|---|---|
| Number of compressors per refrigerating circuit | | 1 |
| Refrigerating circuits | | 1 |
| Condensing temperature on dew point | °C | 62.2 |
| Pressure Equipment Directive | | CAT I |
| **Compressor** | | |
| Configuration | | Inverter |
| Power consumption | kW | 9.1 |
| Current consumption | A | 18.5 |
| Current consumption max. | A | 22.5 |
| **FreeCool** | | |
| Operation Mode | | DX Only |
| FreeCool Capacity | kW | 0.00 |
| **Pump** | | |
| Current consumption max. | A | 2.9 |
| **Electric** | | |
| Power supply | | 3~400V, N, PE, 50Hz |
| Power consumption cooling mode | kW | 10.5 |
| Current consumption cooling mode | A | 20.9 |
| Current consumption max. | A | 32.8 |
| Recommended type D circuit breaker rating | A | 40 |
| **Connections** | | |
| Refrigerant | | |
| Type | | Solder connections |
| Discharge line | " | 5/8 |
| Liquid line | " | 5/8 |
| FreeCool | | |





| | | |
|---|---|---|
| Type | | Threaded pipework connections (BSPT) |
| Water inlet | " | 1 1/4 |
| Water outlet | " | 1 1/4 |
| Miscellaneous | | |
| Water drain | mm | 22 |
| **Dimensions and weight** | | |
| Length | mm | 1180 |
| Width | mm | 780 |
| Height | mm | 1940 |
| Weight | kg | 380 |
| **Sound Data** | | |
| Sound pressure level free field | dB(A) | 60 |
| Sound pressure level distance | m | 2.0 |
| Sound power level | dB(A) | 80 |
| NR curve | | 54 |

**Product of FläktGroup**
Type DMF030DLCIN4PN1

## 2 DMOUHM032E1N1NNNREC1ONN 2 Pcs

**HYBRID HEAT REJECTION (HHR) UNIT**

**GENERAL**
Engineered for outdoor installation with Aluzinc frame and panels.
Installation feet can mounted on site for vertical or horizontal unit configuration.

**HYBRID CONDENSER / DRYCOOLER**
Condenser: 3-row heat exchanger with internally-grooved tubes and aluminium fins spaced at 1.8mm.
Drycooler: 5-row heat exchanger with internally-smooth tubes and aluminium fins spaced at 1.8mm.
Copper header plus copper inlet and outlet pipe stubs for site connection.
Supplied with a dry nitrogen holding charge.

**FANS**

Low-noise direct drive axial fans with 7 composite aerofoil owl wing profiled blades, high-performance composite material, statically and dynamically balanced that draw air through the coil.
Highly efficient EC permanent magnet variable-speed motor supported on a protection grille. Protection IP54.
Motor protection with LED fault code indication.
Motor efficiency class according IE4.

**SERVICE SWITCH**
Side-mounted weather proof service switch in interlocked enclosure.
3-phase and earth terminals are fed from a circuit breaker in the air handling unit.

**CONTROL**
Side-mounted weatherproof terminal box.
0 to 10 Volt control is fed from terminals in the air handling unit.

**AMBIENT STAT**
An ambient sensor (provided loose) to enable control of the FreeCool circuit to be available / unavailable.

**PACKAGING**
Air handling unit screwed to a pallet, enveloped in cardboard with edge protection in a timber crate.

**Technical data outdoor unit**

| | | |
|---|---|---|
| **Selection** | | |
| Heat of rejection per unit | kW | 35.5 |
| Ambient temperature | °C | 45.0 |
| Condensing temperature on dew point | °C | 62.2 |
| Refrigerant type | | R410A |
| Unit cooling medium volume | l | 13 |
| **Fan** | | |
| Type | | EC fan |
| Air volume flow | $m^3/s$ | 2.70 |
| Speed | 1/min | 1004 |
| Control voltage | V | 8.4 |
| Power consumption | kW | 0.6 |
| Current consumption | A | 1.0 |
| Current consumption max. | A | 2.0 |
| **Electric** | | |
| Power consumption | kW | 0.6 |
| Current consumption | A | 1.0 |
| Current consumption max. | A | 2.0 |
| Power supply | | 3~400V, N, PE, 50Hz |
| **Connections** | | |
| Discharge line | " | 1 1/8 |
| Liquid line | " | 1 1/8 |
| Water inlet | mm | 35 |
| Water outlet | mm | 35 |

| **Dimensions and weight** | | **Vertical** | **Horizontal** |
|---|---|---|---|
| Length | mm | 1469 | 1469 |
| Width | mm | 1239 | 1210 |
| Height | mm | 1568 | 1200 |
| Weight | kg | 173 | 162 |
| **Sound Data** | | | |
| Sound pressure level free field | dB(A) | 52 | |
| Sound pressure level distance | m | 5.0 | |
| Sound power level | dB(A) | 75 | |

**Product of FläktGroup**
Type DMOUHM032E1N1NNNREC1ONN

## 3 DMAC030AMB 2 pcs

**FREECOOL AMBIENT SENSOR**

**FREECOOL AMBIENT SENSOR**
An ambient sensor (provided loose) to enable control of the FreeCool circuit to be available / unavailable. This sensor should be installed on, or near, the outdoor unit without being in direct sunlight. The sensor must be wired back to the indoor unit to enable proper function.
A connection to the sensor should be made with a multicore cable with an external sheathing of 8mm max. to maintain the IP65 degree of protection.
Interconnecting wiring between the indoor and outdoor unit should be made using a Belden 8761 cable or equivalent.

