Royal Northern College of Music (RNCM)

Library Decarbonisation - Plant Noise Assessment Report

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ARCHITECTURE ▪ DESIGN ▪ ENGINEERING ▪ URBANISM ▪ SUSTAINABILITY ▪ LIGHTING ▪ ACOUSTICS

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1 Introduction

BDP Acoustics has been commissioned by RNCM to undertake an environmental noise survey and plant noise assessment for the Library Decarbonisation project at RNCM, Booth St West, Manchester.

In brief, the scheme proposals include removal of existing rooftop plant items (AHUs and condensers) and the installation of replacement AHUs and new ASHP equipment; indicative areas presented in Figure 1.

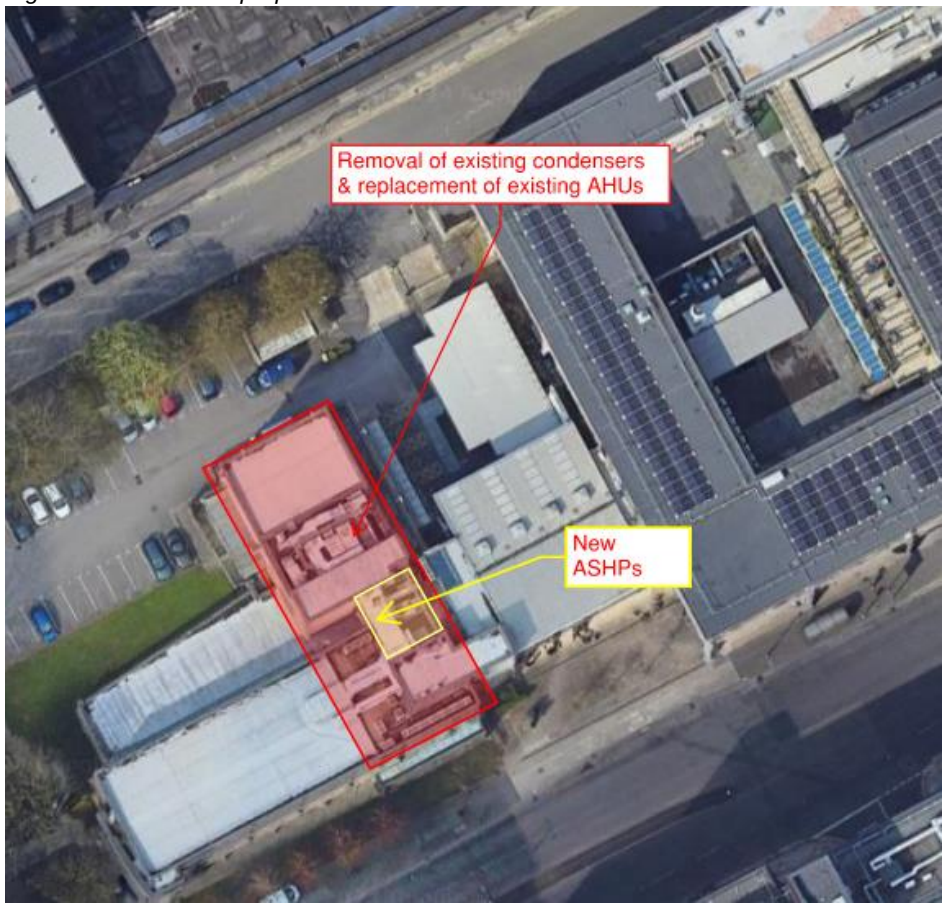
Proposed layouts and equipment selections have been provided to us by the project team to facilitate plant noise modelling to assess proposals and derive suitable mitigation to allow the relevant noise criteria to be achieved.

This report, in summary, includes the following:

- Review of the Local Planning Authority 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;
- Overview of the plant noise assessment undertaken, with source noise data included in appendices.

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

Figure 1: Overview of proposals



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)

Manchester City Council Planning and Noise Technical Guidance October 2022 outlines guidance in regards to suitable noise level criteria and assessment methodology for noise egress from plant items associated with a 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

Environmental noise surveys have been undertaken on 10/01/2024 and 12/01/2024. Measuring the typical worst -case background noise levels in both the day and night-time periods respectively at the nearest / most exposed noise sensitive receptor (NSR) properties to the proposed 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 cumulative external noise limit criteria for the scheme.

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 during the day and night time.

The approximate measurement positions are presented in Figure 2 and were selected in order to encompass 'worst-case', i.e. quietest, night-time (0215 – 0315 hours) and daytime (1330 – 1430 hours) background noise levels, during likely typical periods of operation of the proposed plant items at the nearest / most exposed NSR properties for the purposes of determination of plant noise emission limits, in line with LPA requirements.

Weather conditions during the night-time survey period were dry with wind speeds varying below 1.7 m/s, temperatures varying around 4ºC with 100% cloud cover.

Weather conditions during the daytime survey period were dry with wind speeds below 5.0 m/s, temperatures varying around 6ºC and 90% cloud cover.

The instrumentation used for measurements consisted of 1no. Rion NA-28 and 1no. B&K 2260 sound level meters, which were field calibrated before and after the survey, with no significant drift in sensitivity observed. The sound level meters and calibrators used on site had been calibrated to traceable standards and calibration certificates can be provided upon request.

At all positions 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. Measurements were carried out by Lewis Herd MIOA and Gavin Stevenson MIOA in the day and night time respectively.

3.3 Noise Survey Results

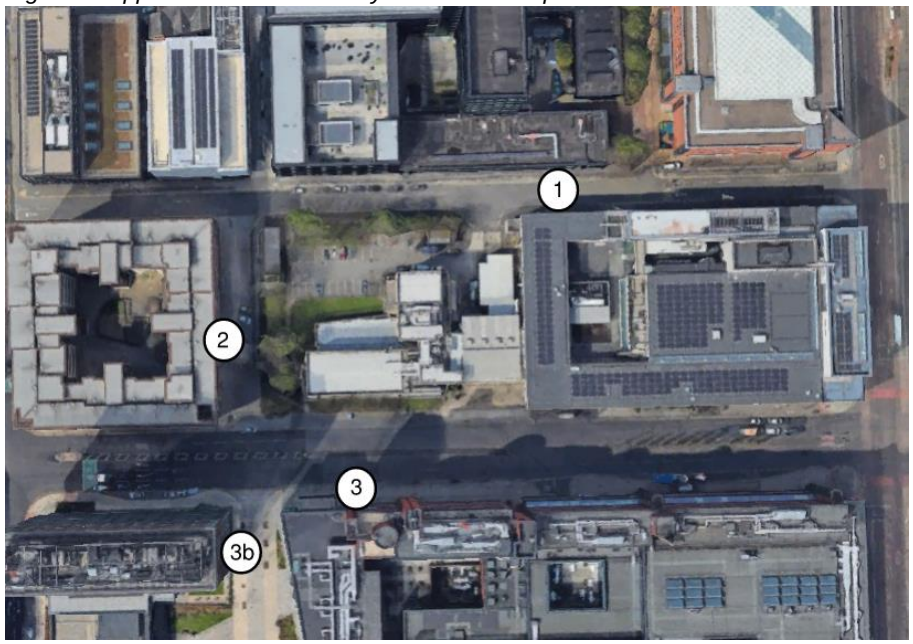
The daytime background noise climate at measurement position 1 was dominated by road traffic noise, with contributions from occasional construction noise, passing aircraft and pedestrian movements. Measurement position 2 was also dominated by road traffic noise with contributions from plant in the locality during the daytime. During the night, measurement position 2 was dominated by existing plant, including the plant located east on Booth St W. Local Road traffic noise contributed to the ambient noise level. Road traffic noise dominated the noise climate as measurement position 3 (day), HGV and bus pass bys were loud and consistent. The background noise climate at measurement position 3b(night) was dominated by existing plant with local road traffic contributing to the ambient noise level.

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

Table 1: Summary of noise measurement results

Measurement Position	***Period of Operation***	***Start Time (hh:mm)***	***$L_{A90,5mins}$ Range (dB)***	***$L_{Aeq,5mins}$ Range (dB)***	***$L_{AFmax,5mins}$ Range (dB)***
1	Daytime	13:36	52	54 – 57	66 – 73
2	Daytime	13:54	53 – 54	58 – 59	66 – 69
2	Night-time	02:17	45	51 – 55	62 – 71
3	Daytime	14:16	56 - 60	68 - 69	79
3b	Night-time	02:35	45	52 - 56	65 - 71

Figure 2: Approximate noise survey measurement positions



4 Assessment criteria

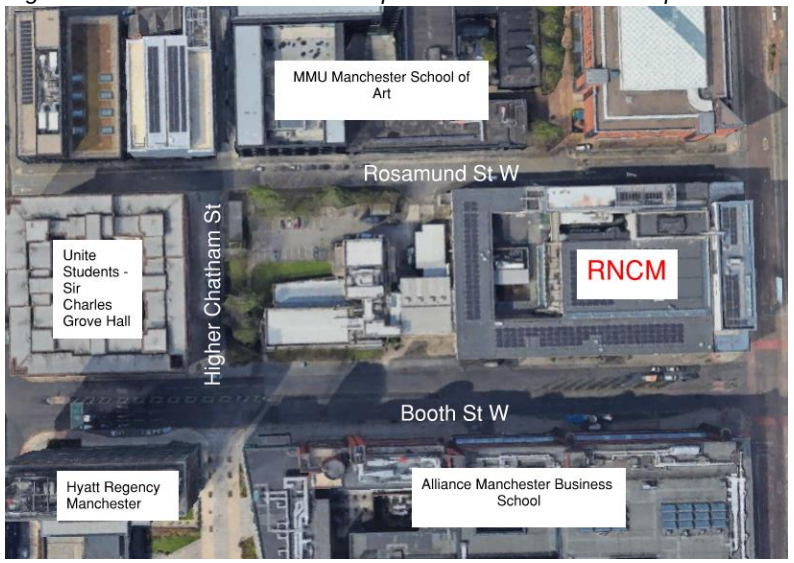
The following section provides an assessment to establish the limiting external noise criteria based on the survey results and the technical guidance set out by the LPA

4.1 Noise Sensitive Receptor Properties

The nearest / most exposed NSRs to the proposed equipment locations at the site are outlined below and presented in Figure 3:

- MMU Manchester School of Art off Rosamond St W, to the north of the site (daytime receptor);
- Unite Students – Sir Charles Grove Hall building off Higher Chatham St, to the west of the site (day & night time receptor);
- Alliance Manchester Business School off Booth St W, to the south of the site (daytime receptor);
- Hyatt Regency Manchester off Higher Chatham St, to the south-west of the site (day & night time receptor).

Figure 3: Identified nearest/most exposed noise sensitive receptors



4.2 Proposed Assessment Criteria

LPA criteria relating to the proposed new external equipment 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 plant noise criteria at the NSRs identified in Section 4.1 are presented within Table 2.

Table 2: The proposed external noise limit criteria based on LPA requirements as derived from the 'worst-case' existing background noise levels.

Identified NSR properties	***Period of operation***	***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 equipment (dB $L_{Ar,Tr}$)***
MMU Manchester School of Art off Rosamund St W	Daytime (0700 - 2300 hours)	52	**47**
Unite Students - Sir Charles Grove Hall off Higher Chatham St	Daytime (0700 - 2300 hours)	53	**48**
	Night-time (2300 – 0700 hours)	45	**40**
Alliance Manchester Business School off Booth St West	Daytime (0700 - 2300 hours)	56	**51**
Hyatt Regency Manchester off Higher Chatham St	Daytime (0700 - 2300 hours)	56	**51**
	Night-time (2300 – 0700 hours)	45	**40**

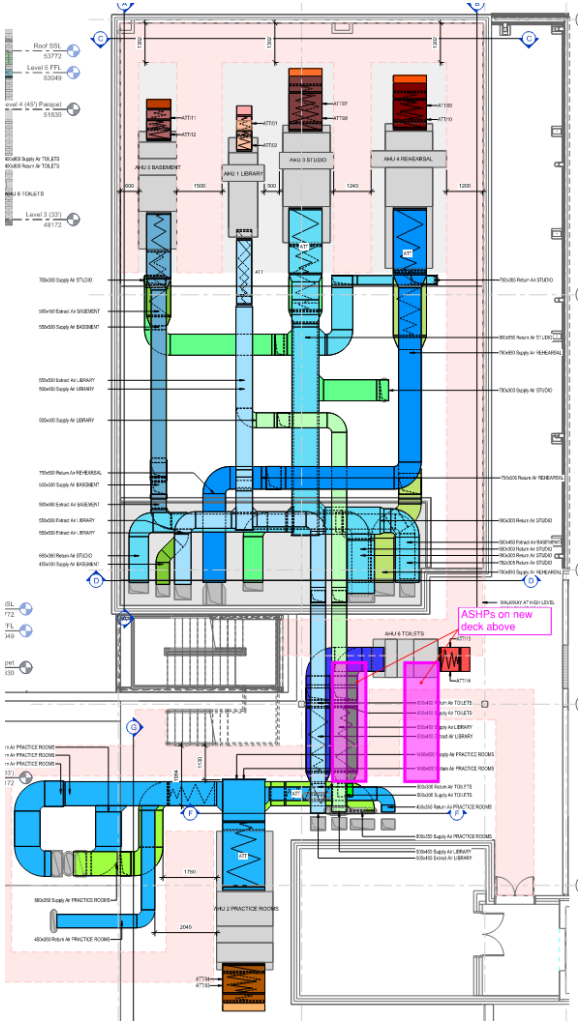
5 Plant Noise Assessment

Plant noise modelling has been undertaken based on the design team's proposals using proprietary 3D noise propagation software CadnaA. The equipment has been modelled as various area sources and point sources based on the noise data for the engineers' equipment selections.

The modelling exercise has been undertaken based on the following information:

- Proposed new external plant layouts as per information provided by the design team (refer 'Appendix II – Equipment Data Sheets & Layout', and Figure 4)
- 6no. new AHUs: operational case radiated noise levels as per datasheets provided, refer 'Appendix II – Equipment Data Sheets & Layout', atmospheric terminations attenuated to achieve the AHU atmospheric termination limits outlined in Section 5.1;
- 2no. new ASHPs (unit ref LAHP-1502LTS-454). Operational noise levels as per datasheet provided, refer 'Appendix II – Equipment Data Sheets & Layout' (Sound Power Level 89 dBA);
- Noise limits at NSR positions outlined in Section 4.2;
- Proposed plant screens are visual screens only, i.e. no acoustic screening is offered;
- *Operational modes*: the following modes of operation have been assessed based on the information provided to us by the design team:
    - Daytime (0700-2300 hrs): potential for 6no. AHUs & 2 no ASHPs to operate simultaneously during the daytime assessment period;
    - Night-time (2300-0700 hrs): potential for 6no. AHUs to operate simultaneously during the night-time assessment period;

Figure 4: Excerpt of proposed new AHU library roof level layout plan with approximate new ASHP locations overmarked in pink – ASHPs located on new plant deck approx. 3.5m above RNCM Library roof level



5.1 AHU atmospheric termination attenuation requirements

Based on the assessments undertaken, appropriate noise limits have been derived for the atmospheric terminations of the proposed new AHUs, suitable to allow the plant noise emission criteria to be achieved at the NSR locations.

These noise limits have been provided to the project engineers' to facilitate appropriate selection of ducted attenuators to the AHUs associated with the scheme.

New AHU atmospheric termination noise limits to be achieved with ducted attenuation:

- **AHUs 1,3,4,5**: atmospheric terminations attenuated to achieve Sound Pressure Level ≤50 dBA @1m
- **AHUs 2 & 6**: atmospheric terminations attenuated to achieve Sound Pressure Level ≤60 dBA @1m

5.2 Plant Noise Assessment: Results

A summary of the predicted results based on the modelling exercise, inclusive of the required AHU ducted attenuation requirements outlined in the previous section, is provided in Table 3 below, alongside noise contour plots (at 13.5m AGL) for the daytime and night-time operational modes (following page). No character corrections are included in the predicted rating level on the basis that the relevant noise characteristics will not be readily apparent against the residual noise climate at the noise sensitive receptor locations.

Table 3: Summary of predicted mitigated plant noise rating level at NSR locations (inclusive of AHU attenuation requirements)

Identified NSR properties	***Period of operation***	***Proposed external noise limit criteria at the NSR façade location for the proposed new ASHPs & AHUs (dB $L_{Ar,Tr}$)***	***Predicted external noise level at the NSR façade location due to noise from the proposed new ASHPs & AHUs (dB $L_{Ar,Tr}$)***
MMU Manchester School of Art off Rosamund St W	Daytime (0700 - 2300 hours)	47	**47**
Unite Students - Sir Charles Grove Hall off Higher Chatham St	Daytime (0700 - 2300 hours)	48	**48**
	Night-time (2300 – 0700 hours)	40	**34**
Alliance Manchester Business School off Booth St West	Daytime (0700 - 2300 hours)	51	**51**
Hyatt Regency Manchester off Higher Chatham St	Daytime (0700 - 2300 hours)	51	**47**
	Night-time (2300 – 0700 hours)	40	**31**

Table notes: green text indicates predicted plant noise emissions level meets the proposed NSR noise limit.

Figure 5: Predicted noise contour plot @13.5m AGL, Daytime 0700-2300 hrs (number within large circles represent the highest predicted noise level at the various building facades)

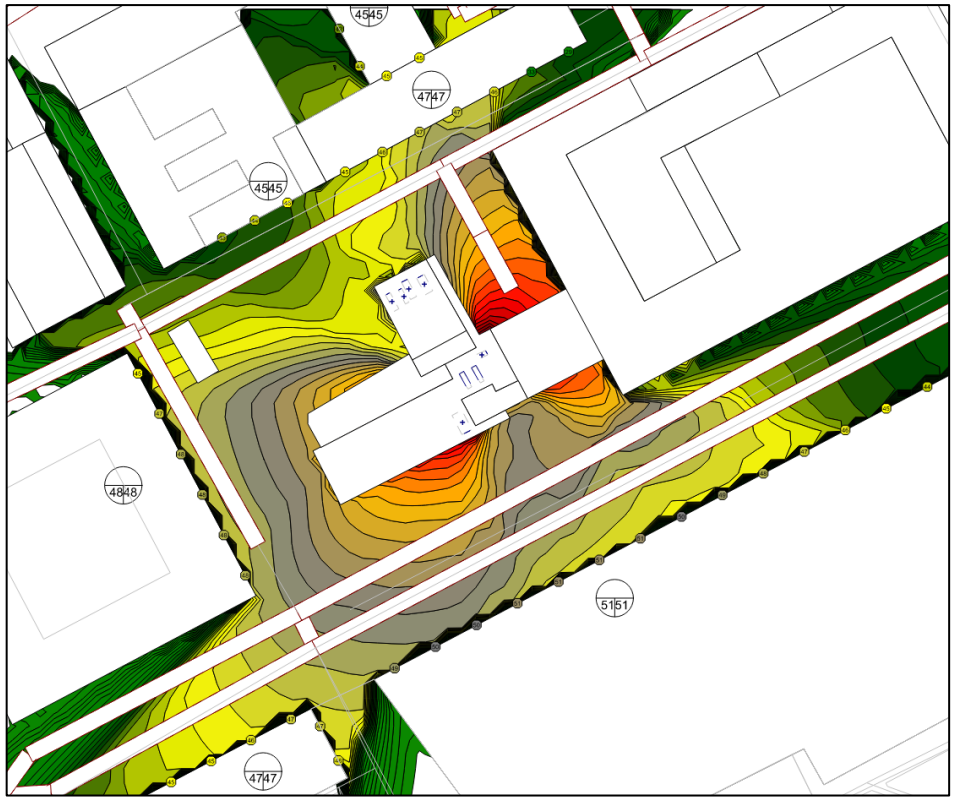
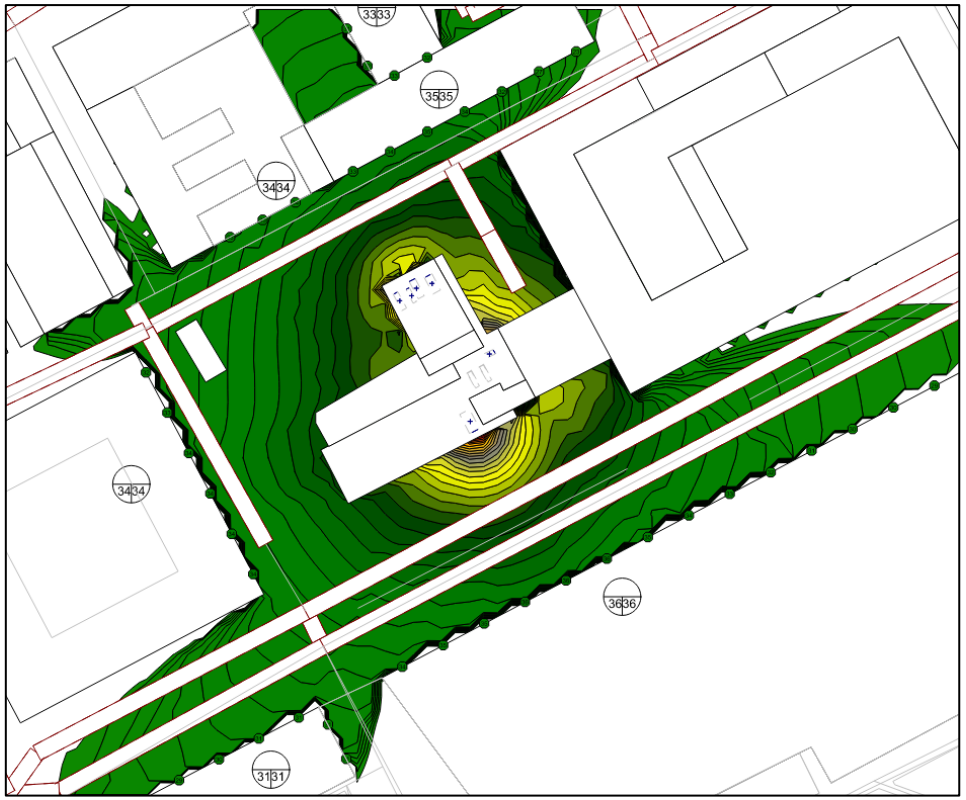


Figure 6: Predicted noise contour plot @13.5m AGL, Night-time 2300-0700 hrs (number within large circles represent the highest predicted noise level at the various building facades)



6 Summary

BDP Acoustics has been commissioned by RNCM to undertake an environmental noise survey and plant noise assessment to establish suitable plant noise emissions limits at nearby noise sensitive receptor locations and assess equipment proposals from an acoustic perspective.