**Product of FläktGroup**
Type DMAC030AMB





## 4 DMAC030DAM 2 pcs

**SHUT-OFF DAMPER**

**SHUT-OFF DAMPER**
Galvanized opposed-blade damper with 24V motor open spring-return actuator.
For upflow units it is recommended that a 250mm high discharge plenum (not supplied) is installed between the top of the unit and the shut-off damper.

**Product of FläktGroup**
Type DMAC030DAM

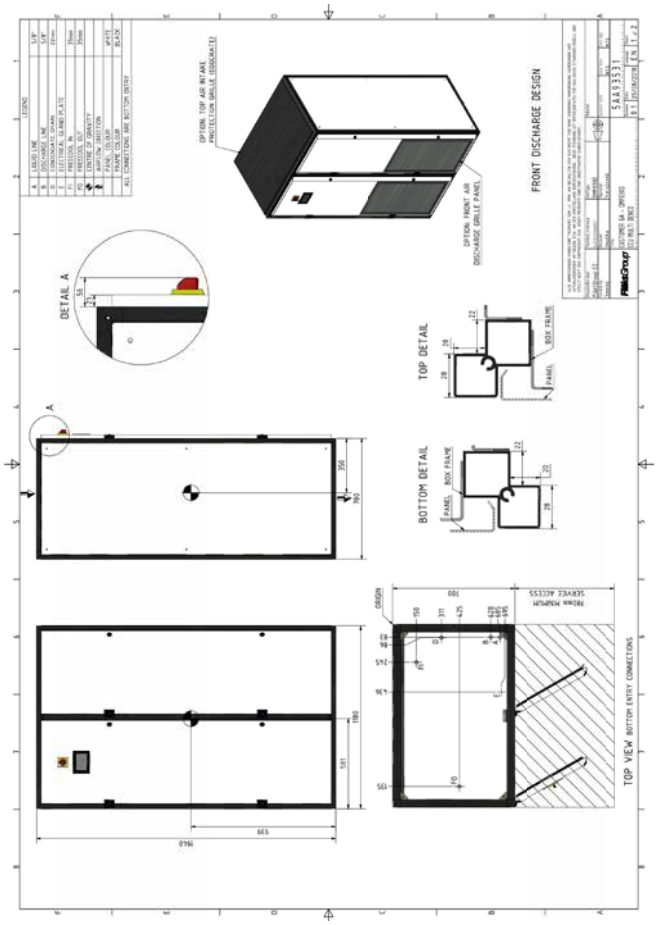
## 5 DMAC030PLI 2 pcs

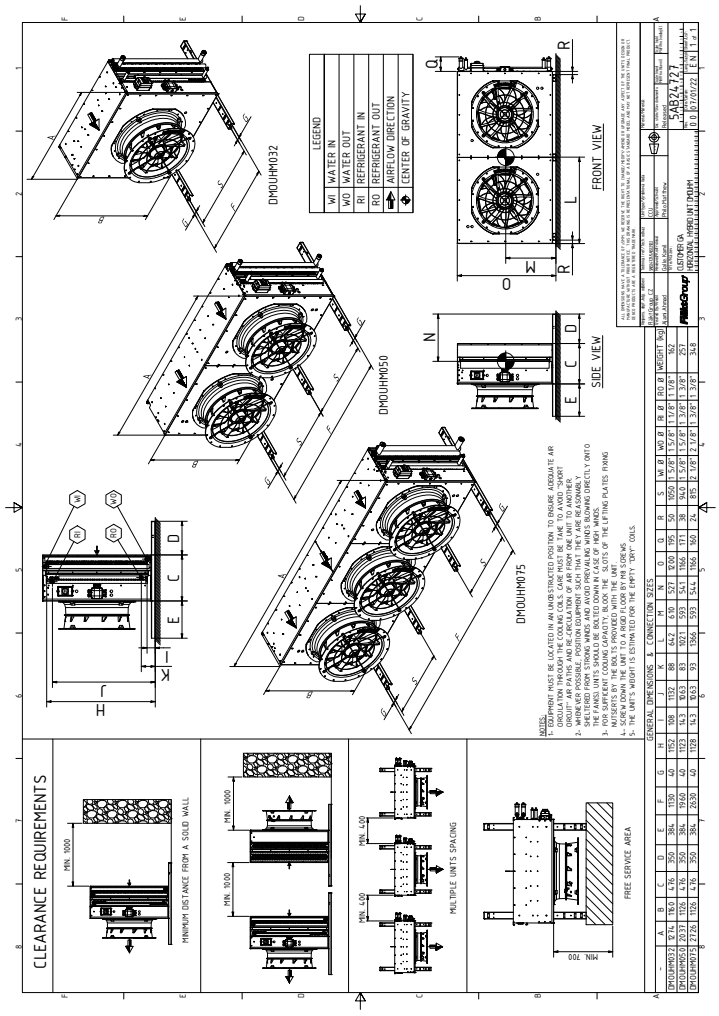
**BASE PLINTH**

**BASE PLINTH**
Unit matching plinth with removable access panels and 3-mm thick gasket, for services entry into unit. Height 200mm.

**Product of FläktGroup**
Type DMAC030PLI










## 1 DMA018DLSIS4PE1 1 Pcs

**MULTI-DENCO®**
Direct expansion air-cooled air handling unit version A with internal compressor(s) matched with external air-cooled condenser.

**DOWNFLOW UNIT**
Top air inlet and front low-level door mounted steel discharge grille(s) with vertical blades.

**G4 FILTER**
Disposable pleated panel filter made of synthetic fleece with moisture-resistant cardboard frame.
Efficiency rating G4 on cooling-coil air inlet.
ISO 16890: Coarse 65%
Filter condition is monitored by an adjustable differential-pressure switch to generate dirty-filter maintenance alarm.

**FAN**
Direct-driven variable-speed high efficiency EC Plug fan with 7 backward curved three dimensional profiled blades made of high-performance composite material.
Motor efficiency class in accordance with IE4.
Fan impellers are balanced in accordance with DIN ISO 21940-11, balance quality grade G6,3 or better.
No additional anti-vibration features are used for mounting the fan.
Minimum and maximum air volumes to be set during commissioning.
In the event of fan failure all other unit functions are disabled.

Fan speed modulates on temperature.

**AIR-VOLUME FLOW MONITORING**
Measurement of air volume with fan inlet ring pressure tappings connected to a pressure sensor.
Live air-volume flow reading on the unit display.

**REFRIGERATION CIRCUIT**
Internal refrigeration pipework complete with liquid line shut-off ball valve with Schrader, filter drier, electronic expansion valve with sight glass and filter, Schrader charging valve.
Suction and hot-gas line insulated and vapor sealed.
Electronic expansion valve closes on mains failure.
High-pressure safety switch with manual reset.
Front Schrader, hot-gas, suction and liquid line service connections.
Pipework suitable for brazed connections.
Pipework terminated at the bottom of the unit.

**COMPRESSOR**
Variable-speed high efficiency fully hermetic discharge gas cooled scroll compressor operating on R410A.
High-efficiency, permanent-magnet, brushless DC motor.
Periodical oil-reclaim cycle.
Inverter-speed control with EMC filter with 20 rps minimum turn down.
Speed controlled on cooling demand, with operational thresholds to avoid coil freeze up and high-pressure trip.
Neoprene anti-vibration mounts.
Motor protected against overcurrent and thermal overload.

**EVAPORATOR**
Inclined high-performance coil with rippled aluminium fins spaced at 1.8mm.
Internally-grooved copper tubes 4 rows deep.
Aluminium intermediate drip tray to avoid droplet break-off.
Stainless-steel condensate drain tray with U trap.
Pipework terminated at the bottom of the unit.





**ELECTRICAL HEATER**
3-phase staged heater bank (1 phase on size 010).
Stainless-steel hairpin elements and fins operating at low-surface temperature.
Overheat protection thermostat (Klixon).

**IMMERSED ELECTRODE STEAM HUMIDIFIER**
The humidifier is designed for connection to a common cold mains water supply at a pressure of between 1 and 10 bar.
Sterile, odourless, and mineral deposit free steam is generated in a plastic cylinder.
Highly efficient grid electrodes ensure extended service life.
Auto-adaptive drain cycle for long service life.
Continuous proportional steam production based on deviation from setpoint.
The maximum steam output can be set.
The humidifier is mounted on a corrosion-free plastic frame.
Inlet and outlet solenoid valves.
Inlet water filter.
Supply-water connection.
Provided with standard conductivity bottle, suitable for water with conductivity between 350 to 750 µS/cm (microSiemens/cm).
Maintenance and cylinder replacement from the unit front.

- Under no circumstances should the water supply be fed from a water softening system.
- Durability and lifetime of the humidifier degrades rapidly with the use of softened water.
- The quality of steam production can be affected by the generation of foam due to the use of softened water.

**CASING**
Anodized-aluminum profile frame.
Color Black RAL 9005.
Additional black steel base
Front service access doors with key-entry locks and easily removable doors without tools.
Flat flush-fitting rear and side panels.
Pre coated scratch and dirt resistant steel doors and panels. Lined with 15 mm thick, non-eroding, non-combustible insulation with thermal and acoustic properties.
Hot-dip galvanized internal panels and sheet metal components.
Panel color white RAL 9010.