Daytime and night-time noise measurements have been undertaken at representative locations in the vicinity of the proposed site.

The measured noise data has been used to derive cumulative plant noise limits for the scheme in accordance with LPA guidance.

3D noise propagation modelling has been undertaken based on the design team's proposals to predict the noise levels at NSR locations.

Atmospheric termination noise limits have been outlined in terms of SPL @1m to be achieved through appropriate specification of ducted attenuation to the proposed new AHUs. These have been provided to the project engineers' to facilitate appropriate selection of ducted attenuators to the proposed AHUs.

Mitigated plant noise levels due to the proposed new rooftop equipment associated with the scheme is predicted to meet the proposed noise limits at the NSR positions during the daytime and night-time assessment periods.

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).

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.

Façade Position

A measurement position located 1m away from a reflecting surface, typically a building façade. At a façade position, the sound level is recognised to be +3dB higher than a measurement taken at the same position without the presence of a reflecting surface.

Free Field

A sound field region with no adjacent reflecting surfaces.

Rating Level, $L_{Ar,Tr}$

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_{Amax}

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.

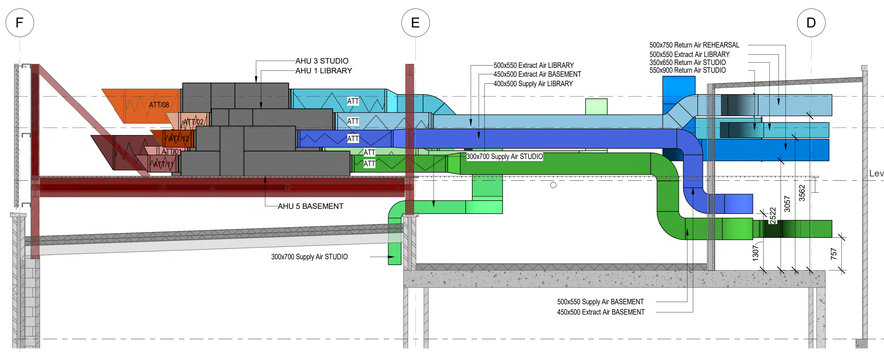
Z-Weighting

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

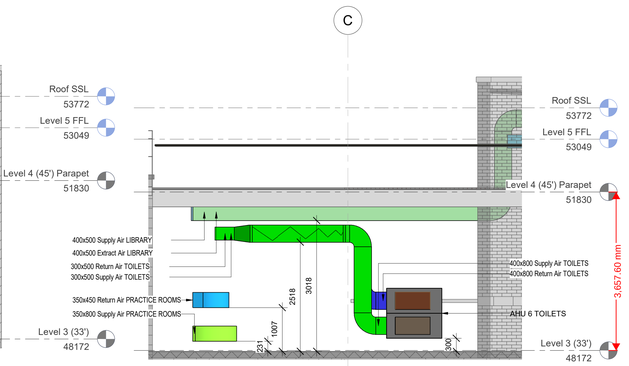
Appendix II – Equipment Data Sheets & Layout

Relevant supporting documents are appended on the following pages:

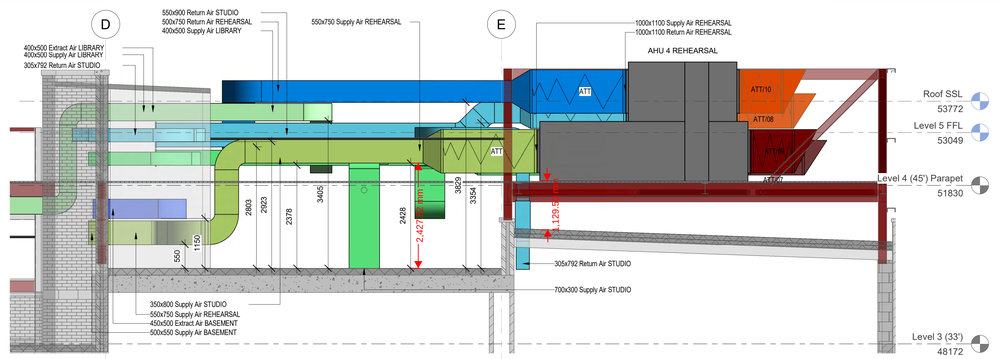
- AHU layout plan
- ASHP equipment selection datasheet
- AHU equipment selection datasheets



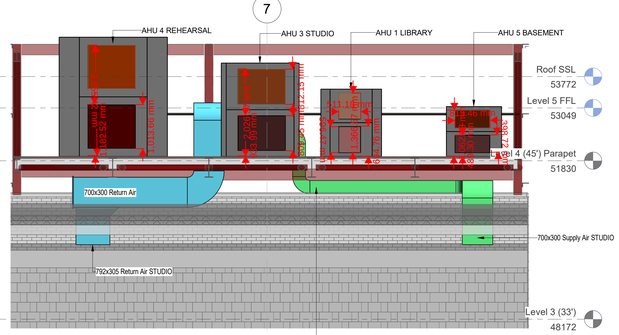
Proposed Roof Layout - Section A



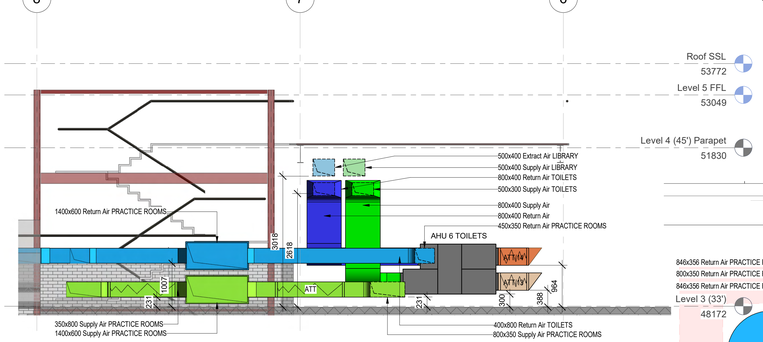
Proposed Roof Layout - Section E



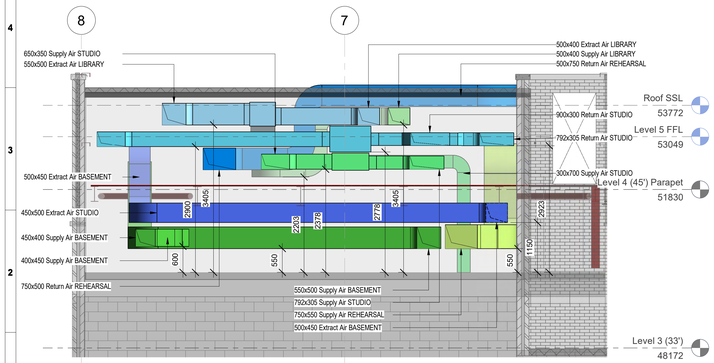
Proposed Roof Layout - Section B



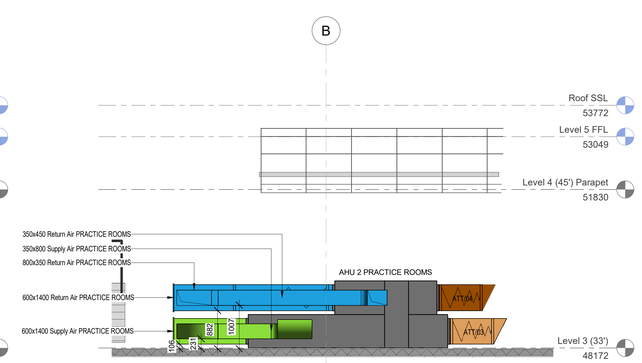
Proposed Roof Layout - Section C



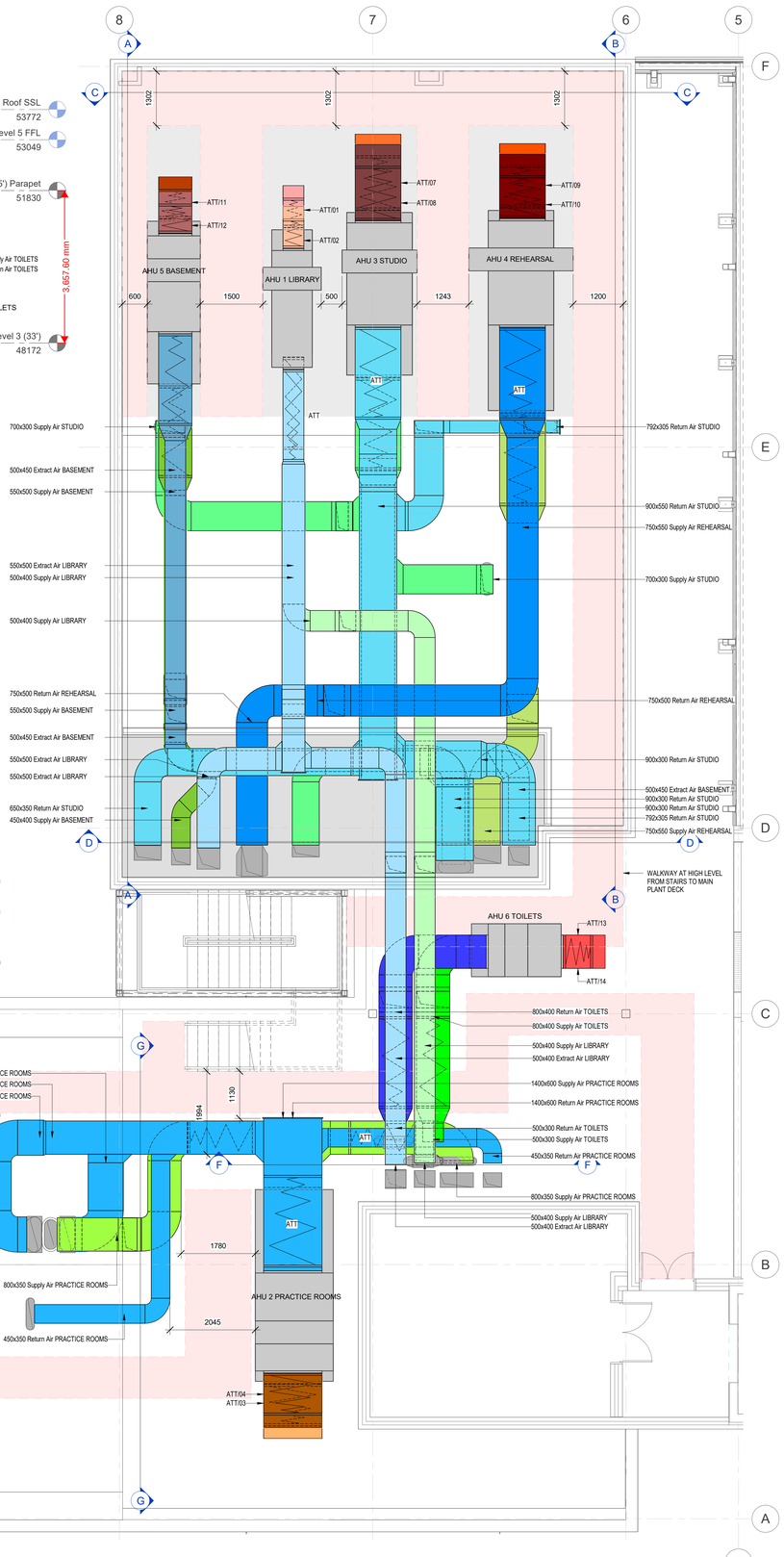
Proposed Roof Layout - Section F



Proposed Roof Layout - Section D



Proposed Roof Layout - Section G



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LEGEND

FO	FLAT OVAL DUCTWORK
SD	SUPPLY DIFFUSER
SG	SUPPLY GRILLE
EG	EXTRACT GRILLE
AC	AIR CONDITIONING
CA	CASSETTE TYPE AIR CONDITIONING
VCD	VOLUME CONTROL DAMPER
MFSD	MOTORISED FIRE SMOKE DAMPER
FD	FIRE DAMPER
ATT	ATTENUATOR
AHU	AIR HANDLING UNIT
	AHU 1 SUPPLY AIR
	AHU 1 EXTRACT AIR
	AHU 1 FRESH AIR
	AHU 1 EXHAUST AIR
	AHU 2 SUPPLY AIR
	AHU 2 EXTRACT AIR
	AHU 2 FRESH AIR
	AHU 2 EXHAUST AIR
	AHU 3 SUPPLY AIR
	AHU 3 EXTRACT AIR
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	AHU 5 FRESH AIR
	AHU 5 EXHAUST AIR
	AHU 6 SUPPLY AIR
	AHU 6 EXTRACT AIR
	AHU 6 FRESH AIR
	AHU 6 EXHAUST AIR
	ATTENUATOR
VAV	VARIABLE AIR VOLUME
AD	ACCESS PANEL
FD	FIRE DAMER
MSFD	MOTORISED FIRE SMOKE DAMPER
VCD	VOLUME CONTROL DAMPER
	SUPPLY/EXTRACT GRILLE
SG / SG	SUPPLY GRILLE
	SUPPLY/EXTRACT GRILLE
VRV	VARIABLE REFRIGERANT FLOW
CA	CASSETTE TYPE AIR CONDITIONING
	ZONE FOR ACCESS

REV.	DESCRIPTION OF CHANGES	DATED	BY
P 01	PRELIMINARY ISSUE	14.02.24	JB/LH

THIS DRAWING HAS BEEN BASED ON ARCHITECTURAL MODEL:

MODEL	REVISION	DATED
P00001_IPA_02_A_MainModel	02	18.01.24

INFORMATION ONLY	X PRELIMINARY ISSUE
FOR APPROVAL	FOR CONSTRUCTION

STATUS & SUITABILITY:

Dodd Group
CHECKED
APPROVED
CONTRACTS
Dodd Group (North West) Ltd.
Electrical, Mechanical Installation Engineers & Contractors
Unit 8 Rugby Park, Bletchley Road, Heaton Mersey, Stockport, SK4 3EJ
tel: (0161) 443 4287

CLIENT:
Royal Northern College of Music

PROJECT:
Library Decarbonisation

DRAWING TITLE:
MECHANICAL SERVICES
PROPOSED VENTILATION LAYOUT
ROOF LEVEL

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JB	LH	FEB 2024	1:50	P 01

DRAWING No:
109138-DGL-XX-RF-DR-M-5711

2500.07 mm
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1m 2m 3m 4m 5m
VISUAL SCALE 1:50 @ A0

TECHNICAL PRODUCT SUBMITTAL
AMICUS LAHP-1502LTS-454 AIR SOURCE HEAT PUMP

Heating Data [1]		
Heating Capacity (EN14511)	kW	150
Total Power input (EN14511)	kW	37.30
COP (EN14511)	W/W	4.02
Nominal flow rate	m^3/h	26.05
Pressure drop across the heat pump	kPa	65.3
Design air flow rate	m^3/h	52489
EcoDesign data [2]		
Energy Label Rating Low temperature		A++
SCOP Low Temperature		4.08
Seasonal Efficiency Low temperature	**%**	160
Cooling Data (RV units only) [3]		
Cooling Capacity (EN14511)3	kW	124
Total Power input (EN14511)[3]	kW	44.2
EER (EN14511)[3]	W/W	2.81
SEER (EN14511)[3]	W/W	4.22
Nominal flow rate	m^3/h	21.22
Pressure drop across the heat pump	kPa	44.7
Design air flow rate	m^3/h	56177
General		
Refrigerant type		R454B
Compressor Type		Scroll
Number of Compressors		2
Number of Circuits		1
Capacity steps		3
Minimum capacity step	**%**	39.7
Electrical Data		
Power supply	V/Ph/Hz	400/3+N/50
Maximum input power	kW	66
Maximum input current standard unit	A	141
Peak input current standard unit	A	363
Peak input current unit with soft start option fitted	A	255
Fuse rating (delayed)	A	200
Optional Hydraulic kit input power	kW	3.4
Optional Hydraulic kit maximum input current	A	6.46
Fans		
Fan type (standard unit)		Axial
Number of fans (standard unit)		3
Sound power level [2]	dB(A)	89
Sound pressure level [3]	dB(A)	56

ErP Data including Product Fiche and Energy Labels where applicable and Warranty information are available at www.lochinvar.ltd.uk

TECHNICAL PRODUCT SUBMITTAL

AMICUS LAHP-1502LTS-454 AIR SOURCE HEAT PUMP

LAHP-1502LTS-454			Heating OUT					
Water Delivery Temperature			35C	40C	45C	50C	55C	60C
Performance Data	-5	Heat Output (KW)	95.6	94	93.2	N/A	N/A	N/A
		Efficiency COP	2.51	2.25	2.04	N/A	N/A	N/A
	-4	Heat Output (KW)	98.1	96.6	95.5	95.4	N/A	N/A
		Efficiency COP	2.57	2.31	2.09	1.92	N/A	N/A
	-3	Heat Output (KW)	102	101	99.8	99.9	N/A	N/A
		Efficiency COP	2.66	2.41	2.19	2.01	N/A	N/A
	-2	Heat Output (KW)	106	105	104	104	N/A	N/A
		Efficiency COP	2.75	2.51	2.28	2.1	N/A	N/A
	-1	Heat Output (KW)	111	110	109	109	N/A	N/A
		Efficiency COP	2.92	2.64	2.39	2.21	N/A	N/A
	0	Heat Output (KW)	116	115	114	113	N/A	N/A
		Efficiency COP	3.04	2.74	2.51	2.28	N/A	N/A
	1	Heat Output (KW)	121	119	119	118	N/A	N/A
		Efficiency COP	3.18	2.85	2.62	2.37	N/A	N/A
	2	Heat Output (KW)	126	124	123	122	122	N/A
		Efficiency COP	3.31	2.99	2.68	2.42	2.26	N/A
	3	Heat Output (KW)	131	129	128	128	126	N/A
		Efficiency COP	3.44	3.1	2.81	2.59	2.33	N/A
	4	Heat Output (KW)	136	134	133	132	131	N/A
		Efficiency COP	3.61	3.24	2.92	2.69	2.43	N/A
	5	Heat Output (KW)	140	139	137	136	136	N/A
		Efficiency COP	3.71	3.4	3.06	2.78	2.52	N/A
	6	Heat Output (KW)	145	144	142	141	140	N/A
		Efficiency COP	3.87	3.54	3.18	2.88	2.62	N/A
	7	Heat Output (KW)	150	148	146	144	143	141
		Efficiency COP	4.02	3.65	3.27	2.95	2.69	2.41
	8	Heat Output (KW)	154	152	150	148	146	144
		Efficiency COP	4.15	3.76	3.37	3.03	2.73	2.46
	9	Heat Output (KW)	158	155	153	151	149	147
		Efficiency COP	4.27	3.82	3.45	3.1	2.8	2.52
	10	Heat Output (KW)	161	158	156	154	152	150
		Efficiency COP	4.35	3.9	3.52	3.17	2.86	2.55

Amicus air to water heat pumps must be installed and maintained in line with the Installation Commissioning and Maintenance Instructions which are available on the Literature & Downloads section of www.lochinvar.ltd.uk

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TECHNICAL PRODUCT SUBMITTAL

AMICUS LAHP-1502LTS-454 AIR SOURCE HEAT PUMP

	Octave band (Hz)									
	63	125	250	500	1K	2K	4K	8K	Lw	Lp
Model	dB	dB	dB	dB	dB	dB	dB	dB	dB(A)	dB(A)
LAHP-452LTS-454	53	60	66	71	74	71	64	56	78	46
LAHP-512LTS-454	54	61	66	72	75	73	66	57	79	47
LAHP-682LTS-454	56	63	68	74	77	75	71	62	81	49
LAHP-752LTS-454	56	63	68	74	80	75	68	59	82	50
LAHP-912LTS-454	60	68	73	77	82	79	75	69	86	54
LAHP-1102LTS-454	61	69	74	78	83	80	76	70	87	55
LAHP-1152LTS-454	62	70	75	79	84	81	77	71	88	56
LAHP-1352LTS-454	63	71	76	80	85	82	78	72	89	57
LAHP-1502LTS-454	62	70	75	83	84	81	77	71	89	56
LAHP-1612LTS-454	63	71	76	84	85	82	78	72	90	57
LAHP-1792LTS-454	63	71	76	85	85	82	78	75	90	58
LAHP-2012LTS-454	64	72	77	85	89	83	79	76	92	59
LAHP-2304LTS-454	65	73	78	82	87	84	80	74	91	58
LAHP-2312LTS-454	64	72	77	87	89	83	79	76	92	60
LAHP-2654LTS-454	65	73	78	82	87	84	80	74	91	58
LAHP-2954LTS-454	65	73	78	86	87	84	80	74	92	59
LAHP-3214LTS-454	65	73	78	86	87	84	80	74	92	59
LAHP-3514LTS-454	66	74	79	88	84	85	81	78	93	60
LAHP-3954LTS-454	68	71	78	86	89	83	79	74	91	59
LAHP-4454LTS-454	65	68	75	83	86	80	76	72	89	56