**SWITCH CABINET**
Integral switch cabinet wired in accordance with EN60204 complete with the following components:
- Circuit breakers to protect individual components
- Contactors
- Color-coded and numbered cabling
- Transformer and control-circuit fuse
- Volt-free critical and maintenance alarm terminals
- 24V AC fire shutdown terminals, switched remotely, closed for unit run
- Volt-free run indication
- Circuit breaker and connectors for the power supply of condensate pump and air damper
- Front-door interlocked incoming mains isolator with supply terminals

**AIR SENSORS**
Return-air temperature and humidity plus supply-air temperature with 10m lead for remote mounting.

**WATER-LEAK DETECTION**
1 spot sensor to be installed below unit plus condensate tray high-level sensor.

**ELECTRONIC CONTROLS**
Type C5-12
Main control functions:
- Temperature return or supply air °C





- Return-air humidity %RH or moisture content g/kg
- Optimization of fan speed
- Optimization of compressor operating conditions
- Optimization of humidifier output
- Auto restart after power failure

Monitoring of all digital and analogue inputs and outputs including:
- Fan speed
- Low and high-side compressor operating pressures
- Suction and discharge compressor temperatures.

Alarms:
- High and low temperature
- High and low humidity or moisture content
- Airflow failure, filter blocked, refrigeration system fault
- Humidifier fault, electric heating fault, DencoNet communication and sensor failure.

Networking:
Up to 15 units can be networked using a 2 core 22AWG stranded twisted pair screened cable (e.g. Belden 8761) in a serial configuration to allow:
- Sensor averaging
- Auto change over

**TOUCH SCREEN DISPLAY**
4.3" color touch screen display facial mounted on unit front door. 3 levels of password protection.
Plots:
- Temperature °C
- Humidity %RH

Features:
- Multi-lingual (English, German, Polish, Russian, French, Thai, Romanian, Chinese, Dutch)
- Alarms are displayed in plain text
- Saving and loading of commissioning settings
- Refrigerant pressure gauges
- Refrigeration circuit monitoring

**INTERFACE**
- Inbuilt Modbus (RS485) connectivity
- BACnet I/P, SNMP, Webpage interface and e-mail alarm facility. Ethernet interface plug in card (pCOWeb)

**CONDENSER FAN SPEED CONTROL**
0 to 10 volt control signal from the controller in air handling unit plus terminals for condenser wiring.

**GENERAL**
The air handling unit is CE marked according Machinery-, LV- EMC- and the Pressure equipment directive.
Documentation including the operating manual is supplied with the unit.

**PACKAGING**
Air handling unit screwed to a pallet, enveloped in cardboard with edge protection in a timber crate.

**Technical Data**

| Selection | | |
|---|---|---|
| Gross total capacity | kW | 20.0 |
| Gross sensible capacity | kW | 20.0 |
| Net total capacity | kW | 18.7 |

| | | |
|---|---|---|
| Net sensible capacity | kW | 18.7 |
| Dehumidification capacity | kW | 0.0 |
| Sensible heat ratio | | 1.00 |
| Heat of rejection | kW | 26.4 |
| EER efficiency ratio | | 2.50 |
| **Air quality** | | |
| Air inlet temperature | °C | 33.0 |
| Air inlet relative humidity | % | 30 |
| Air inlet absolute humidity | g/kg | 9.4 |
| Air outlet temperature | °C | 20.9 |
| Air outlet absolute humidity | g/kg | 9.4 |
| **General** | | |
| Air path | | Downflow (bottom discharge) |
| **Filter** | | |
| Filter type | | Filter G4 |
| **Humidifier** | | |
| Humidification capacity | kg/h | 3.0 |
| Power consumption | kW | 2.3 |
| Current consumption | A | 3.3 |
| Current consumption max. | A | 4.3 |
| Conductivity | µS/cm | 350-750 |
| **Heater** | | |
| Type | | Electric heating |
| Heating capacity | kW | 6.0 |
| Current consumption | A | 8.7 |
| Current consumption max. | A | 8.7 |





| | | |
|---|---|---|
| **Fan** | | |
| Type | | EC plug fan |
| Air volume flow | m³/s | 1.34 |
| External static pressure | Pa | 50 |
| Fan motor exhaust heat | kW | 1.3 |
| Fan Speed | 1/min | 2090 |
| Control voltage | V | 8.7 |
| Power consumption | kW | 1.3 |
| Current consumption | A | 2.1 |
| Current consumption max. | A | 3.9 |
| **Refrigerating circuit** | | |
| Refrigerant type | | R410A |
| Number of compressors per refrigerating circuit | | 1 |
| Refrigerating circuits | | 1 |
| Condensing temperature on dew point | °C | 63.9 |
| Pressure Equipment Directive | | CAT I |
| **Compressor** | | |
| Configuration | | Inverter |
| Power consumption | kW | 6.4 |
| Current consumption | A | 9.3 |
| Current consumption max. | A | 18.5 |
| **Electric** | | |
| Power supply | | 3~400V, N, PE, 50Hz |
| Power consumption cooling mode | kW | 8.0 |
| Current consumption cooling mode | A | 12.0 |
| Current consumption max. | A | 33.1 |
| Recommended type D circuit breaker rating | A | 40 |





| | | |
|---|---|---|
| **Connections** | | |
| Refrigerant | | |
| Type | | Solder connections |
| Discharge line | " | 5/8 |
| Liquid line | " | 1/2 |
| Miscellaneous | | |
| Humidifier water feed | mm | 15 |
| Water drain | mm | 2x22 |
| **Dimensions and weight** | | |
| Length | mm | 800 |
| Width | mm | 600 |
| Height | mm | 1940 |
| Weight | kg | 220 |
| **Sound Data** | | |
| Sound pressure level free field | dB(A) | 69 |
| Sound pressure level distance | m | 2.0 |
| Sound power level | dB(A) | 88 |
| NR curve | | 64 |

**Product of FläktGroup**
Type DMA018DLSIS4PE1

## 2 DMOUCD021E1N1NNNREC1ONN 1 Pcs

**AIR-COOLED CONDENSER**

**GENERAL**
Engineered for outdoor installation with Aluzinc frame and panels.
Installation feet can mounted on site for vertical or horizontal unit configuration.