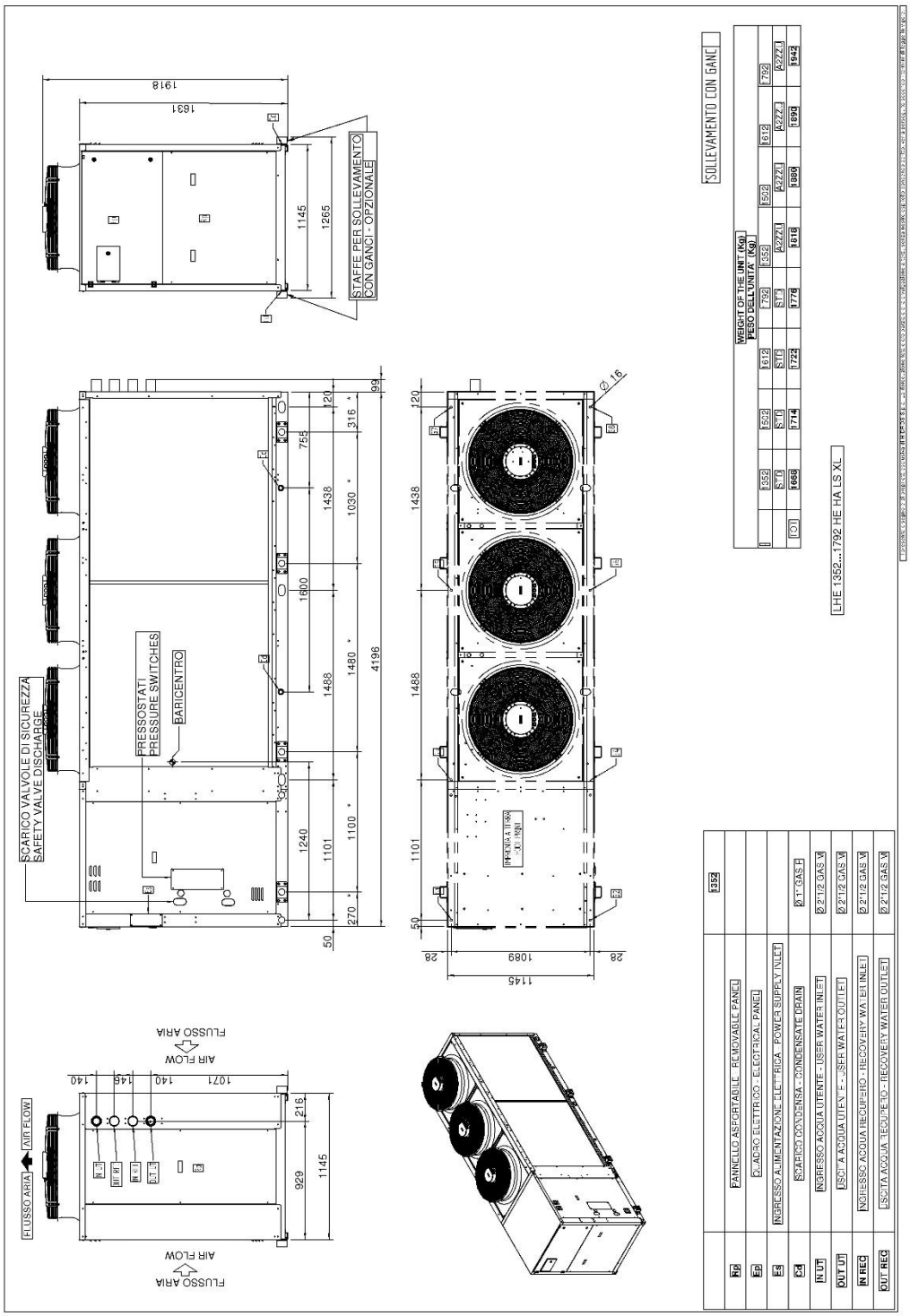
Proposed ASHP

Lw: sound power level according to ISO 3744
Lp: sound pressure level at 10mtrs from unit in free field conditions, direction factor Q=2 according to ISO 3744

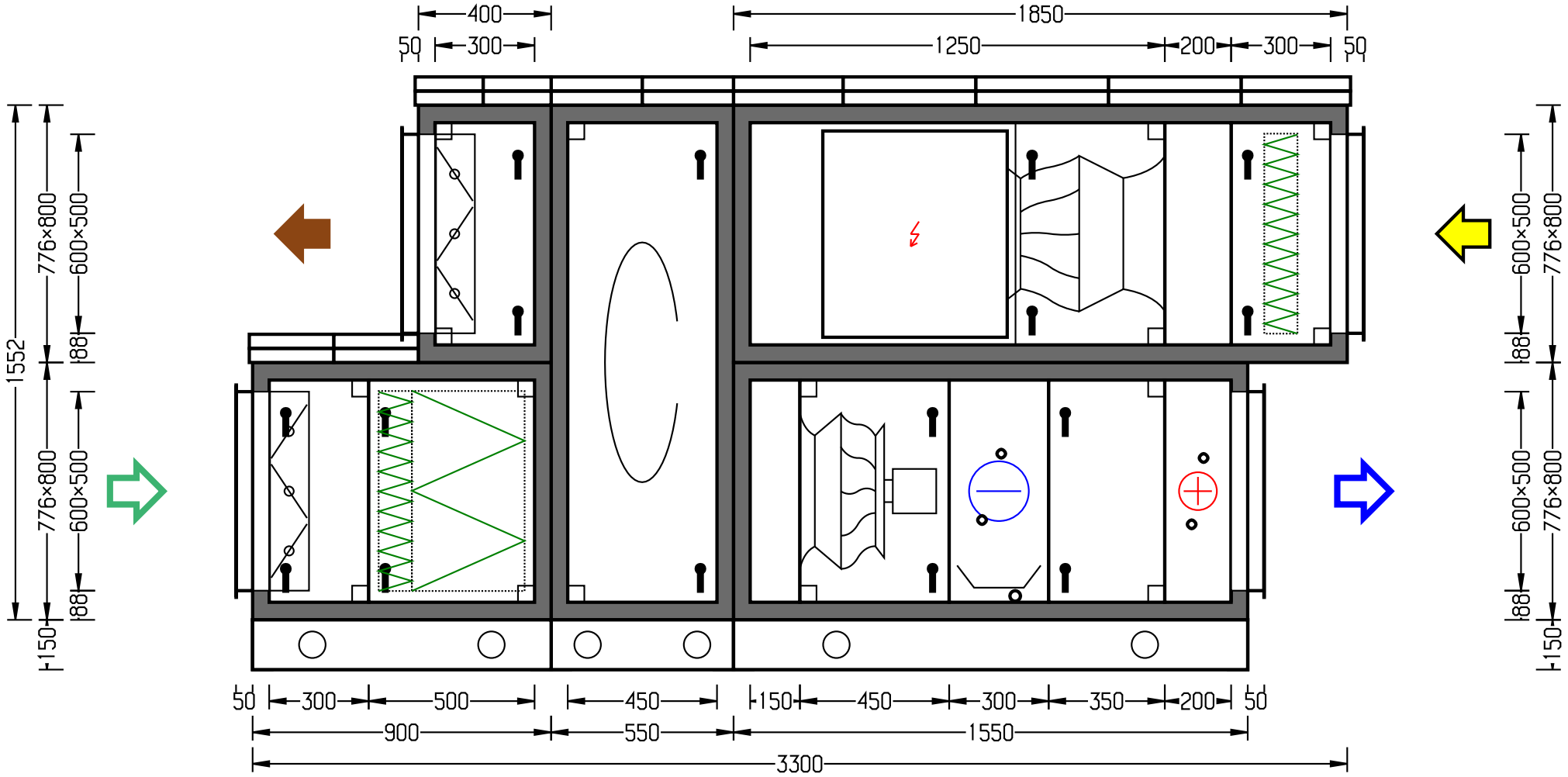
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TECHNICAL PRODUCT SUBMITTAL

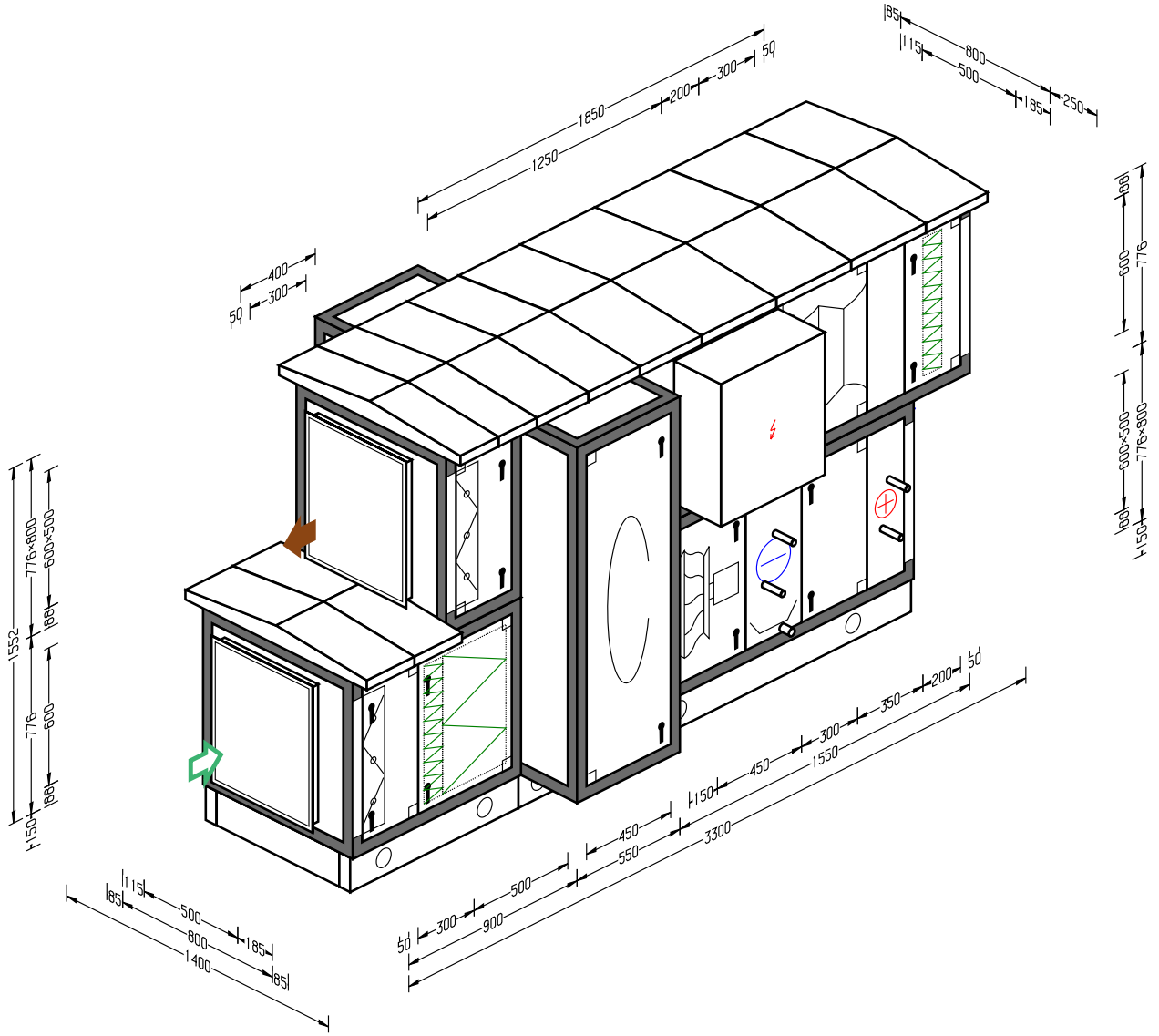
AMICUS LAHP-1502LTS-454 AIR SOURCE HEAT PUMP



ErP Data including Product Fiche and Energy Labels where applicable and Warranty information are available at www.lochinvar.ltd.uk



From Inspection Side	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(A) / AHU1 - Library	
	Unit	1	**Supply air volume flow rate**	eQ - 009	750 l/s
	AOC	ACON-03139995	**Extract air volume flow rate**	eQ - 009	750 l/s



Isometric South West	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(A) / AHU1 - Library	
	Unit	1	**Supply air volume flow rate**	eQ - 009	750 l/s
	AOC	ACON-03139995	**Extract air volume flow rate**	eQ - 009	750 l/s

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03139995	**Customers ref.**	
Unit	1 (A) / AHU1 - Library	**Our ref.**	Andy Window
Size	009		

SUMMARY TECHNICAL SPECIFICATION

DIMENSIONING DATA

Supply air		
Supply air volume flow rate	750	l/s
External static pressure	300	Pa
Internal static pressure	360	Pa
Ref. density	1.2	kg/m³

Exhaust air		
Extract air volume flow rate	750	l/s
External static pressure	300	Pa
Internal static pressure	161	Pa
Ref. density	1.2	kg/m³

Winter		
Design outdoor temperature winter	-5	°C
Dim. humidity winter	99	%
Temperature in, extract air, winter	19	°C
Air humidity in, extract air, winter	50	%

Summer		
Design outdoor temperature summer	28	°C
Dim. humidity summer	50	%
Temperature in, extract air, summer	24	°C
Air humidity in, extract air, summer	45	%

UNIT

Unit type . . . . . eQ
Size 009
Installation . . . . . Outdoor horizontal
Sum filtration supply air . . . . . ePM1 - 70.0%
Total dry weight . . . . . 891 kg
Controls . . . . . with
Transport dimensions . . . . . See block list page
Unit dimensions . . . . . 3300 x 1552 x 1400 mm

CASING

Model box code . . . . . See block list page
Thermal insulation T3
Condensation insulation TB3
Casing strength . . . . . D1(M)
Material . . . . . AlZn sheet steel
Leakage class . . . . . L1(M) / L2(R)*

ERP / EUROVENT

Unit type . . . . . NRVU BVU
SFPint . . . . . 326 W/(m³/s)
Dry temperature efficiency (balanced) . . . . . 84.5 %
External leakage rate . . . . . 0.6 %
Internal leakage rate . . . . . 0.0 %
Mixing ratio at winter design temperature . . . . . 0.0 %

Approved according to requirements 2018



	Supply air	Extract air	
Heat exchanger pressure drop	76	76	Pa
Filter energy classification			
Filter pressure drop, start	39	24	Pa
Filter area	0.5	0.5	m²
Filter cross section air velocity	1.6	1.8	m/s
Air flow	750	838	l/s
Total pressure rise	577	433	Pa
Fan fan system effect	0	0	Pa
Fan total efficiency	66.6	64.9	%
Fan system input power (absorbed electrical power) according to SFP	0.667	0.518	kW

Fan system effect is taken into account in fan performance

Summary Energy Calculation	Supply air	Extract air	
Airflow Rate	0.750	0.750	m^3/s
Total Static Pressure	660	461	Pa
Internal Static Pressure	360	161	Pa
Power Input	0.780	0.555	kW
Velocity	1.60	1.60	m/s
Winter Temperature Efficiency HRS (balanced)	84	84	%
Pressure drop HRS	76	76	Pa
Mixing Ratio	0.0		%
Winter Design Temperature	-5.0		°C
Electric Reheater (winter)	No		

SUMMARY

Supply air	v0 [m/s]	Et [%]	tw [°C]	rw [kg/m³]	ts [°C]	rs [kg/m³]	dP* [Pa]
Connection section	2.9			1.3144		1.1638	3
Filter	2.4			1.3144		1.1638	222
Heat exchanger	1.4	84.5	-5 / 15.8	1.3117	28 / 25.1	1.1613	79
Inspection section							0
Plenum fan		66.5	15.8 / 16.6	1.2139	25.1 / 26	1.1734	660
Air cooler	2.3			1.2181	26 / 22	1.1777	34
Inspection section							0
Air heater	2.4		15 / 22	1.2242		1.1932	20
Connection section	3.9			1.1991		1.193	2
Supply outlet				1.1991		1.193	300
Exhaust air							
Exhaust inlet							300
Connection section	3.9			1.1997		1.1784	2
Filter	2.1			1.1997		1.1784	70
Inspection section							0
Plenum fan		65.7		1.1989		1.1776	461
Heat exchanger	1.4		19.6 / -1.2	1.2018	24.6 / 27.5	1.1806	78
Connection section	2.9			1.2956		1.1666	11

**Refers to the fan design case*
Fan system effect is taken into account in fan performance

SOUND POWER LEVELS

standard: EN13053 ISO/CD 13347-2

	Lw per octave band									LwA	
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Fresh air connection	59	60	65	64	55	54	50	47	dB	64	dB(A)
Supply air connection	63	66	71	68	68	66	60	55	dB	72	dB(A)
Extract connection	61	61	64	64	57	55	52	51	dB	64	dB(A)
Exhaust connection	59	63	66	65	64	64	59	56	dB	70	dB(A)
To surroundings	54	55	53	43	32	37	32	30	dB	47	dB(A)

ENERGY

Temperature efficiency (EN308) . . . . . 84.5 %
Heat recovery capacity . . . . . 27.3 kW
SFPv Total sum . . . . . 1.58 kW/(m^3/s)
SFPe Total sum . . . . . 1.73 kW/(m^3/s)

FAN POWER SUPPLY DATA

Voltage, supply flow . . . . . 3x400VAC+PE, 50Hz
Voltage, extract flow . . . . . 3x400VAC+PE, 50Hz
Power, supply flow . . . . . 2.4 kW
Power, extract flow . . . . . 2.4 kW
Current, full load, supply flow . . . . . 3 A
Current, full load, extract flow . . . . . 3 A

COILS

	Capacity	Air		Water				Conn
Air cooler	3.64 kW	26 °C, 43.5 %	22 °C, 55.2 %	8 / 13 °C	0.18 l/s	5.2 kPa	Ethylene glycol 20 %	DN25
Air heater	6.41 kW	15 °C, 58.4 %	22 °C, 37.6 %	44 / 39 °C	0.31 l/s	17.5 kPa		DN25

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03139995	**Customers ref.**	
Unit	1 (A) / AHU1 - Library	**Our ref.**	Andy Window
Size	009		

TECHNICAL SPECIFICATION

Components listed in direction of air flow

SUPPLY AIR

Data at actual density as given in summary above

Intake/ exhaust section (outdoor version, with door)

Unit size: 009
Installation alternative: Fresh air in end
Damper type: with AluZink damper CEN class 3
Inspection side: right
Pressure drop, dimensioning 3 Pa

Casing end wall
Damper
Width cm : 050
Height in cm : 060
Tightness class : CEN 3
Connection: Flange
Function : Outdoor air
Location: internally end wall
Damper type: 100 mm blade
Material : AlZn
Damper actuator
Duct connection piece
Width cm : 50
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Empty section
Unit size : 009
Length: 030
Inspection side : right

Filter

Inspection side: right

Filter selection
Filter class: F8 - ePM1 70%, glassfibre, short
Filter frame : AZ sheet steel
Prefilter: G4 – coarse, synthetic

Design
Connection side : inlet in end wall
Location: negative pressure
Drain tray: without

Number of filters	1x592x592 L=380	
Pressure drop, start	147	Pa
Pressure drop, dimensioning	222	Pa
Pressure drop, end	297	Pa
Face area	0.4	m^2
Face velocity	2.4	m/s

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring

Filter monitoring

Rotary heat exchanger

Size: 009
Rotor type: RegAsorp
Edge-reinforced: no
Foil spacing: Outputvariant 6 (2.1 mm, 270 mm wheel)
Delivery version: Whole rotor
Function lenght: standard
Material: galvanized sheet steel/AlZn
Inspection side: right

Efficiency			
Temperature efficiency according to standard EN 308		84.5	%
Temperature efficiency at 0°C outdoors		84.5	%
Cooling recovery		84.0	%
Humidity efficiency, Summer		78.7	%
Humidity efficiency, Winter		85.2	%
Supply air	**Summer**	**Winter**	
Pressure drop	79	70	Pa
Air temperature	28 / 25.1	-5 / 15.8	°C
Relative humidity	50 / 45.7	99 / 55.6	%
Capacity reduction	9	27	kW
Air flow transfer	88	88	l/s
Face velocity	1.5	1.4	m/s
Exhaust air	**Summer**	**Winter**	
Pressure drop	78	71	Pa
Air temperature	24.6 / 27.5	19.6 / -1.2	°C
Relative humidity	43.4 / 48.4	48.2 / 90.6	%
Additional throttling	0	0	Pa
Face velocity	1.5	1.4	m/s

Empty section

Unit size : 009
Length: 015
Inspection side : right

Plenum fan

Inspection side: right

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 3
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Speed	2513	Rpm
Max speed	3700	Rpm
Total efficiency	66.5	%
Total static pressure, dimensioning (wet coil)	660	Pa
Dynamic pressure	16	Pa
Fan system input power (absorbed electrical power)	0.78	kW
Temperature rise	0.9	°C
K factor	33.96	
Fan wheel size	031	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	0.667	kW
Pressure rise	577	Pa
Speed	2362	Rpm

Motor

Motor output	2.4	kW
Electric current	3.0	A
Output margin, minimum	10	%

Motor accessories

Air cooler for chilled water

Size: 009
Connection side: right
Material: galvanized sheet steel
Droplet eliminator: without
Design variant: version 3

Coil selection

Use as: Cooling Coil
Calculation principle: input data
Output variant: 2
Fluid passes: 12
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Shunt selection

Shunt control: without

Nom. pipe size	25	
Liquid volume	3.4	l
Pressure drop, dimensioning	34	Pa
Ethylene glycol	20	%
Oversizing	89.9	%
Pressure drop, wet coil	34	Pa
Pressure drop, dry coil	35	Pa
Output	3.64	kW
Air temperature	26 / 22	°C
Relative humidity	43.5 / 55.2	%
Face velocity	2.3	m/s
Water temperature	8 / 13	°C
Water flow	0.18	l/s
Water velocity	0.6	m/s
Pressure drop water	5.2	kPa
Amount of condensation	0.0	l/s

Empty section

Unit size : 009
Length: 035
Inspection side : right

Air heater for hot water

Size: 009
Inspection side: right
Material: galvanized sheet steel
Coil selection
Calculation principle: input data
Output variant: 1
Fluid passes: 08
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Nom. pipe size	25	
Liquid volume	1.9	l
Pressure drop, dimensioning	19	Pa
Control principle for water heater	flow control	
Oversizing	13.2	%
Output	6.41	kW
Air temperature	15 / 22	°C
Face velocity	2.4	m/s
Water temperature	44 / 39	°C
Water flow	0.31	l/s
Water velocity	1.4	m/s
Pressure drop water	17.5	kPa

End connection frame

Pressure drop, dimensioning	2	Pa

Casing end wall
Duct connection piece
Width cm : 50
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

EXHAUST AIR

Data at actual density as given in summary above

End connection frame

Pressure drop, dimensioning	2	Pa

Casing end wall
Duct connection piece
Width cm : 50
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Filter

Inspection side: left
Filter selection
Filter class: pleated G4 – coarse, synthetic
Design
Drain tray: without

Number of filters	1x592x592	
Pressure drop, start	45	Pa
Pressure drop, dimensioning	70	Pa
Pressure drop, end	95	Pa
Face area	0.4	m^2
Face velocity	2.1	m/s

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring
Filter monitoring

Empty section

Unit size : 009
Length: 020
Inspection side : left

Plenum fan

Inspection side: left

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 3
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Speed	2233	Rpm
Max speed	3700	Rpm
Total efficiency	65.7	%
Total static pressure, dimensioning (wet coil)	461	Pa
Dynamic pressure	16	Pa
Fan system input power (absorbed electrical power)	0.555	kW
Temperature rise	0.6	°C
K factor	33.96	
Fan wheel size	031	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	0.518	kW
Pressure rise	433	Pa
Speed	2166	Rpm

Motor

Motor output	2.4	kW
Electric current	3.0	A
Output margin, minimum	10	%

Motor accessories

Intake/ exhaust section (outdoor version, with door)

Unit size: 009
Installation alternative: Damper inside on end wall
Damper type: with AluZink damper CEN class 3
Inspection side: left

Pressure drop, dimensioning	11	Pa

Empty section

Unit size : 009
Length: 030
Inspection side : left

Casing end wall

Damper

Width cm : 050
Height in cm : 060
Tightness class : CEN 3
Connection: Flange
Function : extract air
Location: internally end wall
Damper type: 100 mm blade
Material : AlZn

Damper actuator

Duct connection piece

Width cm : 50
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

BLOCK LIST

	Length	Width	Height	Volume	Weight
Intake/ exhaust section (outdoor version, with door), Filter *EQGA-009-090-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	950 mm	950 mm	1181 mm	1.07 m^3	127 kg
Rotary heat exchanger *EQHB-009-055-22-1-1-2-1-5-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	600 mm	1550 mm	1957 mm	1.82 m^3	241 kg
Plenum fan, Air cooler for chilled water , Air heater for hot water, End connection frame *EQGA-009-155-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1600 mm	950 mm	1096 mm	1.67 m^3	216 kg
End connection frame, Filter, Plenum fan *EQGA-009-185-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1900 mm	1100 mm	1031 mm	2.15 m^3	240 kg
Intake/ exhaust section (outdoor version, with door) *EQGA-009-040-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	450 mm	850 mm	1031 mm	0.39 m^3	66 kg
				7.1 m^3	891 kg

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For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

CONTROLS

Electrical cabinet

Control cabinet: Assembly: Cabinet side and second floor Flange location: Bottom Position: Outdoor IP65 Integrated web server	EQCM-1-02-3-2-2-02-8-0-1
Control panel: Siemens Climatix 600 Modbus TCP Basic web Integrated web server	STCM-03-0-0-2-0-2-1
Semi-graphical HMI	STCZ-77-02-0-1
Communication BACnet IP	STCZ-84-03-1-1
Miniature circuit breaker: Supply air fan 1, 3-phases, 10A	STCZ-89-011-3-010-1-1
Miniature circuit breaker: Extract air fan 1, 3-phases, 10A	STCZ-89-021-3-010-1-1
Miniature circuit breaker: Manoeuvre control cabinett, 1-phase, 6A	STCZ-89-050-1-006-1-1
Miniature circuit breaker: Socket with personal safety, 1-phase, 6A	STCZ-89-072-1-006-1-1
Miniature circuit breaker: HEX (1st), 1-phase, 10A	STCZ-89-081-1-010-1-1
Miniature circuit breaker: Heat1(pump), 1-phase, 6A	STCZ-89-112-1-006-1-1
Miniature circuit breaker: Cool 1 (pump), 1-phase, 6A	STCZ-89-113-1-006-1-1
Main switch:	STCZ-87-4-3-032-020-0-3-3-05-1
Service socket: EU (type F)	STCZ-92-2-0-1

Configuration

HMI language: English	STDZ-01-03-000-1
Temp control: Extract Air Temp Control	STDZ-05-02-000-1
Cooling recovery: With, based on enthalpy	STDZ-08-02-000-1
Frost protection heat exchanger: Enthalpy	STDZ-13-02-000-1
Fire alarm 1: Both fans stopped	STDZ-15-01-000-1
Fan control: Flow controlled supply and exhaust fans	STDZ-19-01-000-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-1-086-091-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-2-195-205-1
Filter alarm with sensor: extract air filter	STDZ-24-2-2-090-095-1

FUNCTION DESCRIPTION

Starting and stopping the air handling unit
The supply air fan and exhaust air fan are started and stopped according to internal scheduler.
The controller forces the heat exchanger to 100% recovery during start-up.
Mode selection switch is available in web interface and on the operator's control panel along with operation and alarm indication.
The following dampers open before supply/exhaust fan start and close when supply/exhaust fan stop:
- Outdoor air damper
- Exhaust air damper
The following dampers close in the event of a loss of power:
- Outdoor air damper
- Exhaust air damper

Temperature control
If there is an increased heating demand the heating sequence is controlled in the following order:
- Heat exchanger for heat recovery
- Heating coil 1, water
If there is an increased cooling demand the cooling sequence is controlled in the following order:
- Heat exchanger for cooling recovery; if the enthalpy of the Extract air is lower than the enthalpy of the Outdoor air. Otherwise blocked.
- Cooling coil 1, water
The rotary heat exchanger is controlled by the control unit by means of a drive unit.
The control unit maintains the extract air temperature at the setpoint by controlling the supply air temperature.
The supply air temperature sensor limits the minimum and maximum supply air temperature.
A risk of frost in heating coil 1 is detected by:
- Return water temperature sensor
If there is a risk of frost in heating coil 1 the air handling unit is stopped.
If there is a risk of frost in heating coil 1 its valve actuator is forced to open. If the risk of frost persists the air handling unit is stopped.
When the air handling unit is stopped the return water temperature in heating coil 1 is maintained at 20°C.
Operation of the circulation pump for heating coil 1 is handled by the control unit and the pump is in operation if there is a heating demand, or if the coil return water temperature falls below 12 °C, or during pump kick function.
Operation of the circulation pump for cooling coil 1 is handled by the control unit and the pump is in operation if there is a heating demand or during pump kick function.

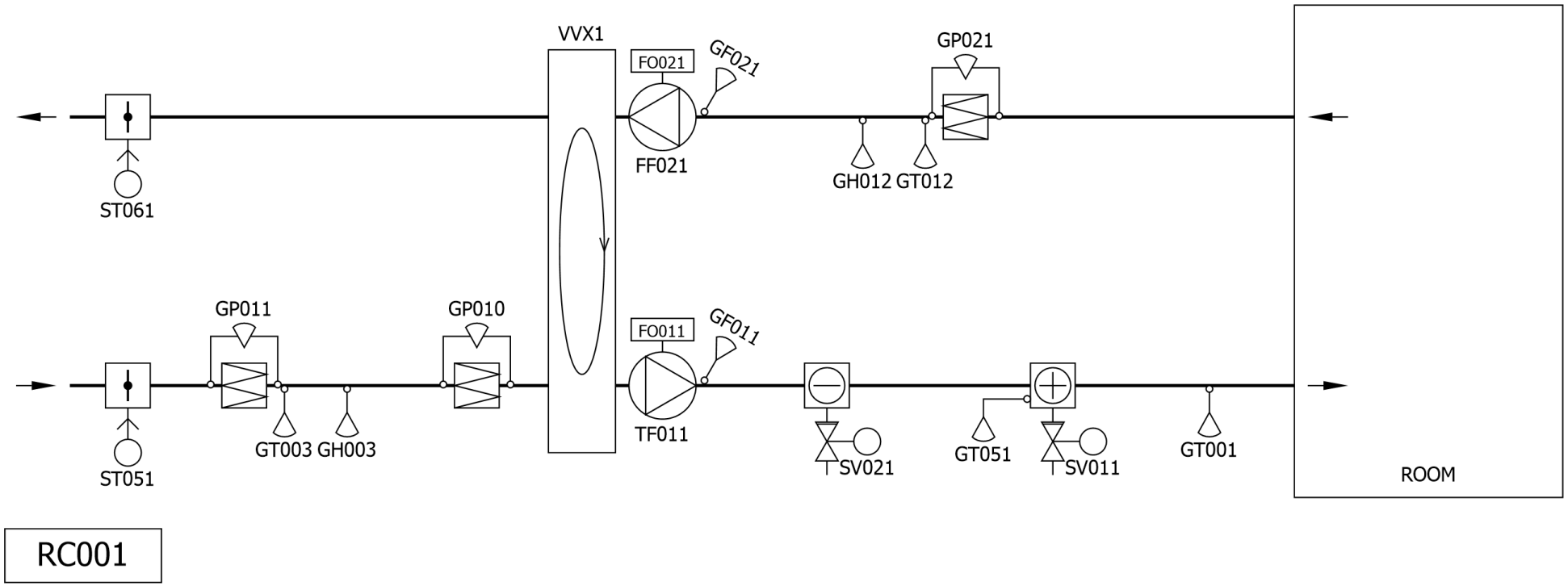
Fan control
The supply air flow is maintained according to operative setpoint by means of the speed controlled supply air fan.
The extract air flow is maintained according to operative setpoint by means of the speed controlled exhaust air fan.

Filter monitoring
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air

Frost protection
When the calculated temperature in the extract air after the rotary heat exchanger drops below the dew point of the exhaust air and set value, recovery is limited so as to prevent the formation of frost.

Fire mode
In case of of fire alarm 1 the air handling unit is stopped.

Alarms are generated for
- Manual operation
- Heat exchanger
- Overload, circulation pump, heating coil 1
- Overload, circulation pump, cooling coil 1
- Overload, circulation pump, recovery
- Control fault, supply air fan
- Control fault, exhaust air fan
- Fault in speed controlled supply air fan
- Fault in speed controlled exhaust air fan
- Fire alarm
- Frost protection, heating coil 1
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air
- Temperature sensor fault



	Customer id	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(A) / AHU1 - Library	
	Unit	1	**Supply air volume flow rate**	eQ - 009	750 l/s
	AOC	ACON-03139995	**Extract air volume flow rate**	eQ - 009	750 l/s

COMPONENT LIST

Description	Reference	Type	Delivery options	
Frequency converter, supply fan 1	FO011	Ziehl-Abegg	Factory installed and connected	
Frequency converter, extract fan 1	FO021	Ziehl-Abegg	Factory installed and connected	
Damper actuator on/off with spring return, exhaust air	ST061	GMA121.1E/FW1	Factory installed and connected	
Semi-graphical HMI		POL871.71/STD HMI	Supplied	
Differential pressure sensor, supply air fan 1	GF011	SE2:QBM70.7000TNFW	Factory installed and connected	
Differential pressure sensor, extract air fan 1	GF021	SE2:QBM70.7000TNFW	Factory installed and connected	
Differential pressure sensor, outdoor air prefilter+fitler	GP010/GP011	SE2:QBM68.1212/FW	Factory installed and connected	
Damper actuator on/off with spring return, outdoor air	ST051	GMA121.1E/FW1	Factory installed and connected	
Humidity/Temperature sensor, outdoor air	GH003/GT003	FTK140 MODBUS	Factory installed and connected	
Temperature sensor, supply air	GT001	AKF10.200.06 MODBUS	Supplied with cable and quick connector	
Differential pressure sensor, filter extract air	GP021	SE2:QBM70.7000TNFW	Factory installed and connected	
Humidity/Temperature sensor, extract air	GH012/GT012	FTK140 MODBUS	Factory installed and connected	
Communication BACnet IP		POL908.00/STDBAC net IP	Installed	
Immersion sensor, return heating 1	GT051	AKF10.190.04 MODBUS	Supplied with cable and quick connector	

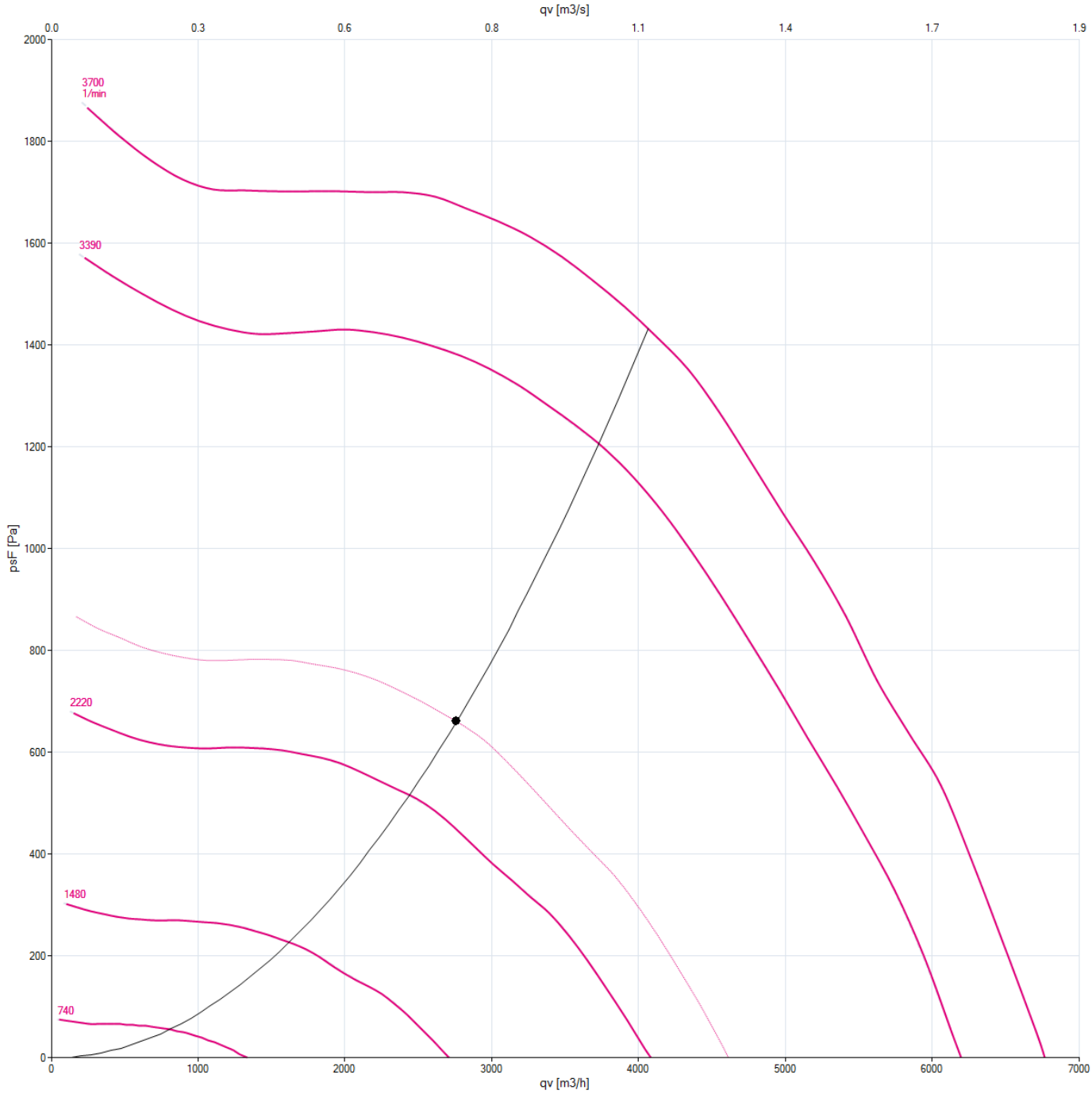
RATED CURRENT

Connection Point	Product code	Rated Voltage	No	Imax	Fmax	CSA
Mains cabling cabinet	STCZ-88	3x400VAC±10%+N+PE, 50Hz	5	8.6 A	63 A	35 mm²
Total				8.6 A		

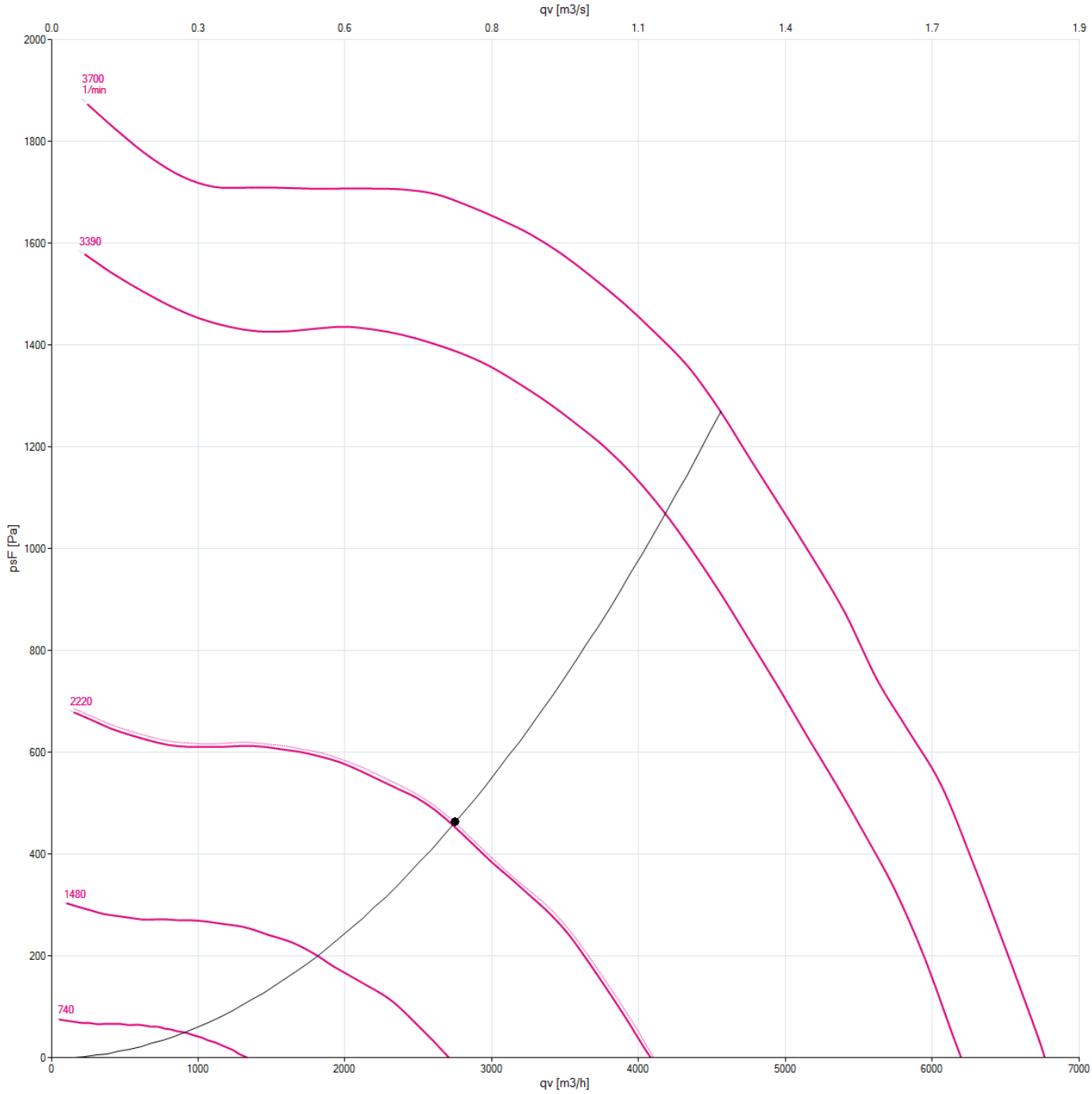
* Note that current for circulation pump is not included. AHU is dimensioned for pumps with max 6A per pump
* Miniature circuit breakers in switch cabinet have C characteristics

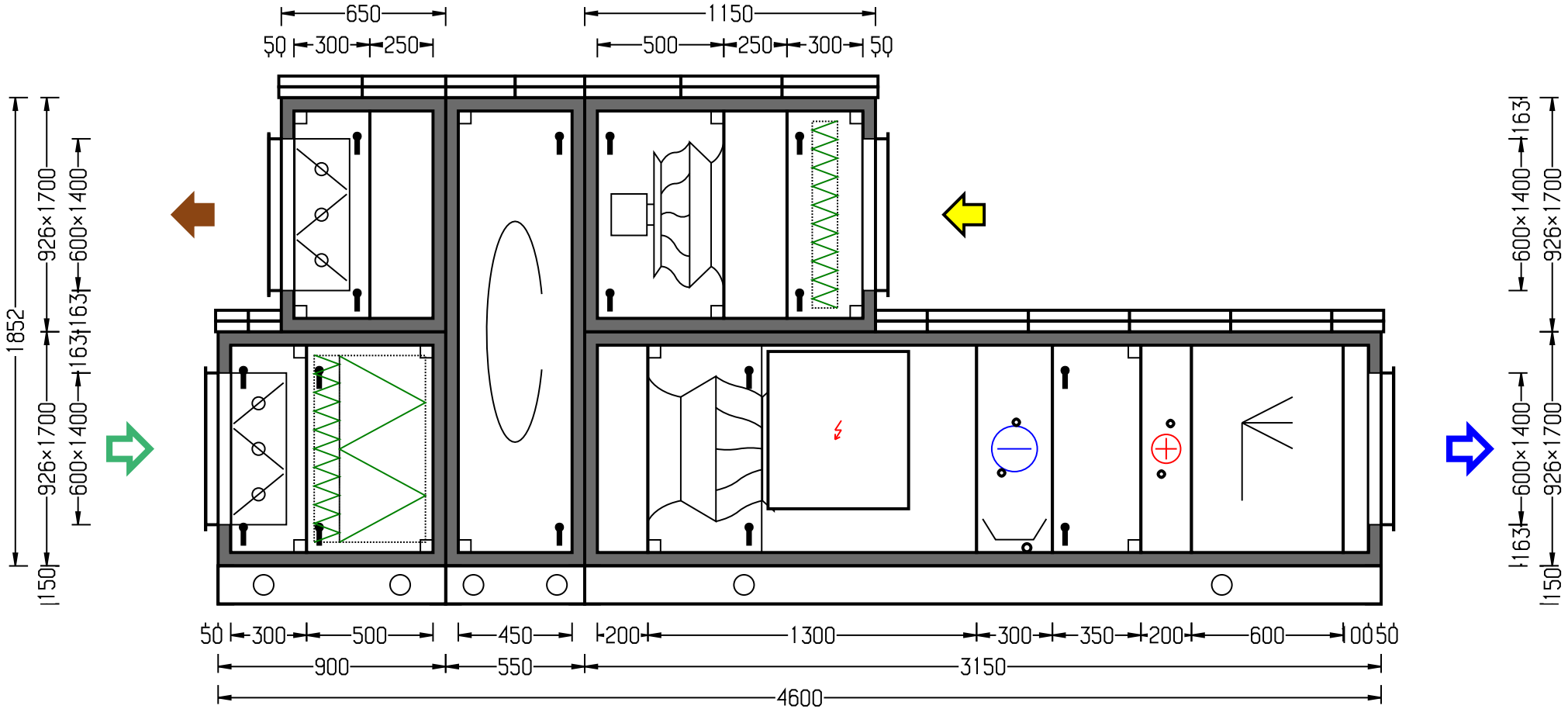
No = Number of conductors
Imax = Maximum current
Fmax = Maximum external fuse
CSAmax = Maximum cross sectional area