**CONDENSER**
3-row heat exchanger with internally-grooved tubes and aluminium fins spaced at 1.8mm.
Copper header plus copper inlet and outlet pipe stubs for site connection.
Supplied with a dry nitrogen holding charge.





**FANS**
Low-noise direct drive axial fans with 7 composite aerofoil owl wing profiled blades, high-performance composite material, statically and dynamically balanced that draw air through the coil.
Highly efficient EC permanent magnet variable-speed motor supported on a protection grille. Protection IP54.
Motor protection with LED fault code indication.
Motor efficiency class according IE4.

**SERVICE SWITCH**
Side-mounted weather proof service switch in interlocked enclosure.
3-phase and earth terminals are fed from a circuit breaker in the air handling unit.

**CONTROL**
Side-mounted weatherproof terminal box.
0 to 10 Volt control is fed from terminals in the air handling unit.

**PACKAGING**
Air handling unit screwed to a pallet, enveloped in cardboard with edge protection in a timber crate.

**Technical data outdoor unit**

| | | |
|---|---|---|
| **Selection** | | |
| Heat of rejection per unit | kW | 26.4 |
| Ambient temperature | °C | 45.0 |
| Condensing temperature on dew point | °C | 63.9 |
| Refrigerant type | | R410A |
| **Fan** | | |
| Type | | EC fan |
| Air volume flow | m³/s | 2.00 |
| Speed | 1/min | 788 |
| Control voltage | V | 6.6 |
| Power consumption | kW | 0.3 |
| Current consumption | A | 0.6 |
| Current consumption max. | A | 2.0 |
| **Electric** | | |
| Power consumption | kW | 0.3 |
| Current consumption | A | 0.6 |
| Current consumption max. | A | 2.0 |

| | | | |
|---|---|---|---|
| Power supply | | 3~400V, N, PE, 50Hz | |
| **Connections** | | | |
| Discharge line | " | 7/8 | |
| Liquid line | " | 7/8 | |
| **Dimensions and weight** | | **Vertical** | **Horizontal** |
| Length | mm | 1073 | 1073 |
| Width | mm | 985 | 698 |
| Height | mm | 990 | 943 |
| Weight | kg | 70 | 66 |
| **Sound Data** | | | |
| Sound pressure level free field | dB(A) | 47 | |
| Sound pressure level distance | m | 5.0 | |
| Sound power level | dB(A) | 70 | |

**Product of FläktGroup**
Type DMOUCD021E1N1NNNREC1ONN

## 3 DMAC018DAM 1 pcs

**SHUT-OFF DAMPER**

**SHUT-OFF DAMPER**
Galvanized opposed-blade damper with 24V motor open spring-return actuator.
For upflow units it is recommended that a 250mm high discharge plenum (not supplied) is installed between the top of the unit and the shut-off damper.

**Product of FläktGroup**
Type DMAC018DAM

## 4 DMAC018PLI 1 pcs

**BASE PLINTH**

**BASE PLINTH**
Unit matching plinth with removable access panels and 3-mm thick gasket, for services entry into unit. Height 200mm.