FAN CHART - SUPPLY AIR

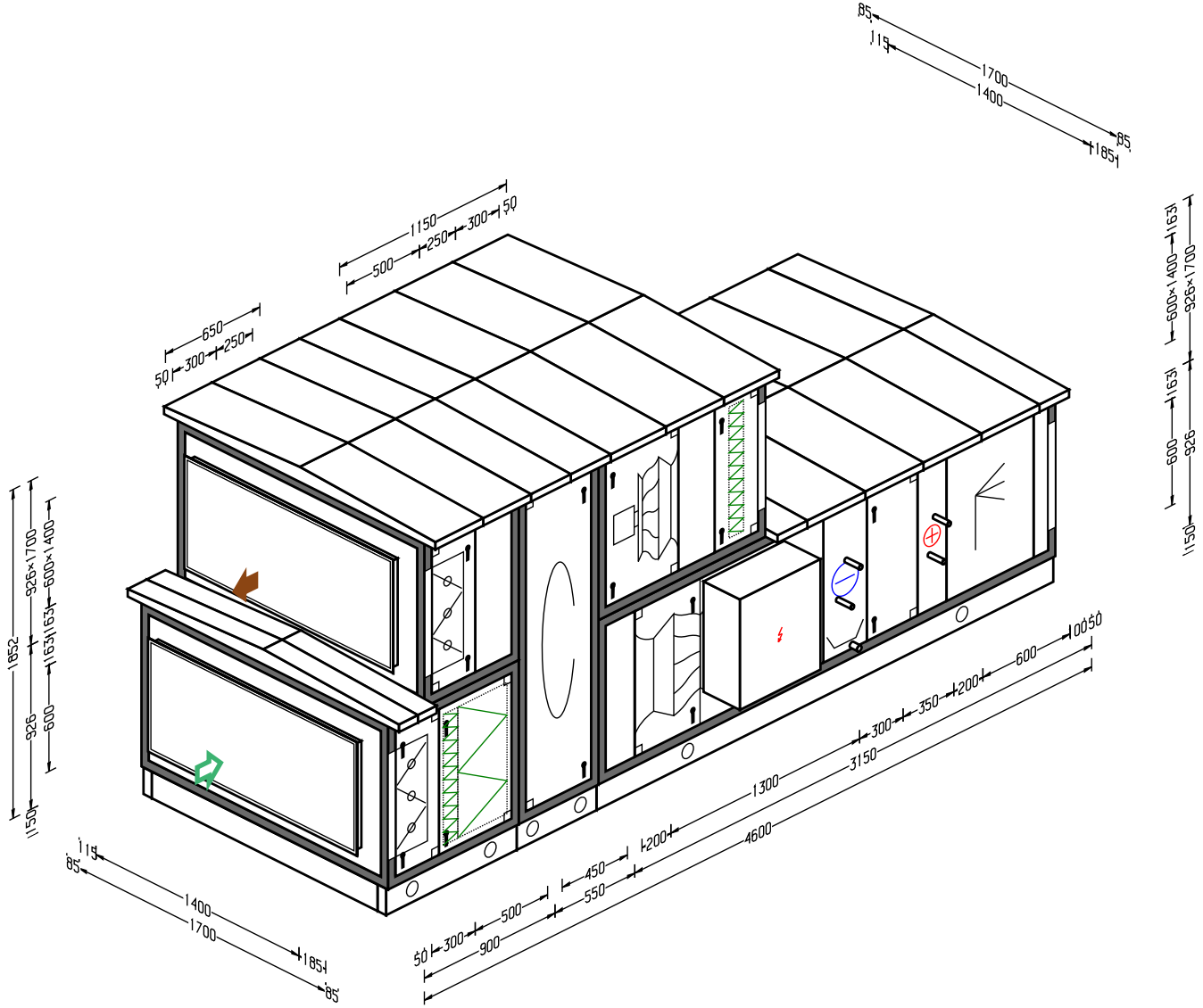


FAN CHART - EXTRACT AIR





From Inspection Side	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(B) / AHU2 - Practice Rooms	
	Unit	2	**Supply air volume flow rate**	eQ - 023	1800 l/s
	AOC	ACON-03139999	**Extract air volume flow rate**	eQ - 023	1800 l/s



Isometric South West	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(B) / AHU2 - Practice Rooms	
	Unit	2	**Supply air volume flow rate**	eQ - 023	1800 l/s
	AOC	ACON-03139999	**Extract air volume flow rate**	eQ - 023	1800 l/s

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03139999	**Customers ref.**	
Unit	2 (B) / AHU2 - Practice Rooms	**Our ref.**	Andy Window
Size	023		

SUMMARY TECHNICAL SPECIFICATION

DIMENSIONING DATA

Supply air		
Supply air volume flow rate	1800	l/s
External static pressure	300	Pa
Internal static pressure	347	Pa
Ref. density	1.2	kg/m³

Exhaust air		
Extract air volume flow rate	1800	l/s
External static pressure	300	Pa
Internal static pressure	178	Pa
Ref. density	1.2	kg/m³

Winter		
Design outdoor temperature winter	-5	°C
Dim. humidity winter	99	%
Temperature in, extract air, winter	19	°C
Air humidity in, extract air, winter	50	%

Summer		
Design outdoor temperature summer	28	°C
Dim. humidity summer	50	%
Temperature in, extract air, summer	24	°C
Air humidity in, extract air, summer	45	%

UNIT

Unit type . . . . . eQ
Size 023
Installation . . . . . Outdoor horizontal
Sum filtration supply air . . . . . ePM1 - 70.0%
Total dry weight . . . . . 1696 kg
Controls . . . . . with
Transport dimensions . . . . . See block list page
Unit dimensions . . . . . 4600 x 1852 x 1700 mm

CASING

Model box code . . . . . EQ 2111
Thermal insulation T3
Condensation insulation TB3
Casing strength . . . . . D1(M)
Material . . . . . AlZn sheet steel
Leakage class . . . . . L1(M) / L2(R)*

ERP / EUROVENT

Unit type . . . . . NRVU BVU
SFPint . . . . . 354 W/(m³/s)
Dry temperature efficiency (balanced) . . . . . 81.6 %
External leakage rate . . . . . 0.4 %
Internal leakage rate . . . . . 0.0 %
Mixing ratio at winter design temperature . . . . . 0.0 %

Approved according to requirements 2018



	Supply air	Extract air	
Heat exchanger pressure drop	97	97	Pa
Filter energy classification			
Filter pressure drop, start	32	18	Pa
Filter area	1.3	1.3	m²
Filter cross section air velocity	1.4	1.5	m/s
Air flow	1800	1943	l/s
Total pressure rise	560	447	Pa
Fan fan system effect	0	0	Pa
Fan total efficiency	69.3	68.3	%
Fan system input power (absorbed electrical power) according to SFP	1.51	1.24	kW

Fan system effect is taken into account in fan performance

Summary Energy Calculation	Supply air	Extract air	
Airflow Rate	1.80	1.80	m^3/s
Total Static Pressure	647	478	Pa
Internal Static Pressure	347	178	Pa
Power Input	1.76	1.33	kW
Velocity	1.37	1.37	m/s
Winter Temperature Efficiency HRS (balanced)	82	82	%
Pressure drop HRS	97	97	Pa
Mixing Ratio	0.0		%
Winter Design Temperature	-5.0		°C
Electric Reheater (winter)	No		

SUMMARY

Supply air	v0 [m/s]	Et [%]	tw [°C]	rw [kg/m³]	ts [°C]	rs [kg/m³]	dP* [Pa]
Connection section	2.4			1.3144		1.1638	2
Filter	2.2			1.3144		1.1638	205
Heat exchanger	2.1	81.6	-5 / 15.1	1.3119	28 / 25.3	1.1615	101
Inspection section							0
Plenum fan		70.3	15.1 / 15.8	1.2179	25.3 / 26.1	1.171	647
Air cooler	1.7			1.2222	26.1 / 22	1.1753	26
Inspection section							0
Air heater	1.7		15 / 22	1.2253		1.1915	12
Humidifier				1.2002		1.1914	0
Inspection section							0
Connection section	2.2			1.2002		1.1914	1
Supply outlet				1.2002		1.1914	300
Exhaust air							
Exhaust inlet							300
Connection section	2.2			1.1997		1.1784	1
Filter	2.0			1.1997		1.1784	68
Inspection section							0
Plenum fan		68.7		1.1989		1.1776	478
Heat exchanger	2.1		19.6 / 1	1.2021	24.6 / 27.4	1.1808	101
Inspection section							0
Connection section	2.4			1.2845		1.1689	8

**Refers to the fan design case*
Fan system effect is taken into account in fan performance

SOUND POWER LEVELS

standard: EN13053 ISO/CD 13347-2

	Lw per octave band									LwA	
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Fresh air connection	67	69	68	65	59	58	55	52	dB	67	dB(A)
Supply air connection	71	81	72	73	70	64	58	54	dB	75	dB(A)
Extract connection	74	75	73	68	62	60	58	57	dB	70	dB(A)
Exhaust connection	73	77	70	72	66	63	59	57	dB	73	dB(A)
To surroundings	64	62	55	43	38	38	36	30	dB	51	dB(A)

ENERGY

Temperature efficiency (EN308) . . . . . 81.6 %
Heat recovery capacity . . . . . 55.8 kW
SFPv Total sum . . . . . 1.52 kW/(m³/s)
SFPe Total sum . . . . . 1.66 kW/(m³/s)

FAN POWER SUPPLY DATA

Voltage, supply flow . . . . . 3x400VAC+PE, 50Hz
Voltage, extract flow . . . . . 3x400VAC+PE, 50Hz
Power, supply flow . . . . . 2.4 kW
Power, extract flow . . . . . 1.7 kW
Current, full load, supply flow . . . . . 3.1 A
Current, full load, extract flow . . . . . 2.2 A

COILS

	Capacity	Air		Water				Conn
Air cooler	11.6 kW	26.1 °C, 56.1 %	22 °C, 68.4 %	8 / 13 °C	0.58 l/s	7.0 kPa	Ethylene glycol 20 %	DN25
Air heater	15.3 kW	15 °C, 44.1 %	22 °C, 28.4 %	44 / 39 °C	0.74 l/s	14.8 kPa		DN25

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03139999	**Customers ref.**	
Unit	2 (B) / AHU2 - Practice Rooms	**Our ref.**	Andy Window
Size	023		

TECHNICAL SPECIFICATION

Components listed in direction of air flow

SUPPLY AIR

Data at actual density as given in summary above

Intake/ exhaust section (outdoor version, with door)

Unit size: 023
Installation alternative: Fresh air in end
Damper type: with AluZink damper CEN class 3
Inspection side: right
Pressure drop, dimensioning 2 Pa

Casing end wall

Damper
Width cm : 140
Height in cm : 060
Tightness class : CEN 3
Connection: Flange
Function : Outdoor air
Location: internally end wall
Damper type: 200 mm blade
Material : AlZn

Damper actuator

Duct connection piece
Width cm : 140
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Empty section
Unit size : 023
Length: 030
Inspection side : right

Filter

Inspection side: right

Filter selection
Filter class: F8 - ePM1 70%, glassfibre, short
Filter frame : AZ sheet steel
Prefilter: G4 – coarse, synthetic

Design
Connection side : inlet in end wall
Location: negative pressure
Drain tray: without

Number of filters	2x592x592, 1x287x592 L=380	
Pressure drop, start	130	Pa
Pressure drop, dimensioning	205	Pa
Pressure drop, end	280	Pa
Face area	0.9	m^2
Face velocity	2.2	m/s

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring

Filter monitoring

Rotary heat exchanger

Size: 023
Rotor type: Regoterm
Edge-reinforced: no
Foil spacing: Outputvariant 6 (2.1 mm, 270 mm wheel)
Delivery version: Whole rotor
Function lenght: standard
Material: galvanized sheet steel/AlZn
Inspection side: right

Efficiency			
Temperature efficiency according to standard EN 308		81.6	%
Temperature efficiency at 0°C outdoors		81.6	%
Cooling recovery		80.9	%
Humidity efficiency, Summer		0.0	%
Humidity efficiency, Winter		50.3	%
Supply air	**Summer**	**Winter**	
Pressure drop	101	90	Pa
Air temperature	28 / 25.3	-5 / 15.1	°C
Relative humidity	50 / 58.8	99 / 43.9	%
Capacity reduction	6	56	kW
Air flow transfer	143	143	l/s
Face velocity	2.2	2.1	m/s
Exhaust air	**Summer**	**Winter**	
Pressure drop	101	92	Pa
Air temperature	24.6 / 27.4	19.6 / 1	°C
Relative humidity	43.4 / 36.9	48.2 / 100	%
Additional throttling	0	0	Pa
Face velocity	2.2	2.1	m/s

Empty section

Unit size : 023
Length: 020
Inspection side : right

Plenum fan

Inspection side: right

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 1
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Speed	1841	Rpm
Max speed	2050	Rpm
Total efficiency	70.3	%
Total static pressure, dimensioning (wet coil)	647	Pa
Dynamic pressure	22	Pa
Fan system input power (absorbed electrical power)	1.76	kW
Temperature rise	0.8	°C
K factor	16.36	
Fan wheel size	045	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	1.51	kW
Pressure rise	560	Pa
Speed	1740	Rpm

Motor

Motor output	2.4	kW
Electric current	3.1	A
Output margin, minimum	10	%

Motor accessories

Air cooler for chilled water

Size: 023
Connection side: right
Material: galvanized sheet steel
Droplet eliminator: without
Design variant: version 3

Coil selection

Use as: Cooling Coil
Calculation principle: input data
Output variant: 2
Fluid passes: 06
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Shunt selection

Shunt control: without

Nom. pipe size	25	
Liquid volume	8.8	l
Pressure drop, dimensioning	26	Pa
Ethylene glycol	20	%
Oversizing	98.6	%
Pressure drop, wet coil	26	Pa
Pressure drop, dry coil	22	Pa
Output	11.6	kW
Air temperature	26.1 / 22	°C
Relative humidity	56.1 / 68.4	%
Face velocity	1.7	m/s
Water temperature	8 / 13	°C
Water flow	0.58	l/s
Water velocity	0.7	m/s
Pressure drop water	7.0	kPa
Amount of condensation	0.0	l/s

Empty section

Unit size : 023
Length: 035
Inspection side : right

Air heater for hot water

Size: 023
Inspection side: right
Material: galvanized sheet steel
Coil selection
Calculation principle: input data
Output variant: 1
Fluid passes: 04
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Nom. pipe size	25	
Liquid volume	4.7	l
Pressure drop, dimensioning	12	Pa
Control principle for water heater	flow control	
Oversizing	31.5	%
Output	15.3	kW
Air temperature	15 / 22	°C
Face velocity	1.7	m/s
Water temperature	44 / 39	°C
Water flow	0.74	l/s
Water velocity	1.4	m/s
Pressure drop water	14.8	kPa

Humidifier

Unit size: 023
Length in cm: 060
Material: FZ sheet steel
Inspection side: right
Version: Standard

Empty section

Unit size : 023
Length: 010
Inspection side : right

End connection frame

Pressure drop, dimensioning 1 Pa
Casing end wall
Duct connection piece
Width cm : 140
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

EXHAUST AIR

Data at actual density as given in summary above

End connection frame

Pressure drop, dimensioning 1 Pa
Casing end wall
Duct connection piece
Width cm : 140
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Filter

Inspection side: left

Filter selection

Filter class: pleated G4 – coarse, synthetic

Design

Drain tray: without

Number of filters	2x592x592, 1x287x592	
Pressure drop, start	43	Pa
Pressure drop, dimensioning	68	Pa
Pressure drop, end	93	Pa
Face area	0.9	m^2
Face velocity	2.0	m/s

Analogue differential pressure sensor

Design: U-tube manometer for air flow measuring

Filter monitoring

Empty section

Unit size : 023
Length: 025
Inspection side : left

Plenum fan

Inspection side: left

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 1
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Speed	1689	Rpm
Max speed	1800	Rpm
Total efficiency	68.7	%
Total static pressure, dimensioning (wet coil)	478	Pa
Dynamic pressure	22	Pa
Fan system input power (absorbed electrical power)	1.33	kW
Temperature rise	0.6	°C
K factor	16.36	
Fan wheel size	045	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	1.24	kW
Pressure rise	447	Pa
Speed	1640	Rpm

Motor

Motor output	1.7	kW
Electric current	2.2	A
Output margin, minimum	10	%

Motor accessories

Empty section

Unit size : 023
Length: 025
Inspection side : left

Intake/ exhaust section (outdoor version, with door)

Unit size: 023
Installation alternative: Damper inside on end wall
Damper type: with AluZink damper CEN class 3
Inspection side: left
Pressure drop, dimensioning 8 Pa

Empty section
Unit size : 023
Length: 030
Inspection side : left

Casing end wall

Damper
Width cm : 140
Height in cm : 060
Tightness class : CEN 3
Connection: Flange
Function : extract air
Location: internally end wall
Damper type: 200 mm blade
Material : AlZn

Damper actuator

Duct connection piece
Width cm : 140
Height in cm : 60
Connection type: flange connection
Material: galvanized sheet steel / AlZn

BLOCK LIST

	Length	Width	Height	Volume	Weight
Intake/ exhaust section (outdoor version, with door), Filter *EQGB-023-090-22-1-1-2-1-2-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	950 mm	1850 mm	1331 mm	2.34 m^3	228 kg
Rotary heat exchanger *EQHB-023-055-22-1-1-2-1-3-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	600 mm	1850 mm	2257 mm	2.51 m^3	324 kg
Plenum fan, Air cooler for chilled water , Air heater for hot water, Humidifier, End connection frame *EQGB-023-315-22-1-1-2-1-4-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	3200 mm	2000 mm	1331 mm	8.52 m^3	691 kg
End connection frame, Filter, Plenum fan *EQGB-023-115-22-1-1-2-1-2-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1200 mm	1850 mm	1181 mm	2.62 m^3	287 kg
Intake/ exhaust section (outdoor version, with door) *EQGB-023-065-22-1-1-2-1-4-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	700 mm	1750 mm	1181 mm	1.45 m^3	166 kg
				17.43 m^3	1696 kg

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

CONTROLS

Electrical cabinet

Control cabinet: Assembly: Cabinet side and bottom floor Flange location: Bottom Position: Outdoor IP65 Integrated web server	EQCM-1-01-3-2-2-02-8-0-1
Control panel: Siemens Climatix 600 Modbus TCP Basic web Integrated web server	STCM-03-0-0-2-0-2-1
Semi-graphical HMI	STCZ-77-02-0-1
Communication BACnet IP	STCZ-84-03-1-1
Miniature circuit breaker: Supply air fan 1, 3-phases, 10A	STCZ-89-011-3-010-1-1
Miniature circuit breaker: Extract air fan 1, 3-phases, 10A	STCZ-89-021-3-010-1-1
Miniature circuit breaker: Manoeuvre control cabinett, 1-phase, 6A	STCZ-89-050-1-006-1-1
Miniature circuit breaker: Socket with personal safety, 1-phase, 6A	STCZ-89-072-1-006-1-1
Miniature circuit breaker: HEX (1st), 1-phase, 10A	STCZ-89-081-1-010-1-1
Miniature circuit breaker: Heat1(pump), 1-phase, 6A	STCZ-89-112-1-006-1-1
Miniature circuit breaker: Cool 1 (pump), 1-phase, 6A	STCZ-89-113-1-006-1-1
Main switch:	STCZ-87-4-3-038-020-0-3-3-05-1
Service socket: EU (type F)	STCZ-92-2-0-1

Configuration

HMI language: English	STDZ-01-03-000-1
Temp control: Extract Air Temp Control	STDZ-05-02-000-1
Cooling recovery: With, based on temperature	STDZ-08-01-000-1
Humidity control: Extract air control	STDZ-10-02-000-1
Humidification control	STDZ-11-01-000-1
Frost protection heat exchanger: Enthalpy	STDZ-13-02-000-1
Fire alarm 1: Both fans stopped	STDZ-15-01-000-1
Fan control: Flow controlled supply and exhaust fans	STDZ-19-01-000-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-1-082-087-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-2-183-193-1
Filter alarm with sensor: extract air filter	STDZ-24-2-2-088-093-1

FUNCTION DESCRIPTION

Starting and stopping the air handling unit
The supply air fan and exhaust air fan are started and stopped according to internal scheduler.
The controller forces the heat exchanger to 100% recovery during start-up.
Mode selection switch is available in web interface and on the operator's control panel along with operation and alarm indication.
The following dampers open before supply/exhaust fan start and close when supply/exhaust fan stop:
- Outdoor air damper
- Exhaust air damper
The following dampers close in the event of a loss of power:
- Outdoor air damper
- Exhaust air damper

Temperature control
If there is an increased heating demand the heating sequence is controlled in the following order:
- Heat exchanger for heat recovery
- Heating coil 1, water
If there is an increased cooling demand the cooling sequence is controlled in the following order:
- Heat exchanger for cooling recovery; if the temperature of the Extract air is lower than the temperature of the Outdoor air. Otherwise blocked.
- Cooling coil 1, water
The rotary heat exchanger is controlled by the control unit by means of a drive unit.
The control unit maintains the extract air temperature at the setpoint by controlling the supply air temperature.
The supply air temperature sensor limits the minimum and maximum supply air temperature.
A risk of frost in heating coil 1 is detected by:
- Return water temperature sensor
If there is a risk of frost in heating coil 1 the air handling unit is stopped.
If there is a risk of frost in heating coil 1 its valve actuator is forced to open. If the risk of frost persists the air handling unit is stopped.
When the air handling unit is stopped the return water temperature in heating coil 1 is maintained at 20°C.
Operation of the circulation pump for heating coil 1 is handled by the control unit and the pump is in operation if there is a heating demand, or if the coil return water temperature falls below 12 °C, or during pump kick function.
Operation of the circulation pump for cooling coil 1 is handled by the control unit and the pump is in operation if there is a heating demand or during pump kick function.

Fan control
The supply air flow is maintained according to operative setpoint by means of the speed controlled supply air fan.
The extract air flow is maintained according to operative setpoint by means of the speed controlled exhaust air fan.