**Product of FläktGroup**
Type DMAC018PLI



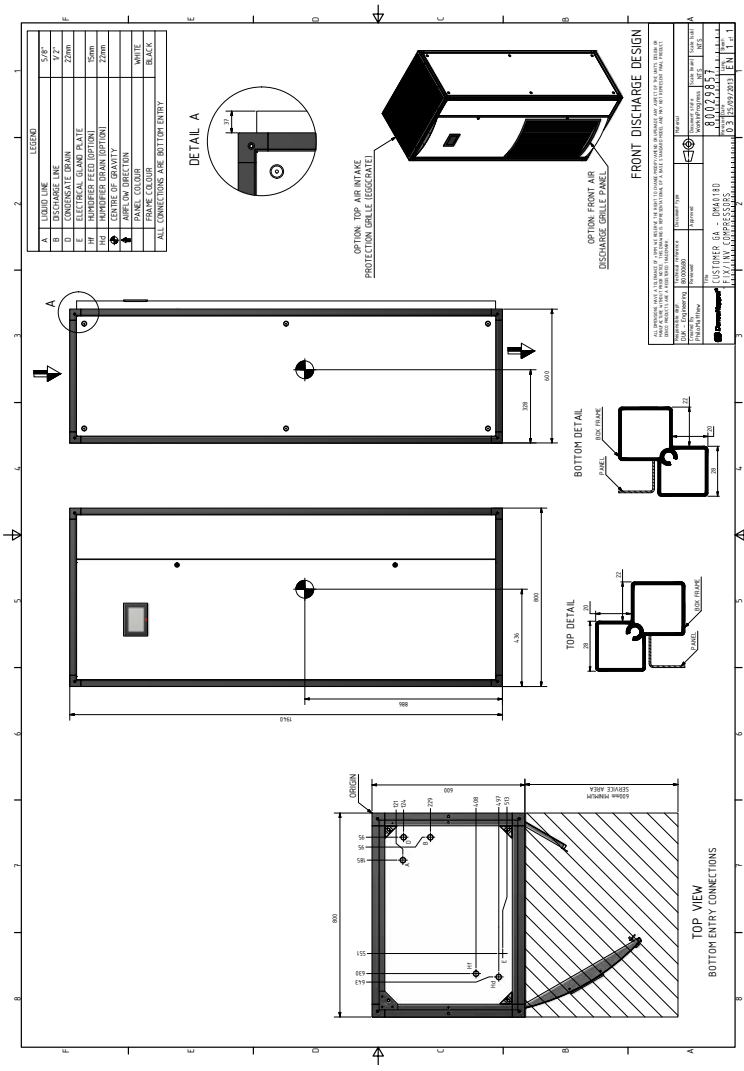


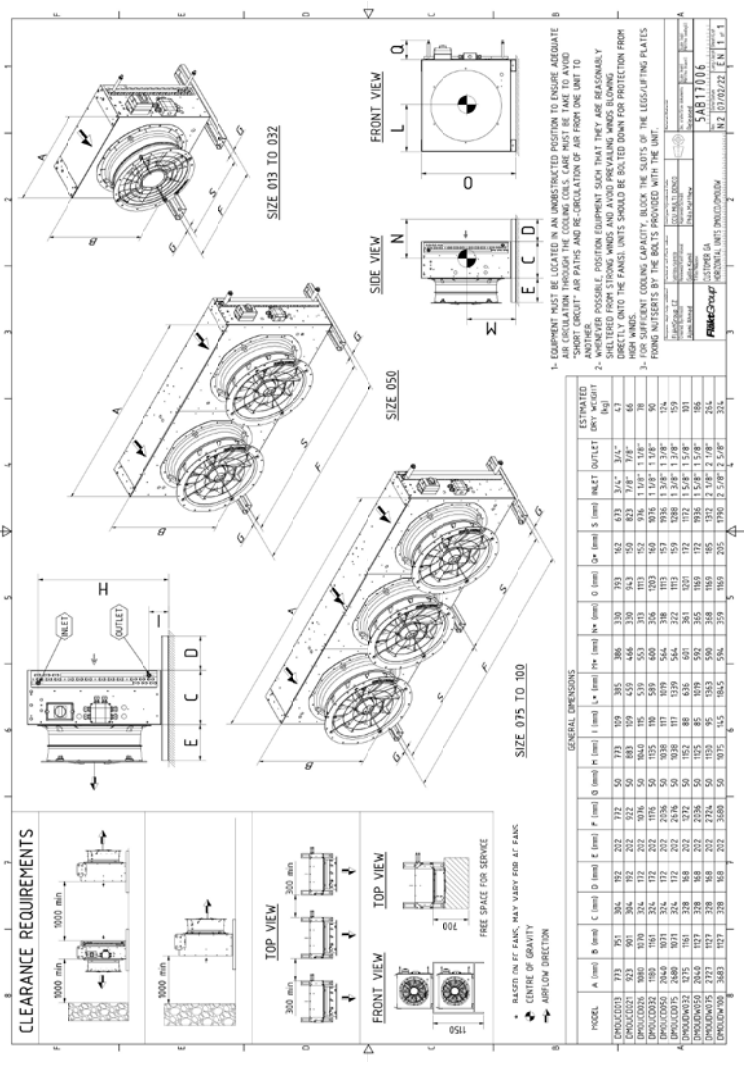
## 5 DMAC018PUH 1 pcs

**HOT WATER CONDENSATE PUMP FOR HUMIDIFIER USE, WITH A 5M FLYING LEAD (LOOSE SUPPLY)**
With a built-in 4 Litre Tank, complete with a Float for start/stop operation and a High Level Alarm as well as a Non-Return Valve with a 15mm Outlet Connection.
The Pump is 205mm high, therefore it should be installed in the plinth/floor void or external to the unit.
The Maximum available Pump Head is 7 meters with a flow rate of 350 l/h (0.097 l/s).
The Pump is supplied loose.
Installation, Containment, Wiring & Termination by others (Unless included within the quotation).

**Product of FläktGroup**
Type DMAC018PUH



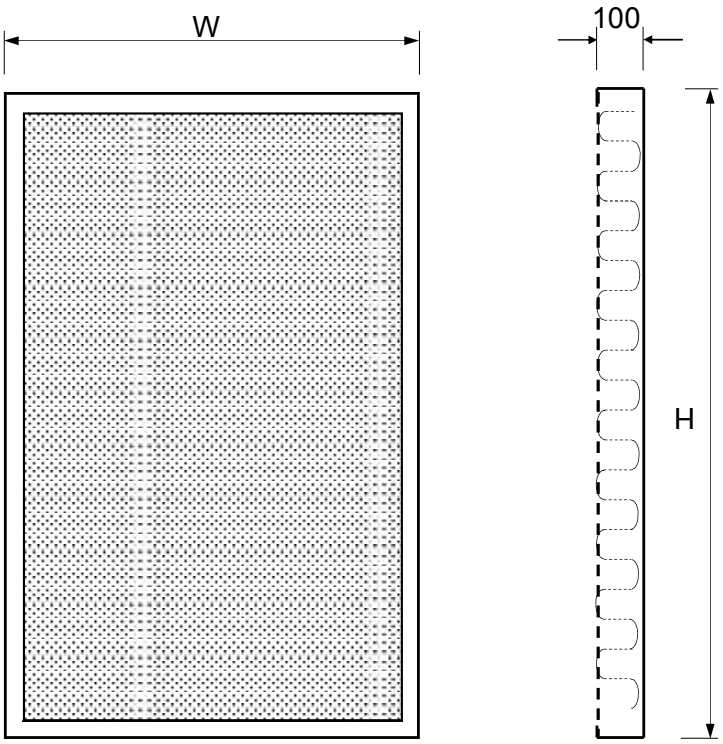


# DATA SHEET E60E
# ACOUSTIC ENCLOSURE PANEL MODEL EP100/UF

IMPORTANT: THIS IS NOT A STAND ALONE DOCUMENT AND UNLESS REFERRED TO IN A DATED AND CERTIFIED EQUIPMENT SCHEDULE IS SUBJECT TO REVISION WITHOUT NOTICE.

## DIMENSIONS




## ACOUSTIC PERFORMANCE

SOUND REDUCTION INDEX BS EN ISO 10140-2 : 2021

| 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | HZ |
|---|---|---|---|---|---|---|---|---|
| 14 | 20 | 26 | 39 | 49 | 52 | 48 | 44 | dB |

SOUND ABSORPTION BS EN ISO 354 : 2003

| 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | HZ |
|---|---|---|---|---|---|---|---|---|
| .15 | 0.6 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 0.75 | - |

## NOTES

THIS DATA SHEET IS TO BE READ IN CONJUNCTION WITH THE EQUIPMENT SCHEDULE

PANELS WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, BRACKETS, FIXINGS OR MASTIC UNLESS OTHERWISE STATED.

PANELS MORE THAN 1800 WIDE OR 2500 HIGH MAY BE MANUFACTURED IN SECTIONS FOR ON SITE ASSEMBLY.

## SPECIFICATION

THE ACOUSTIC ENCLOSURE PANEL COMPRISES A COMBINATION OF SOUND ABSORBENT MATERIALS AND HIGH MASS BARRIERS CONTAINED WITHIN A METAL CASING HAVING AN PLAIN OUTER AND PERFORATED INNER FACE, OFFERING EXCELLENT SOUND REDUCTION AND ABSORPTION PROPERTIES.

PANELS ARE CONSTRUCTED FROM PRE-GALVANISED SHEET STEEL AS STANDARD.

THE OUTER CASING IS FORMED FROM PLAIN SHEET METAL AND INSIDE FACE FROM PERFORATED METAL.

PANELS CONTAIN A FIBROUS SOUND ABSORBENT INFILL THAT IS NON-SHEDDING, NON-COMBUSTIBLE, NON-HYGROSCOPIC AND CHEMICALLY INERT. THE INFILL IS FACED WITH GLASS CLOTH TO PREVENT FIBRE MIGRATION.

THE CASING CAN BE SUPPLIED WITH A PERIMETER FLANGE FOR FIXING ADJACENT SECTIONS TOGETHER, FIXING THE PANELS INTO THE BUILDERSWORK OPENING OR FIXING INTO THE FRAMEWORK OF AN ACOUSTIC ENCLOSURE (OPTION F).

POLYESTER POWDER FINISH AVAILABLE (SUFFIX P)

## SUFFIX

P - POLYESTER POWDER COAT

F - PERIPHERAL FIXING FRAME

X - SPECIAL CONSTRUCTION, REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

## BUILDERSWORK

THE W AND H DIMENSIONS GIVEN ON THE CERTIFIED EQUIPMENT SCHEDULE ARE AS MANUFACTURED.

ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERS-WORK OPENING, MIN 10mm IS RECOMMENDED.

## WEIGHT

ACTUAL WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE.

APPROXIMATE WEIGHT: 35kg/$M^2$.