Humidity control
The relative humidity in the extract air is maintained at the setpoint by controlling the supply air humidity.
The supply air humidity sensor limits the minimum and maximum relative humidity in the supply air.
During humidification the control unit controls heating coil 1 before the humidifier in sequence for increased output.

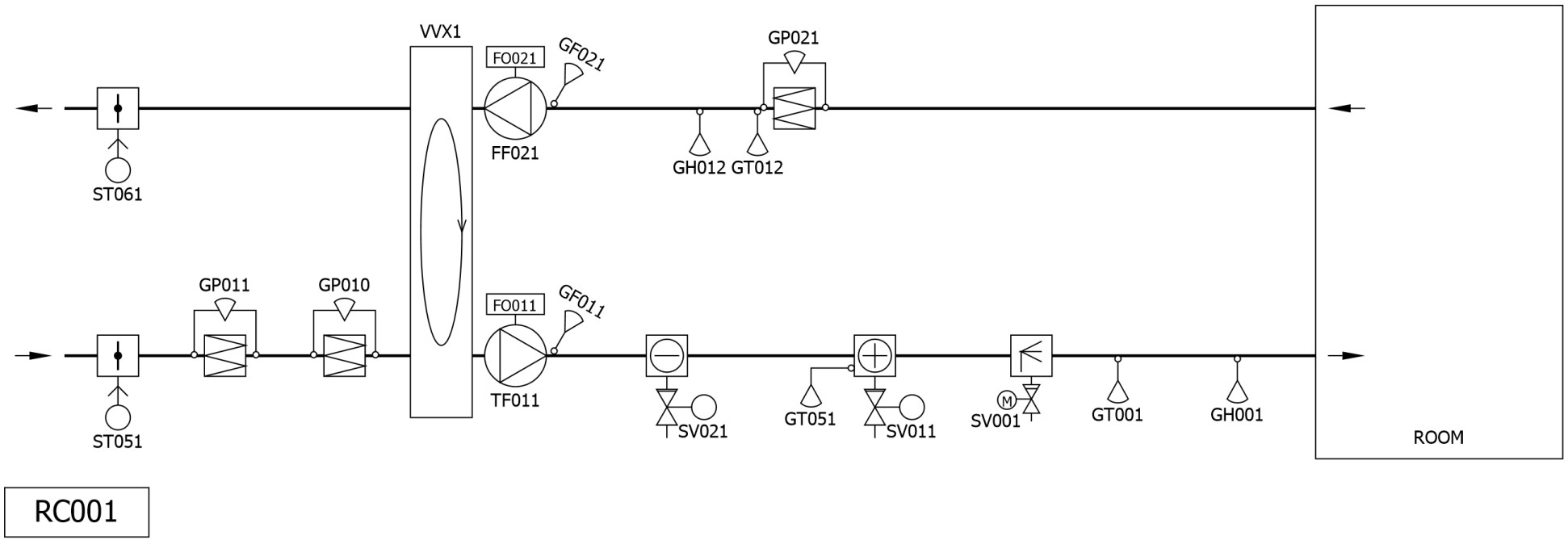
Filter monitoring
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air

Frost protection
When the calculated temperature in the extract air after the rotary heat exchanger drops below the dew point of the exhaust air and set value, recovery is limited so as to prevent the formation of frost.

Fire mode
In case of of fire alarm 1 the air handling unit is stopped.

Alarms are generated for
- Manual operation
- Heat exchanger
- Overload, circulation pump, heating coil 1
- Overload, circulation pump, cooling coil 1
- Overload, circulation pump, recovery
- Control fault, supply air fan
- Control fault, exhaust air fan
- Fault in speed controlled supply air fan
- Fault in speed controlled exhaust air fan
- Fire alarm
- Frost protection, heating coil 1
- Humidifier, supply air
- Prefilter, outdoor air

- Filter, outdoor air
- Filter, extract air
- Temperature sensor fault



	Customer id	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(B) / AHU2 - Practice Rooms	
	Unit	2	**Supply air volume flow rate**	eQ - 023	1800 l/s
	AOC	ACON-03139999	**Extract air volume flow rate**	eQ - 023	1800 l/s

COMPONENT LIST

Description	Reference	Type	Delivery options	
Frequency converter, supply fan 1	FO011	Ziehl-Abegg	Factory installed and connected	
Frequency converter, extract fan 1	FO021	Ziehl-Abegg	Factory installed and connected	
Humidifier	AS030		Not included	
Damper actuator on/off with spring return, exhaust air	ST061	GCA121.1E/FW1	Factory installed and connected	
Semi-graphical HMI		POL871.71/STD HMI	Supplied	
Differential pressure sensor, supply air fan 1	GF011	SE2:QBM70.7000TNFW	Factory installed and connected	
Differential pressure sensor, extract air fan 1	GF021	SE2:QBM70.7000TNFW	Factory installed and connected	
Damper actuator on/off with spring return, outdoor air	ST051	GCA121.1E/FW1	Factory installed and connected	
Humidity/Temperature sensor, supply air	GH001/GT001	FTK140 MODBUS	Supplied with cable and quick connector	
Differential pressure sensor, filter extract air	GP021	SE2:QBM70.7000TNFW	Factory installed and connected	
Humidity/Temperature sensor, extract air	GH012/GT012	FTK140 MODBUS	Factory installed and connected	
Communication BACnet IP		POL908.00/STDBAC net IP	Installed	
Differential pressure sensor prefilter+filter, temperature outdoor air	GP010/GP011/ GT003	SE2:QBM70.7012/FW	Factory installed and connected	
Immersion sensor, return heating 1	GT051	AKF10.190.04 MODBUS	Supplied with cable and quick connector	

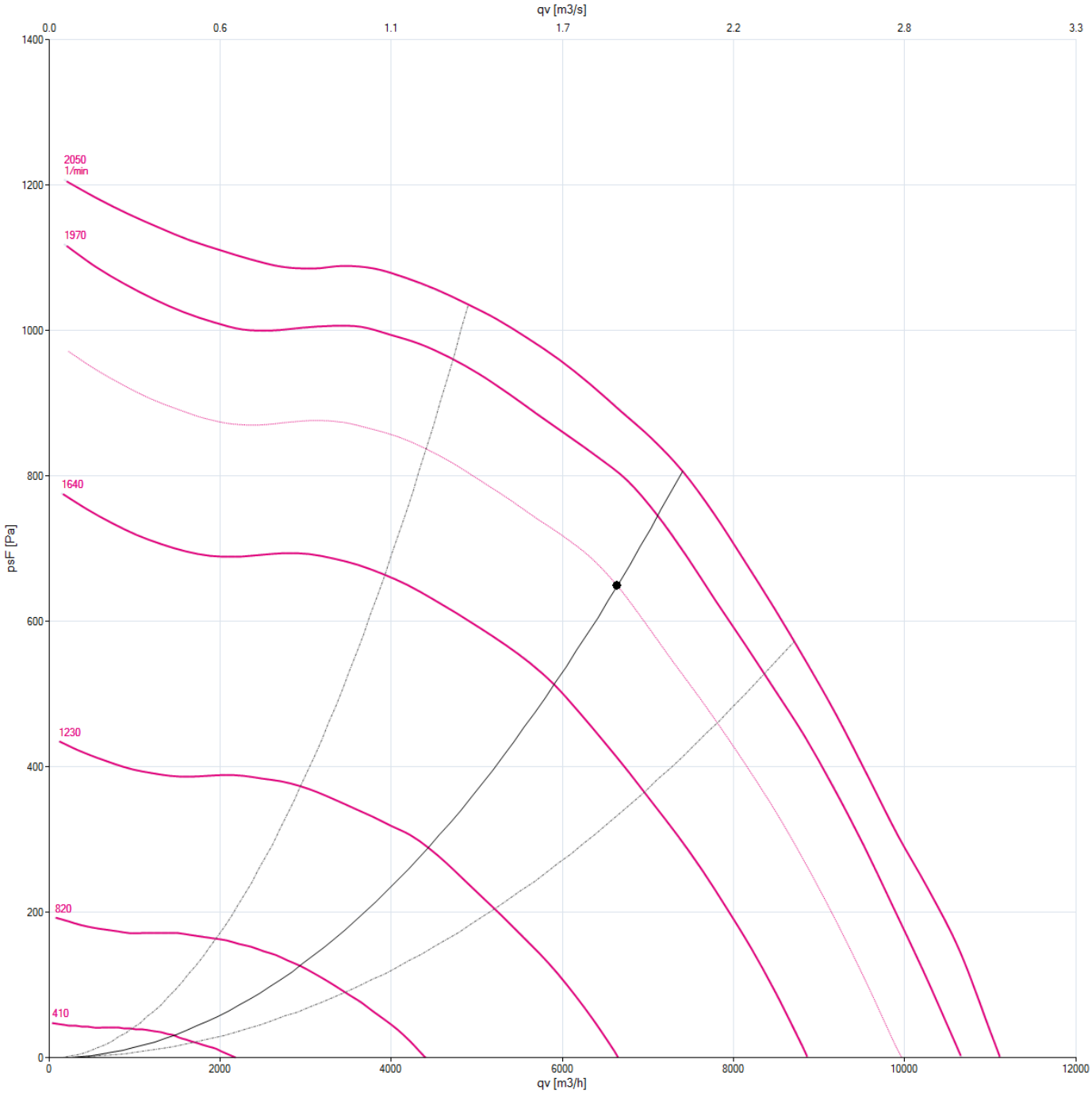
RATED CURRENT

Connection Point	Product code	Rated Voltage	No	Imax	Fmax	CSA
Mains cabling cabinet	STCZ-88	3x400VAC±10%+N+PE, 50Hz	5	8.3 A	63 A	35 mm²
Total				8.3 A		

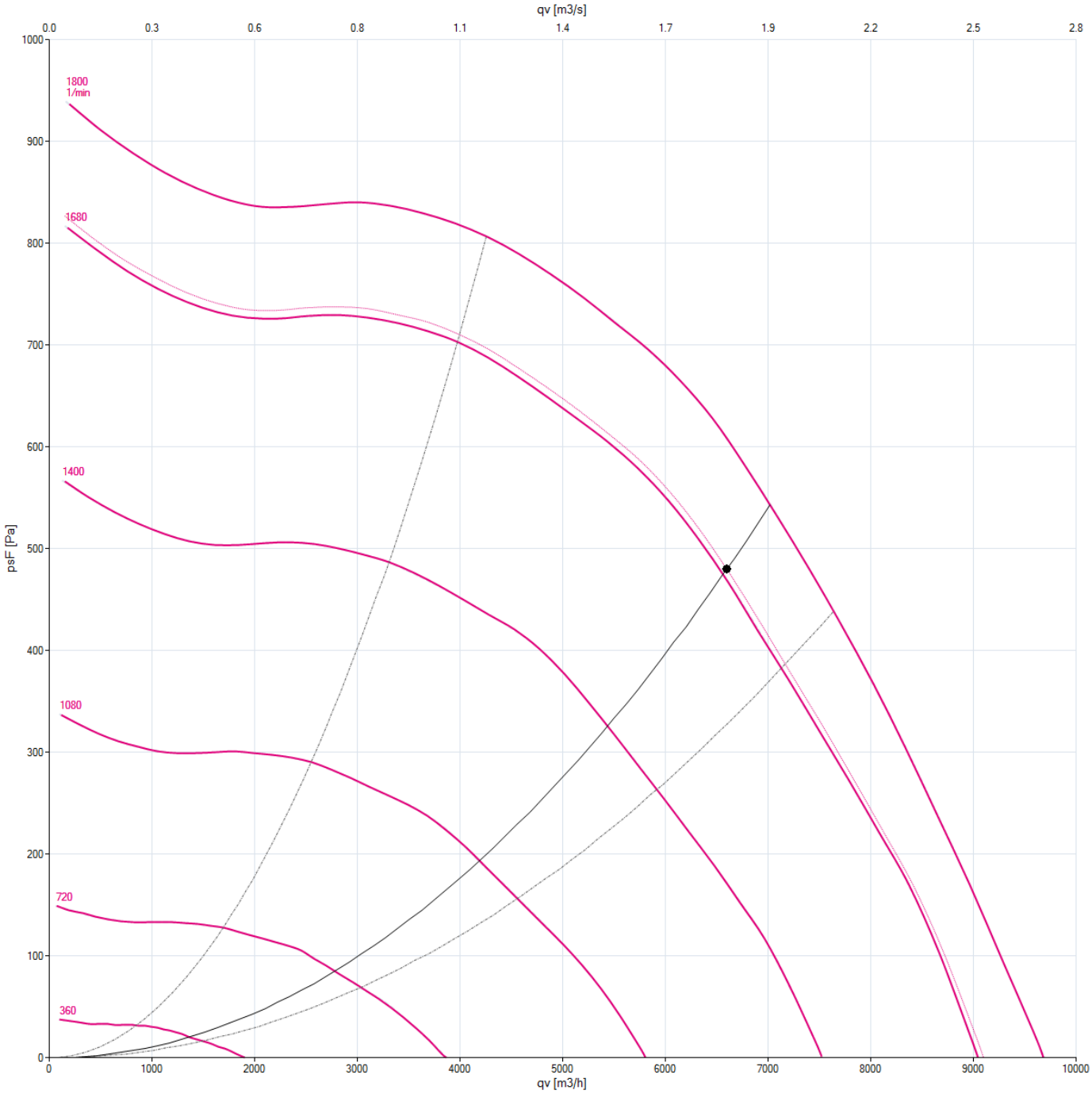
* Note that current for circulation pump is not included. AHU is dimensioned for pumps with max 6A per pump
* Miniature circuit breakers in switch cabinet have C characteristics

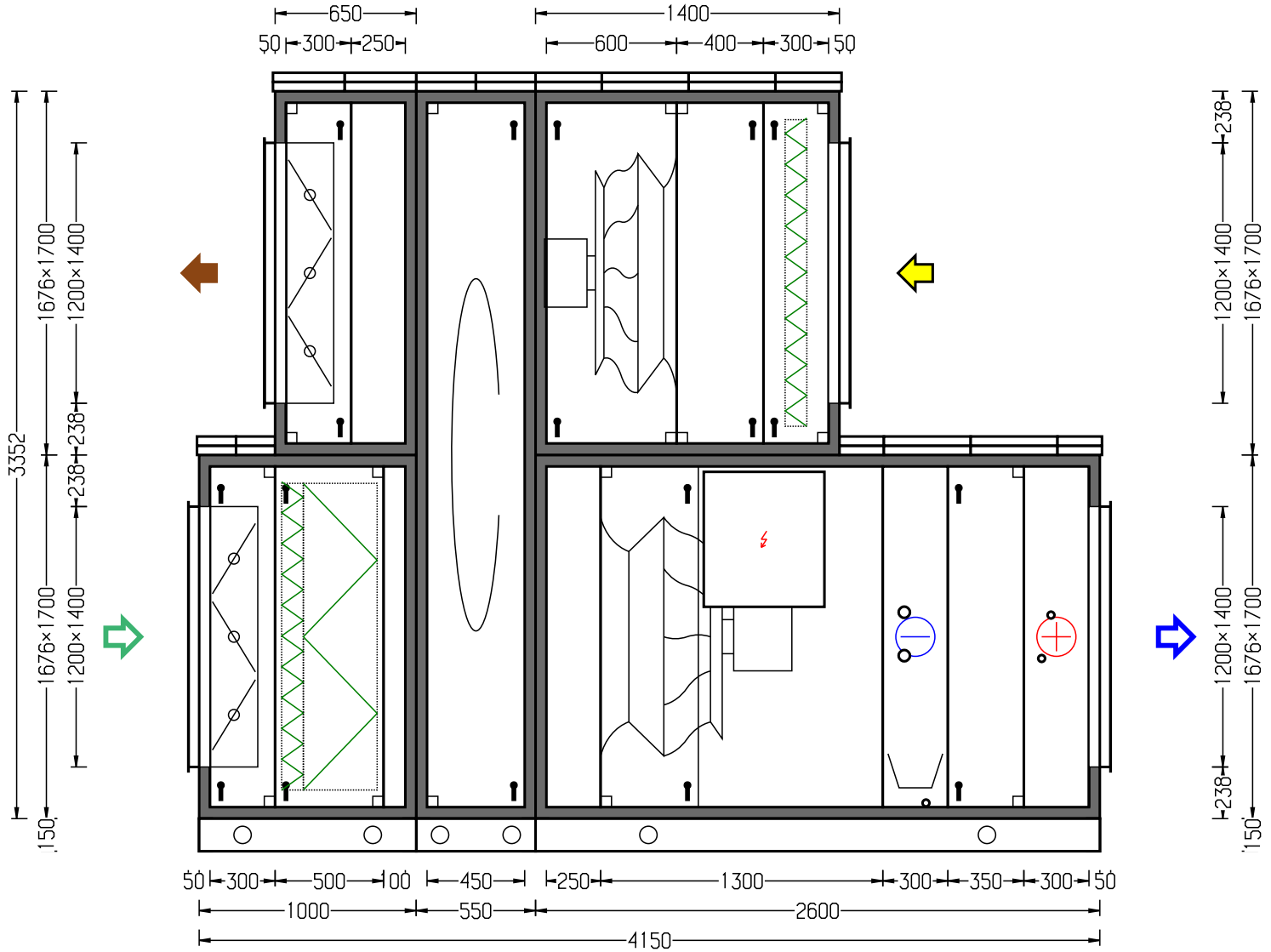
No = Number of conductors
Imax = Maximum current
Fmax = Maximum external fuse
CSAmax = Maximum cross sectional area

FAN CHART - SUPPLY AIR

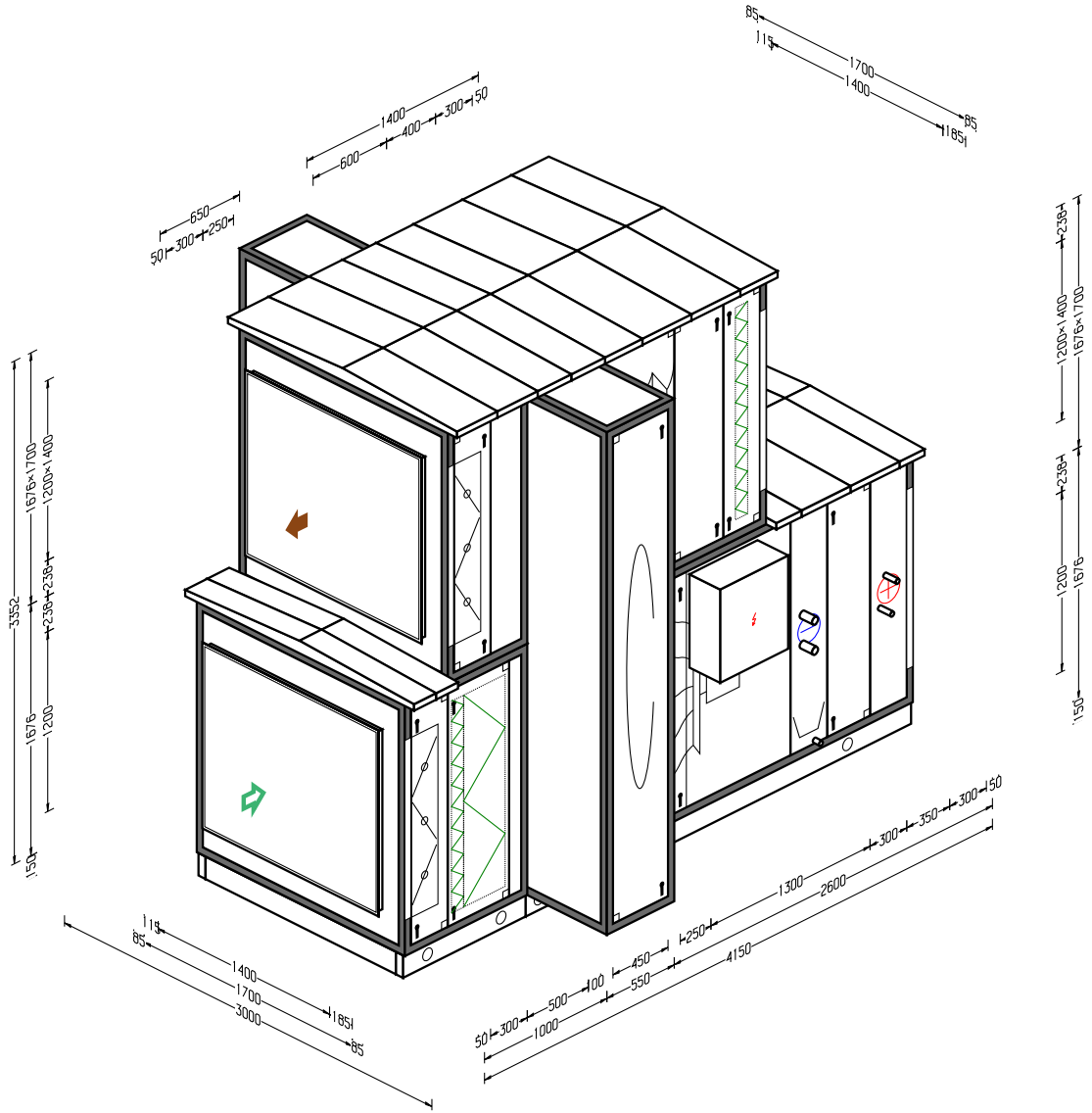


FAN CHART - EXTRACT AIR





From Inspection Side	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(C) / AHU3 - Studios (Option 1)	
	Unit	3	**Supply air volume flow rate**	eQ - 056	4500 l/s
	AOC	ACON-03140001	**Extract air volume flow rate**	eQ - 056	4500 l/s



Isometric South West	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(C) / AHU3 - Studios (Option 1)	
	Unit	3	**Supply air volume flow rate**	eQ - 056	4500 l/s
	AOC	ACON-03140001	**Extract air volume flow rate**	eQ - 056	4500 l/s

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140001	**Customers ref.**	
Unit	3 (C) / AHU3 - Studios (Option 1)	**Our ref.**	Andy Window
Size	056		

SUMMARY TECHNICAL SPECIFICATION

DIMENSIONING DATA

Supply air		
Supply air volume flow rate	4500	l/s
External static pressure	400	Pa
Internal static pressure	357	Pa
Ref. density	1.2	kg/m³

Exhaust air		
Extract air volume flow rate	4500	l/s
External static pressure	400	Pa
Internal static pressure	176	Pa
Ref. density	1.2	kg/m³