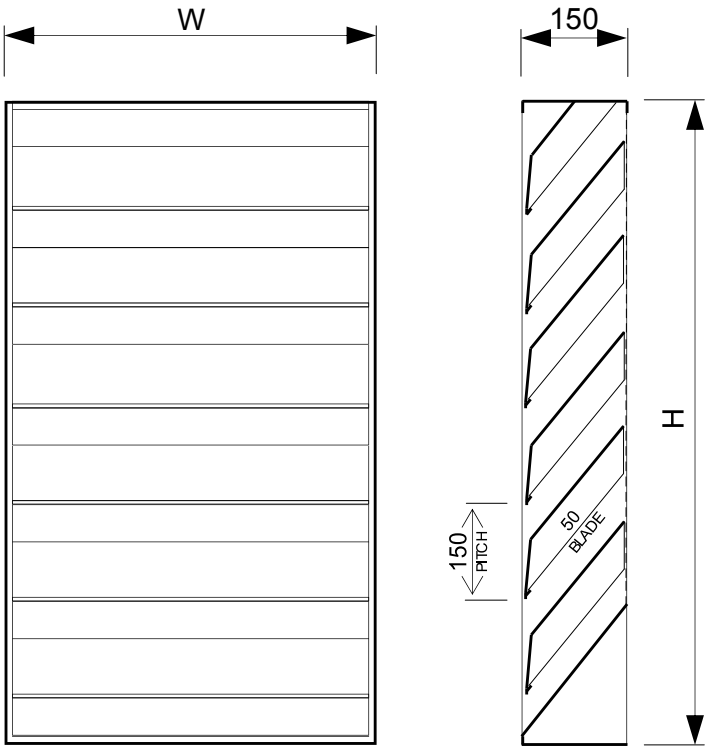
## STANDARD SIZES

THERE ARE NO STANDARD SIZES. PANELS ARE MANUFACTURED TO ORDER

# DATA SHEET L60E
# ACOUSTIC LOUVRE
# MODEL AL1515

THIS IS NOT A STAND ALONE DOCUMENT AND UNLESS REFERRED TO IN A DATED EQUIPMENT SCHEDULE IS SUBJECT TO REVISION WITHOUT NOTICE.

## DIMENSIONS




## SPECIFICATION

LOUVRES ARE CONSTRUCTED FROM FOLDED SHEET METAL AND HAVE A SERIES OF HORIZONTAL BLADES CONTAINED WITHIN A FOUR SIDED EXTERNAL FRAME.

THE MATERIAL OF CONSTRUCTION MAY BE PRE-GALVANISED STEEL (SUFFIX G) OR ALUMINIUM (SUFFIX A).

GALVANISED BIRD SCREENS ARE FITTED AS STANDARD.

CASING SIDES ARE PROVIDED WITH 10mm DIA HOLES FOR FIXING ADJACENT SECTIONS TOGETHER, OR FIXING THE LOUVRE INTO THE BUILDERSWORK OPENING.

LOUVRES ARE SUPPLIED SELF FINISH AS STANDARD OR WITH AN OPTIONAL POLYESTER POWDER FINISH (SUFFIX P).

## NOTES

THIS DATA SHEET IS TO BE READ IN CONJUNCTION WITH THE EQUIPMENT SCHEDULE.

WIDTH (W) AND HEIGHT (H) DIMENSIONS GIVEN ON THE EQUIPMENT SCHEDULE ARE AS MANUFACTURED. ADEQUATE CLEARANCE MUST BE ALLOWED WHEN CONSTRUCTING THE BUILDERSWORK OPENING, A MINIMUM OF 10 mm IS RECOMMENDED.

LOUVRES WILL BE SUPPLIED WITHOUT SUPPORT STEELWORK, CLEATS, BRACKETS, FIXINGS, FLASHING, MASTIC, OR OTHER SUCH ITEMS, UNLESS OTHERWISE STATED.

EXCESSIVELY LARGE OR HEAVY LOUVRES MAY BE MANUFACTURED IN MATING SECTIONS FOR EASE OF HANDLING.

LOUVRES ARE MANUFACTURED TO STANDARD SHEET METAL TOLERANCES OF +/- 3 mm.

## SUFFIX

THE SUFFIX DEFINES ADDITIONAL FEATURES OR SPECIAL CONSTRUCTIONAL DETAILS

A ALUMINIUM CONSTRUCTION.

G GALVANISED STEEL CONSTRUCTION.

P POLYESTER POWDER COAT.

X SPECIAL CONSTRUCTION - REFER TO EQUIPMENT SCHEDULE FOR DETAILS.

## WEIGHT

LOUVRE WEIGHTS ARE GIVEN ON THE EQUIPMENT SCHEDULE. APPROXIMATELY:

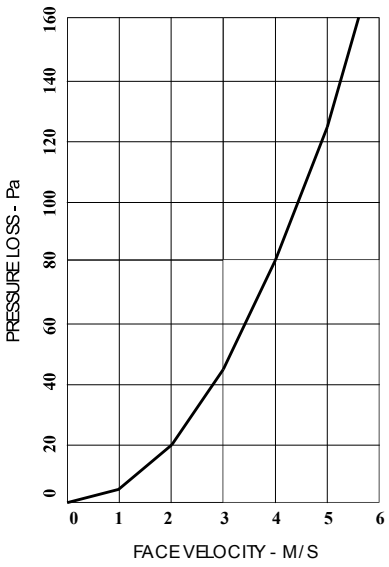
28kg/M² GALVANISED CONSTRUCTION
20kg/M² ALUMINIUM CONSTRUCTION

## ACOUSTIC PERFORMANCE

SOUND REDUCTION INDEX: BS EN ISO 10140 - 2

| 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | HZ |
|---|---|---|---|---|---|---|---|---|
| 4 | 4 | 5 | 8 | 12 | 16 | 15 | 13 | dB |

## PRESSURE LOSS




## STANDARD SIZES

THERE ARE NO STANDARD SIZES. ALL LOUVRES ARE MADE TO ORDER.