Winter		
Design outdoor temperature winter	-5	°C
Dim. humidity winter	99	%
Temperature in, extract air, winter	19	°C
Air humidity in, extract air, winter	50	%

Summer		
Design outdoor temperature summer	28	°C
Dim. humidity summer	50	%
Temperature in, extract air, summer	24	°C
Air humidity in, extract air, summer	45	%

UNIT

Unit type . . . . . eQ
Size 056
Installation . . . . . Outdoor horizontal
Sum filtration supply air . . . . . ePM1 - 70.0%
Total dry weight . . . . . 2826 kg
Controls . . . . . with
Transport dimensions . . . . . See block list page
Unit dimensions . . . . . 4150 x 3352 x 3000 mm

CASING

Model box code . . . . . EQ 2111
Thermal insulation T3
Condensation insulation TB3
Casing strength . . . . . D1(M)
Material . . . . . AlZn sheet steel
Leakage class . . . . . L1(M) / L2(R)*

ERP / EUROVENT

Unit type . . . . . NRVU BVU
SFPint . . . . . 364 W/(m³/s)
Dry temperature efficiency (balanced) . . . . . 82.5 %
External leakage rate . . . . . 0.3 %
Internal leakage rate . . . . . 0.0 %
Mixing ratio at winter design temperature . . . . . 0.0 %

Approved according to requirements 2018



	Supply air	Extract air	
Heat exchanger pressure drop	92	92	Pa
Filter energy classification			
Filter pressure drop, start	45	27	Pa
Filter area	2.5	2.5	m²
Filter cross section air velocity	1.8	2.0	m/s
Air flow	4500	4936	l/s
Total pressure rise	672	547	Pa
Fan fan system effect	0	0	Pa
Fan total efficiency	70.7	70.0	%
Fan system input power (absorbed electrical power) according to SFP	4.42	3.66	kW

Fan system effect is taken into account in fan performance

Summary Energy Calculation	Supply air	Extract air	
Airflow Rate	4.50	4.50	m^3/s
Total Static Pressure	757	576	Pa
Internal Static Pressure	357	176	Pa
Power Input	5.09	3.91	kW
Velocity	1.79	1.79	m/s
Winter Temperature Efficiency HRS (balanced)	82	82	%
Pressure drop HRS	92	92	Pa
Mixing Ratio	0.0		%
Winter Design Temperature	-5.0		°C
Electric Reheater (winter)	No		

SUMMARY

Supply air	v0 [m/s]	Et [%]	tw [°C]	rw [kg/m³]	ts [°C]	rs [kg/m³]	dP* [Pa]
Connection section	3.0			1.3144		1.1638	4
Filter	2.3			1.3144		1.1638	209
Inspection section							0
Heat exchanger	1.7	82.5	-5 / 15.4	1.3119	28 / 25.3	1.1614	95
Inspection section							0
Plenum fan		70.5	15.4 / 16.2	1.2157	25.3 / 26.2	1.1725	757
Air cooler	2.2			1.2208	26.2 / 22	1.1777	31
Inspection section							0
Air heater	2.1		15 / 22	1.2243		1.1942	17
Connection section	2.7			1.2004		1.194	1
Supply outlet				1.2004		1.194	400
Exhaust air							
Exhaust inlet							400
Connection section	2.7			1.1985		1.1773	1
Filter	2.0			1.1985		1.1773	68
Inspection section							0
Plenum fan		70.3		1.1977		1.1765	576
Heat exchanger	1.7		19.7 / -0.7	1.2016	24.7 / 27.4	1.1804	95
Inspection section							0
Connection section	3.0			1.2931		1.1669	12

**Refers to the fan design case*
Fan system effect is taken into account in fan performance

SOUND POWER LEVELS

standard: EN13053 ISO/CD 13347-2

	Lw per octave band									LwA	
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Fresh air connection	70	78	74	71	66	64	59	57	dB	73	dB(A)
Supply air connection	75	85	78	79	77	73	67	61	dB	81	dB(A)
Extract connection	78	81	78	74	68	66	62	61	dB	76	dB(A)
Exhaust connection	76	83	76	78	73	71	67	62	dB	79	dB(A)
To surroundings	68	69	60	49	45	44	40	30	dB	57	dB(A)

ENERGY

Temperature efficiency (EN308) . . . . . 82.5 %
Heat recovery capacity . . . . . 160 kW
SFPv Total sum . . . . . 1.79 kW/(m^3/s)
SFPe Total sum . . . . . 1.94 kW/(m^3/s)

FAN POWER SUPPLY DATA

Voltage, supply flow . . . . . 3x400VAC+PE, 50Hz
Voltage, extract flow . . . . . 3x400VAC+PE, 50Hz
Power, supply flow . . . . . 2 x 3.5 kW
Power, extract flow . . . . . 2 x 3.5 kW
Current, full load, supply flow . . . . . 2 x 4.4 A
Current, full load, extract flow . . . . . 2 x 4.4 A

COILS

	Capacity	Air		Water				Conn
Air cooler	23.3 kW	26.2 °C, 43.7 %	22 °C, 56.3 %	8 / 13 °C	1.17 l/s	6.9 kPa	Ethylene glycol 20 %	DN50
Air heater	38.4 kW	15 °C, 57.2 %	22 °C, 36.9 %	44 / 38.9 °C	1.81 l/s	17.9 kPa		DN32

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140001	**Customers ref.**	
Unit	3 (C) / AHU3 - Studios (Option 1)	**Our ref.**	Andy Window
Size	056		

TECHNICAL SPECIFICATION

Components listed in direction of air flow

SUPPLY AIR

Data at actual density as given in summary above

Intake/ exhaust section (outdoor version, with door)

Unit size: 056
Installation alternative: Fresh air in end
Damper type: with AluZink damper CEN class 3
Inspection side: right
Pressure drop, dimensioning 4 Pa

Casing end wall
Damper
Width cm : 140
Height in cm : 120
Tightness class : CEN 3
Connection: Flange
Function : Outdoor air
Location: internally end wall
Damper type: 200 mm blade
Material : AlZn
Damper actuator
Duct connection piece
Width cm : 140
Height in cm : 120
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Empty section
Unit size : 056
Length: 030
Inspection side : right

Filter

Inspection side: right

Filter selection
Filter class: F8 - ePM1 70%, glassfibre, short
Filter frame : AZ sheet steel
Prefilter: G4 – coarse, synthetic

Design
Connection side : inlet in end wall
Location: negative pressure
Drain tray: without

Number of filters	4x592x592, 4x287x592, 1x287x287 L=380	
Pressure drop, start	134	Pa
Pressure drop, dimensioning	209	Pa
Pressure drop, end	284	Pa
Face area	2.3	m^2
Face velocity	2.3	m/s

Anti-slip protection
Unit size : 056
Function: Filter, Empty section
Width: 1
Material: aluminium
Version: version 1

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring

Filter monitoring

Empty section

Unit size : 056
Length: 010
Inspection side : right

Rotary heat exchanger

Size: 056
Rotor type: RegAsorp
Edge-reinforced: no
Foil spacing: Outputvariant 6 (2.1 mm, 270 mm wheel)
Delivery version: sectoriserad rotor, split casing
Function lenght: standard
Material: galvanized sheet steel/AlZn
Inspection side: right

Efficiency			
Temperature efficiency according to standard EN 308		82.5	%
Temperature efficiency at 0°C outdoors		82.5	%
Cooling recovery		81.8	%
Humidity efficiency, Summer		73.2	%
Humidity efficiency, Winter		82.3	%
Supply air	**Summer**	**Winter**	
Pressure drop	95	84	Pa
Air temperature	28 / 25.3	-5 / 15.4	°C
Relative humidity	50 / 46.2	99 / 55.9	%
Capacity reduction	50	160	kW
Air flow transfer	436	436	l/s
Face velocity	1.8	1.7	m/s
Exhaust air	**Summer**	**Winter**	
Pressure drop	95	86	Pa
Air temperature	24.7 / 27.4	19.7 / -0.7	°C
Relative humidity	43.1 / 47.8	47.9 / 90.4	%
Additional throttling	0	0	Pa
Face velocity	1.8	1.7	m/s

Empty section

Unit size : 056
Length: 025
Inspection side : right

Plenum fan

Inspection side: right

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 2
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Two fan wheels in parallel

Speed	1759	Rpm
Max speed	1950	Rpm
Total efficiency	70.5	%
Total static pressure, dimensioning (wet coil)	757	Pa
Dynamic pressure	23	Pa
Fan system input power (absorbed electrical power)	5.09	kW
Temperature rise	0.9	°C
K factor	6.43	
Fan wheel size	050	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	4.42	kW
Pressure rise	672	Pa
Speed	1666	Rpm

Motor

Motor output	2 x 3.5	kW
Electric current	2 x 4.4	A
Output margin, minimum	10	%

Anti-slip protection

Unit size : 056
Function: Plenum fan (EQLK)
Width: 1
Material: aluminium
Version: version 1

Motor accessories

Air cooler for chilled water

Size: 056
Connection side: right
Material: galvanized sheet steel
Droplet eliminator: without
Design variant: version 3

Coil selection

Use as: Cooling Coil
Calculation principle: input data
Output variant: 2
Fluid passes: 06
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Shunt selection

Shunt control: without

Nom. pipe size	50	
Liquid volume	22.3	l
Pressure drop, dimensioning	31	Pa
Ethylene glycol	20	%
Oversizing	92.3	%
Pressure drop, wet coil	31	Pa
Pressure drop, dry coil	32	Pa
Output	23.3	kW
Air temperature	26.2 / 22	°C
Relative humidity	43.7 / 56.3	%
Face velocity	2.2	m/s
Water temperature	8 / 13	°C
Water flow	1.17	l/s
Water velocity	0.7	m/s
Pressure drop water	6.9	kPa
Amount of condensation	0.0	l/s

Empty section

Unit size : 056
Length: 035
Inspection side : right

Air heater for hot water

Size: 056
Inspection side: right
Material: galvanized sheet steel

Coil selection

Calculation principle: input data
Output variant: 1
Fluid passes: 04
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Nom. pipe size	32	
Liquid volume	10.8	l
Pressure drop, dimensioning	16	Pa
Control principle for water heater	flow control	
Oversizing	17.8	%
Output	38.4	kW
Air temperature	15 / 22	°C
Face velocity	2.1	m/s
Water temperature	44 / 38.9	°C
Water flow	1.81	l/s
Water velocity	1.5	m/s
Pressure drop water	17.9	kPa

End connection frame

Pressure drop, dimensioning	1	Pa

Casing end wall
Duct connection piece
Width cm : 140
Height in cm : 120
Connection type: flange connection
Material: galvanized sheet steel / AlZn

EXHAUST AIR

Data at actual density as given in summary above

End connection frame

Pressure drop, dimensioning	1	Pa

Casing end wall
Duct connection piece
Width cm : 140
Height in cm : 120
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Filter

Inspection side: left
Filter selection
Filter class: pleated G4 – coarse, synthetic
Design
Drain tray: without

Number of filters	4x592x592, 4x287x592	
Pressure drop, start	43	Pa
Pressure drop, dimensioning	68	Pa
Pressure drop, end	93	Pa
Face area	2.3	m^2
Face velocity	2.0	m/s

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring
Filter monitoring

Empty section

Unit size : 056
Length: 040
Inspection side : left
Anti-slip protection
Unit size : 056
Function: Filter, Empty section
Width: 1
Material: aluminium
Version: version 1

Plenum fan

Inspection side: left

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 2
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Two fan wheels in parallel

Speed	1613	Rpm
Max speed	1950	Rpm
Total efficiency	70.3	%
Total static pressure, dimensioning (wet coil)	576	Pa
Dynamic pressure	23	Pa
Fan system input power (absorbed electrical power)	3.91	kW
Temperature rise	0.7	°C
K factor	6.43	
Fan wheel size	050	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	3.66	kW
Pressure rise	547	Pa
Speed	1568	Rpm

Motor

Motor output	2 x 3.5	kW
Electric current	2 x 4.4	A
Output margin, minimum	10	%

Anti-slip protection

Unit size : 056
Function: Plenum fan (EQLK)
Width: 1
Material: aluminium
Version: version 1

Motor accessories

Empty section

Unit size : 056
Length: 025
Inspection side : left

Intake/ exhaust section (outdoor version, with door)

Unit size: 056
Installation alternative: Damper inside on end wall
Damper type: with AluZink damper CEN class 3
Inspection side: left
Pressure drop, dimensioning 12 Pa

Empty section
Unit size : 056
Length: 030
Inspection side : left

Casing end wall

Damper
Width cm : 140
Height in cm : 120
Tightness class : CEN 3
Connection: Flange
Function : extract air
Location: internally end wall
Damper type: 200 mm blade
Material : AlZn

Damper actuator

Duct connection piece
Width cm : 140
Height in cm : 120
Connection type: flange connection
Material: galvanized sheet steel / AlZn

BLOCK LIST

	Length	Width	Height	Volume	Weight
Intake/ exhaust section (outdoor version, with door), Filter *EQGB-056-100-22-1-1-2-1-2-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1050 mm	1850 mm	2081 mm	4.04 m^3	332 kg
Rotary heat exchanger *EQHB-056-055-22-1-1-2-1-7-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1200 mm	3255 mm	2025 mm	7.91 m^3	971 kg
Plenum fan, Air cooler for chilled water , Air heater for hot water, End connection frame *EQGB-056-260-22-1-1-2-1-4-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	2650 mm	2000 mm	2081 mm	11.03 m^3	816 kg
End connection frame, Filter, Plenum fan *EQGB-056-140-22-1-1-2-1-2-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1450 mm	1850 mm	1931 mm	5.18 m^3	495 kg
Intake/ exhaust section (outdoor version, with door) *EQGB-056-065-22-1-1-2-1-4-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	700 mm	1750 mm	1931 mm	2.37 m^3	212 kg
				30.53 m^3	2826 kg

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

CONTROLS

Electrical cabinet

Control cabinet: Assembly: Cabinet side and bottom floor Flange location: Bottom Position: Outdoor IP65 Integrated web server	EQCM-1-01-3-2-2-04-8-0-1
Control panel: Siemens Climatix 600 Modbus TCP Basic web Integrated web server	STCM-03-0-0-2-0-2-1
Semi-graphical HMI	STCZ-77-02-0-1
Communication BACnet IP	STCZ-84-03-1-1
Miniature circuit breaker: Supply air fan 1, 3-phases, 10A	STCZ-89-011-3-010-1-1
Miniature circuit breaker: Supply air fan 2, 3-phases, 10A	STCZ-89-012-3-010-1-1
Miniature circuit breaker: Extract air fan 1, 3-phases, 10A	STCZ-89-021-3-010-1-1
Miniature circuit breaker: Extract air fan 2, 3-phases, 10A	STCZ-89-022-3-010-1-1
Miniature circuit breaker: Manoeuvre control cabinett, 1-phase, 6A	STCZ-89-050-1-006-1-1
Miniature circuit breaker: Socket with personal safety, 1-phase, 6A	STCZ-89-072-1-006-1-1
Miniature circuit breaker: HEX (1st), 1-phase, 10A	STCZ-89-081-1-010-1-1
Miniature circuit breaker: Heat1(pump), 1-phase, 6A	STCZ-89-112-1-006-1-1
Miniature circuit breaker: Cool 1 (pump), 1-phase, 6A	STCZ-89-113-1-006-1-1
Main switch:	STCZ-87-4-3-052-040-0-6-6-05-1
Service socket: EU (type F)	STCZ-92-2-0-1

Configuration

HMI language: English	STDZ-01-03-000-1
Temp control: Extract Air Temp Control	STDZ-05-02-000-1
Cooling recovery: With, based on enthalpy	STDZ-08-02-000-1
Frost protection heat exchanger: Enthalpy	STDZ-13-02-000-1
Fire alarm 1: Both fans stopped	STDZ-15-01-000-1
Fan control: Flow controlled supply and exhaust fans	STDZ-19-01-000-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-1-083-088-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-2-186-196-1
Filter alarm with sensor: extract air filter	STDZ-24-2-2-088-093-1

FUNCTION DESCRIPTION

Starting and stopping the air handling unit
The supply air fan and exhaust air fan are started and stopped according to internal scheduler.
The controller forces the heat exchanger to 100% recovery during start-up.
Mode selection switch is available in web interface and on the operator's control panel along with operation and alarm indication.
The following dampers open before supply/exhaust fan start and close when supply/exhaust fan stop:
- Outdoor air damper
- Exhaust air damper
The following dampers close in the event of a loss of power:
- Outdoor air damper
- Exhaust air damper

Temperature control
If there is an increased heating demand the heating sequence is controlled in the following order:
- Heat exchanger for heat recovery
- Heating coil 1, water
If there is an increased cooling demand the cooling sequence is controlled in the following order:
- Heat exchanger for cooling recovery; if the enthalpy of the Extract air is lower than the enthalpy of the Outdoor air. Otherwise blocked.
- Cooling coil 1, water
The rotary heat exchanger is controlled by the control unit by means of a drive unit.
The control unit maintains the extract air temperature at the setpoint by controlling the supply air temperature.
The supply air temperature sensor limits the minimum and maximum supply air temperature.
A risk of frost in heating coil 1 is detected by:
- Return water temperature sensor
If there is a risk of frost in heating coil 1 the air handling unit is stopped.
If there is a risk of frost in heating coil 1 its valve actuator is forced to open. If the risk of frost persists the air handling unit is stopped.
When the air handling unit is stopped the return water temperature in heating coil 1 is maintained at 20°C.
Operation of the circulation pump for heating coil 1 is handled by the control unit and the pump is in operation if there is a heating demand, or if the coil return water temperature falls below 12 °C, or during pump kick function.
Operation of the circulation pump for cooling coil 1 is handled by the control unit and the pump is in operation if there is a heating demand or during pump kick function.

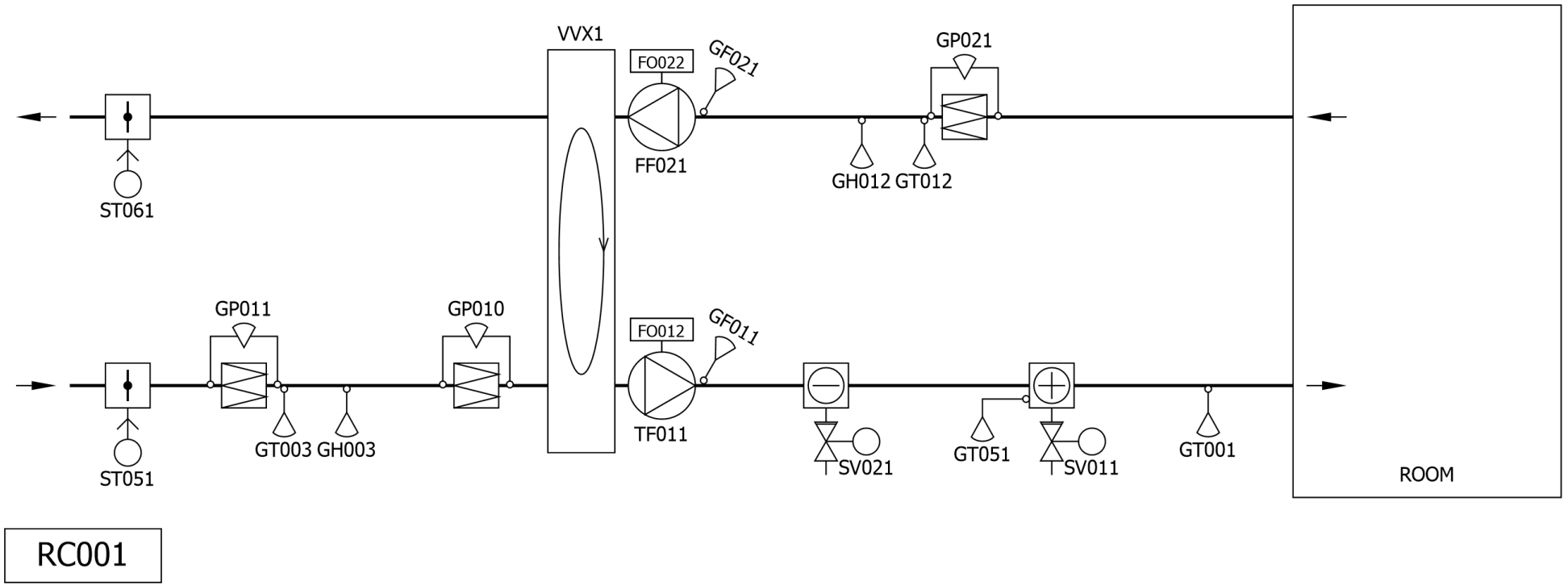
Fan control
The supply air flow is maintained according to operative setpoint by means of the speed controlled supply air fan.
The extract air flow is maintained according to operative setpoint by means of the speed controlled exhaust air fan.

Filter monitoring
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air

Frost protection
When the calculated temperature in the extract air after the rotary heat exchanger drops below the dew point of the exhaust air and set value, recovery is limited so as to prevent the formation of frost.

Fire mode
In case of of fire alarm 1 the air handling unit is stopped.

Alarms are generated for
- Manual operation
- Heat exchanger
- Overload, circulation pump, heating coil 1
- Overload, circulation pump, cooling coil 1
- Overload, circulation pump, recovery
- Control fault, supply air fan
- Control fault, exhaust air fan
- Fault in speed controlled supply air fan
- Fault in speed controlled exhaust air fan
- Fire alarm
- Frost protection, heating coil 1
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air
- Temperature sensor fault



	Customer id	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(C) / AHU3 - Studios (Option 1)	
	Unit	3	**Supply air volume flow rate**	eQ - 056	4500 l/s
	AOC	ACON-03140001	**Extract air volume flow rate**	eQ - 056	4500 l/s

COMPONENT LIST

Description	Reference	Type	Delivery options	
Frequency converter, supply fan 1	FO011	Ziehl-Abegg	Factory installed and connected	
Frequency converter, extract fan 1	FO021	Ziehl-Abegg	Factory installed and connected	
Frequency converter, supply fan 2	FO012	Ziehl-Abegg	Factory installed and connected	
Frequency converter, extract fan 2	FO022	Ziehl-Abegg	Factory installed and connected	
Damper actuator on/off with spring return, exhaust air	ST061	GCA121.1E/FW1	Factory installed and connected	
Semi-graphical HMI		POL871.71/STD HMI	Supplied	
Differential pressure sensor, supply air fan 1	GF011	SE2:QBM70.7000TNFW	Factory installed and connected	
Differential pressure sensor, extract air fan 1	GF021	SE2:QBM70.7000TNFW	Factory installed and connected	
Differential pressure sensor, outdoor air prefilter+fitler	GP010/GP011	SE2:QBM68.1212/FW	Factory installed and connected	
Damper actuator on/off with spring return, outdoor air	ST051	GCA121.1E/FW1	Factory installed and connected	
Humidity/Temperature sensor, outdoor air	GH003/GT003	FTK140 MODBUS	Factory installed and connected	
Differential pressure sensor, filter extract air	GP021	SE2:QBM70.7000TNFW	Factory installed and connected	
Humidity/Temperature sensor, extract air	GH012/GT012	FTK140 MODBUS	Factory installed and connected	
Communication BACnet IP		POL908.00/STDBAC net IP	Installed	
Immersion sensor, return heating 1	GT051	AKF10.190.04 MODBUS	Supplied with cable and quick connector	
Temperature sensor, supply air	GT001	AKF10.200.06 MODBUS	Supplied with cable and quick connector	

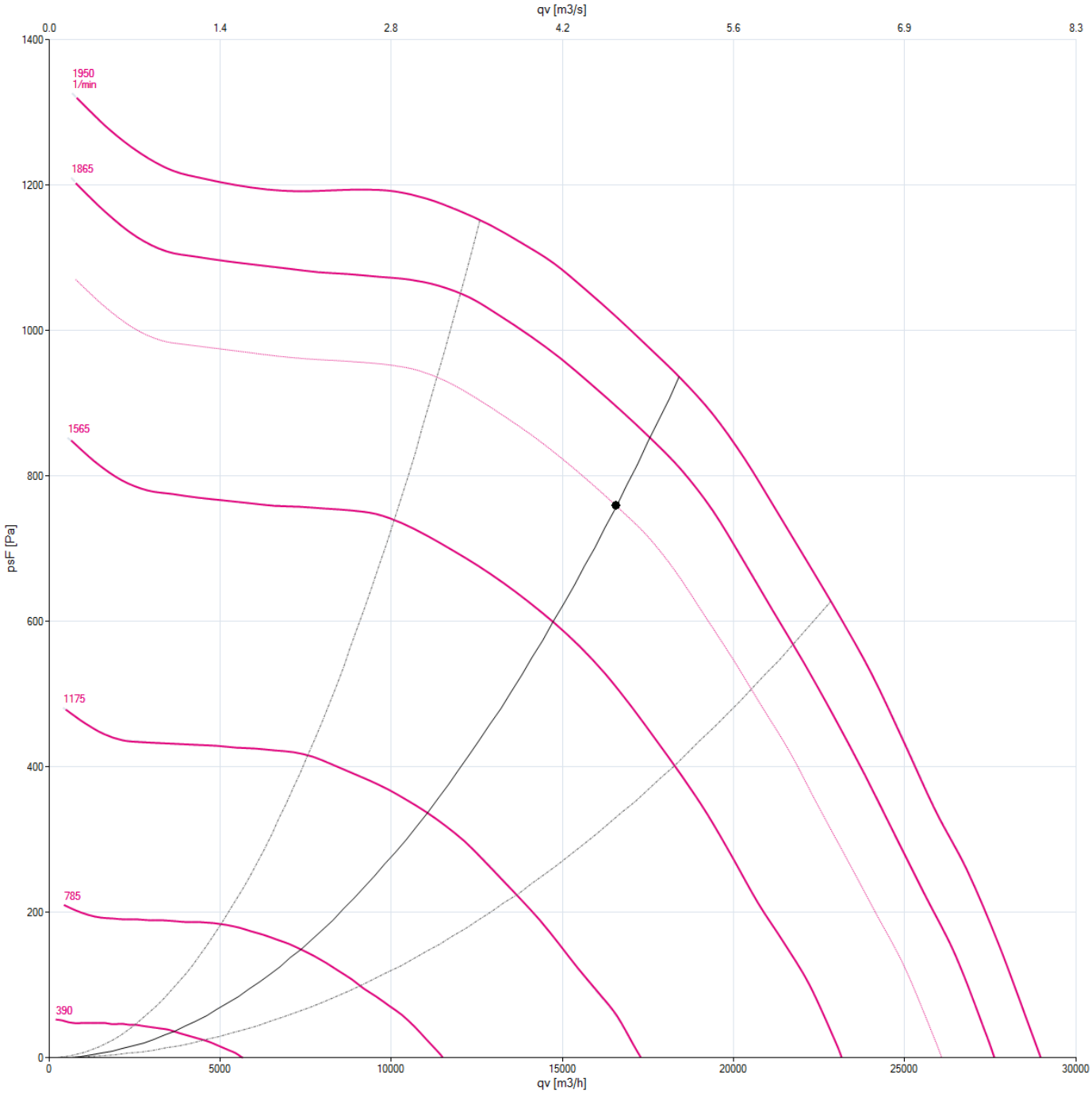
RATED CURRENT

Connection Point	Product code	Rated Voltage	No	Imax	Fmax	CSA
Mains cabling cabinet	STCZ-88	3x400VAC±10%+N+PE, 50Hz	5	19.4 A	63 A	35 mm²
Total				19.4 A		

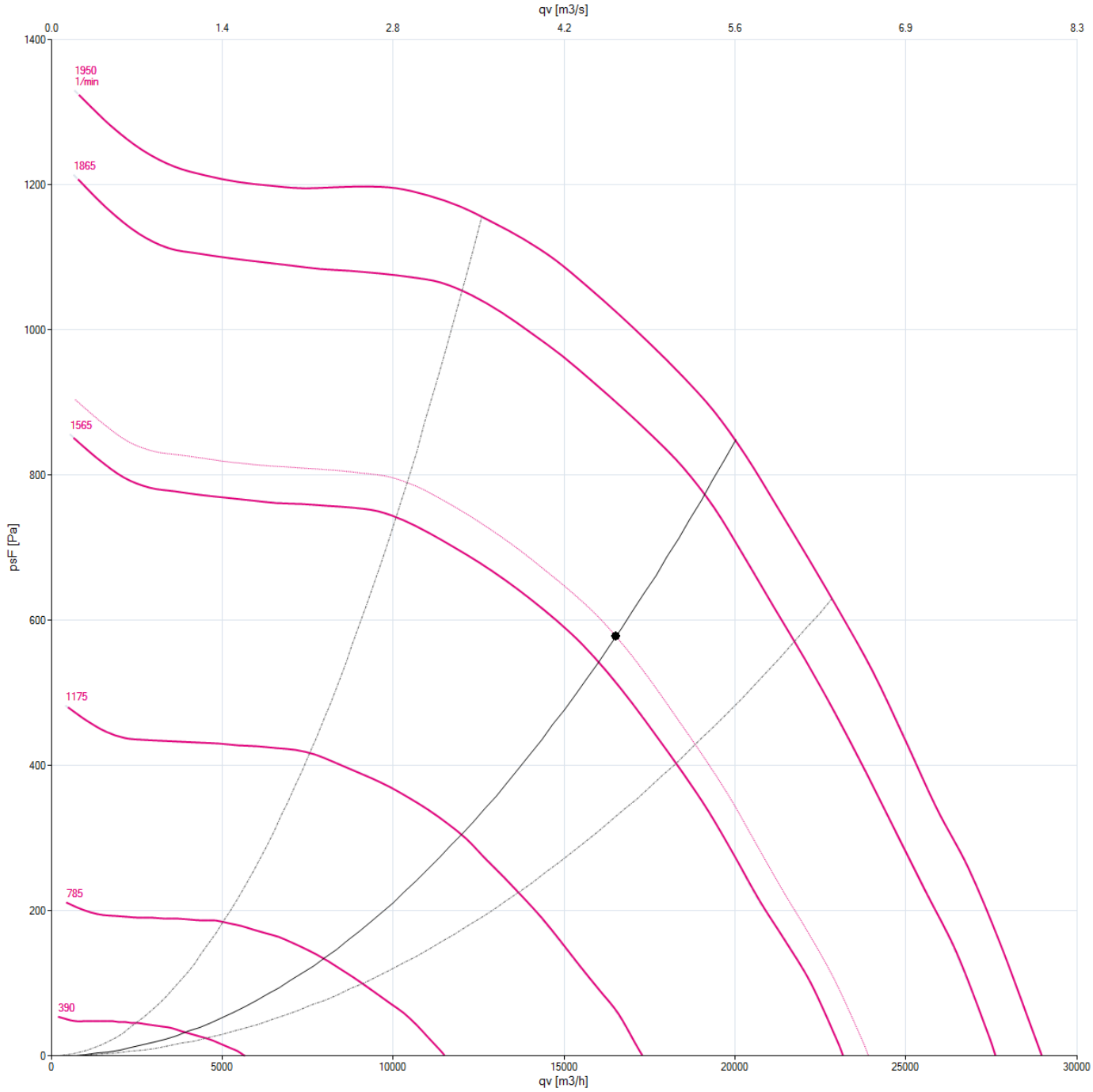
* Note that current for circulation pump is not included. AHU is dimensioned for pumps with max 6A per pump
* Miniature circuit breakers in switch cabinet have C characteristics

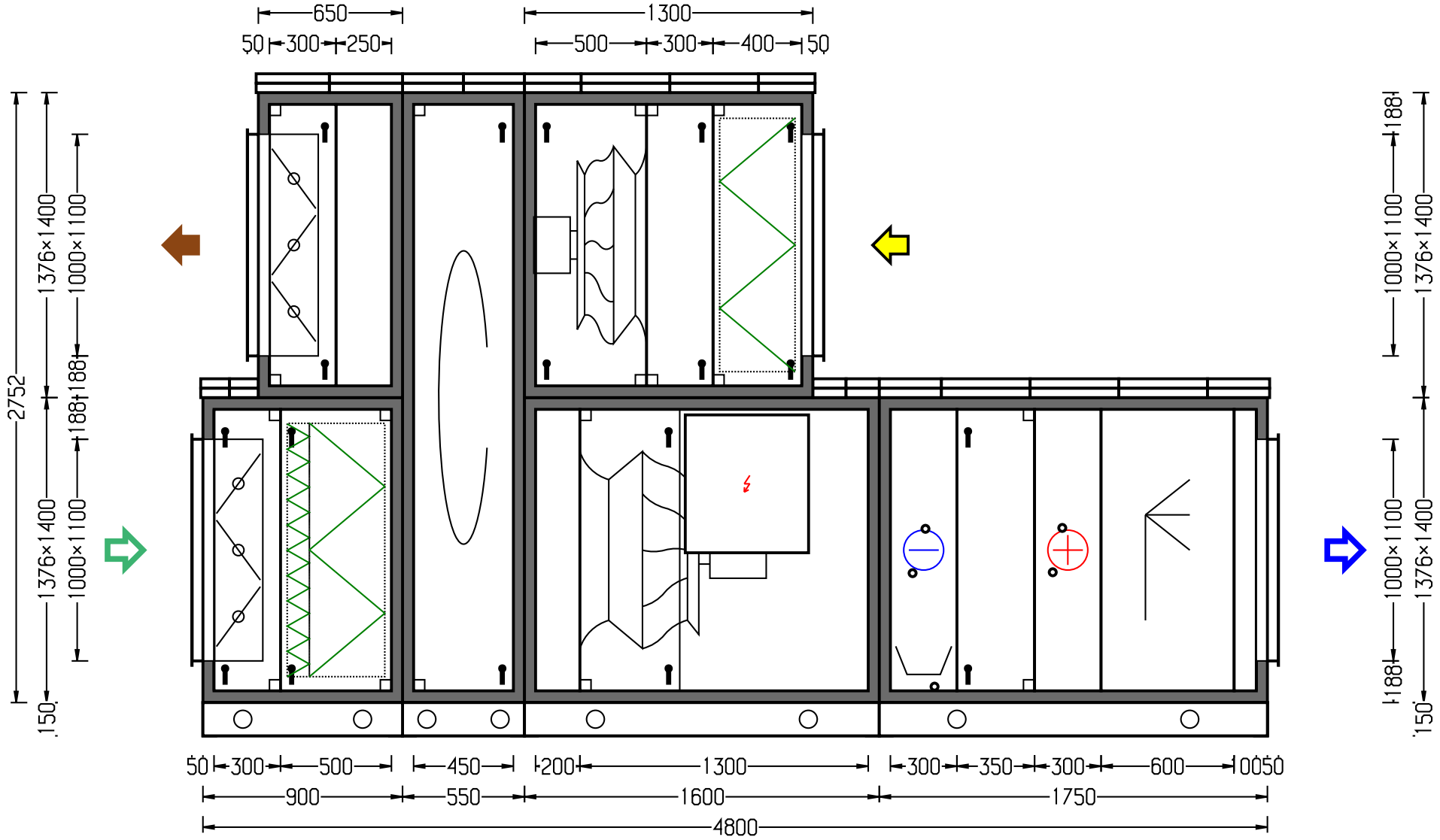
No = Number of conductors
Imax = Maximum current
Fmax = Maximum external fuse
CSAmax = Maximum cross sectional area

FAN CHART - SUPPLY AIR

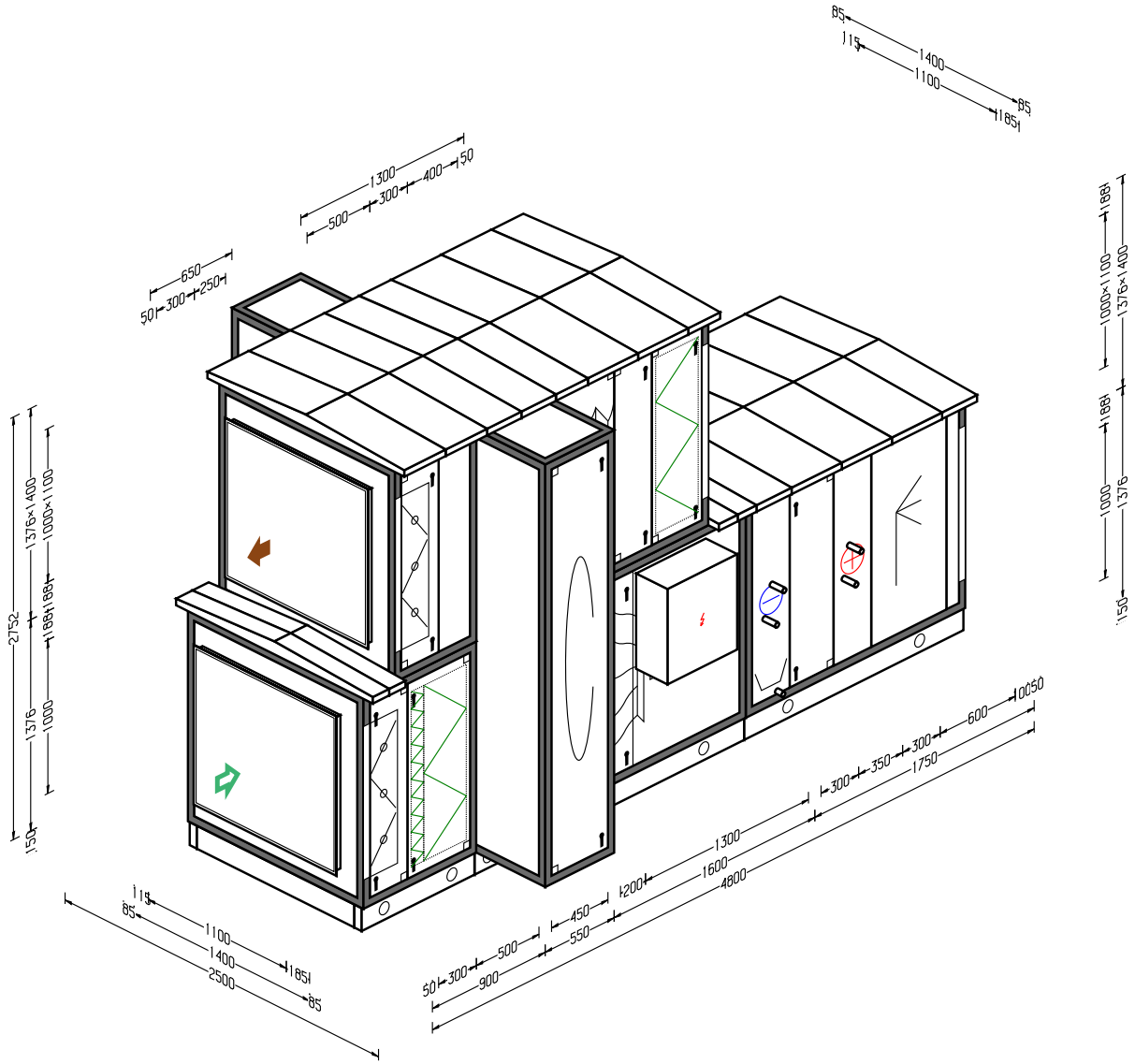


FAN CHART - EXTRACT AIR





From Inspection Side	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(E) / AHU4 - Basement Rehearsal	
	Unit	5	**Supply air volume flow rate**	eQ - 036	3000 l/s
	AOC	ACON-03140012	**Extract air volume flow rate**	eQ - 036	3000 l/s



Isometric South West	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(E) / AHU4 - Basement Rehearsal	
	Unit	5	**Supply air volume flow rate**	eQ - 036	3000 l/s
	AOC	ACON-03140012	**Extract air volume flow rate**	eQ - 036	3000 l/s

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140012	**Customers ref.**	
Unit	5 (E) / AHU4 - Basement Rehearsal	**Our ref.**	Andy Window
Size	036		

SUMMARY TECHNICAL SPECIFICATION

DIMENSIONING DATA

Supply air		
Supply air volume flow rate	3000	l/s
External static pressure	400	Pa
Internal static pressure	371	Pa
Ref. density	1.2	kg/m³

Exhaust air		
Extract air volume flow rate	3000	l/s
External static pressure	400	Pa
Internal static pressure	177	Pa
Ref. density	1.2	kg/m³

Winter		
Design outdoor temperature winter	-5	°C
Dim. humidity winter	99	%
Temperature in, extract air, winter	19	°C
Air humidity in, extract air, winter	50	%

Summer		
Design outdoor temperature summer	28	°C
Dim. humidity summer	50	%
Temperature in, extract air, summer	24	°C
Air humidity in, extract air, summer	45	%

UNIT

Unit type . . . . . eQ
Size 036
Installation . . . . . Outdoor horizontal
Sum filtration supply air . . . . . ePM1 - 70.0%
Sum filtration exhaust air . . . . . ePM10 - 65.0%
Total dry weight . . . . . 2236 kg
Controls . . . . . with
Transport dimensions . . . . . See block list page
Unit dimensions . . . . . 4800 x 2752 x 2500 mm

CASING

Model box code . . . . . EQ 2111
Thermal insulation T3
Condensation insulation TB3
Casing strength . . . . . D1(M)
Material . . . . . AlZn sheet steel
Leakage class . . . . . L1(M) / L2(R)*

ERP / EUROVENT

Unit type . . . . . NRVU BVU
SFPint . . . . . 363 W/(m³/s)
Dry temperature efficiency (balanced) . . . . . 82.8 %
External leakage rate . . . . . 0.4 %
Internal leakage rate . . . . . 0.0 %
Mixing ratio at winter design temperature . . . . . 0.0 %

Approved according to requirements 2018



	Supply air	**Extract air**	
Heat exchanger pressure drop	87	87	Pa
Filter energy classification			
Filter pressure drop, start	46	28	Pa
Filter area	1.7	1.7	m²
Filter cross section air velocity	1.8	2.0	m/s
Air flow	3000	3303	l/s
Total pressure rise	684	536	Pa
Fan fan system effect	0	0	Pa
Fan total efficiency	67.9	68.7	%
Fan system input power (absorbed electrical power) according to SFP	3.09	2.41	kW

Fan system effect is taken into account in fan performance

Summary Energy Calculation	Supply air	Extract air	
Airflow Rate	3.00	3.00	m^3/s
Total Static Pressure	771	577	Pa
Internal Static Pressure	371	177	Pa
Power Input	3.61	2.65	kW
Velocity	1.82	1.82	m/s
Winter Temperature Efficiency HRS (balanced)	83	83	%
Pressure drop HRS	87	87	Pa
Mixing Ratio	0.0		%
Winter Design Temperature	-5.0		°C
Electric Reheater (winter)	No		

SUMMARY

Supply air	v0 [m/s]	Et [%]	tw [°C]	rw [kg/m³]	ts [°C]	rs [kg/m³]	dP* [Pa]
Connection section	3.1			1.3144		1.1638	4
Filter	2.4			1.3144		1.1638	218
Heat exchanger	1.6	82.8	-5 / 15.5	1.3118	28 / 25.3	1.1613	90
Inspection section							0
Plenum fan		67.1	15.5 / 16.4	1.2161	25.3 / 26.3	1.1708	771
Air cooler	2.3			1.2212	26.3 / 22	1.1759	39
Inspection section							0
Air heater	2.2		15 / 22	1.2253		1.1927	18
Humidifier				1.2013		1.1925	0
Inspection section							0
Connection section	3.2			1.2013		1.1925	2
Supply outlet				1.2013		1.1925	400
Exhaust air							
Exhaust inlet							400
Connection section	3.2			1.1985		1.1773	2
Filter	2.1			1.1985		1.1772	72
Inspection section							0
Plenum fan		68.5		1.1977		1.1764	577
Heat exchanger	1.7		19.7 / 0.8	1.2015	24.7 / 27.4	1.1803	90
Inspection section							0
Connection section	3.1			1.2858		1.1686	13

**Refers to the fan design case*
Fan system effect is taken into account in fan performance

SOUND POWER LEVELS

standard: EN13053 ISO/CD 13347-2

	Lw per octave band									LwA	
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Fresh air connection	67	81	73	70	64	63	58	54	dB	72	dB(A)
Supply air connection	73	86	76	77	75	68	61	55	dB	79	dB(A)
Extract connection	66	80	74	70	64	60	55	52	dB	72	dB(A)
Exhaust connection	69	82	72	74	69	65	60	55	dB	75	dB(A)
To surroundings	60	71	58	48	43	43	38	30	dB	57	dB(A)

ENERGY

Temperature efficiency (EN308) . . . . . 82.8 %
Heat recovery capacity . . . . . 95 kW
SFPv Total sum . . . . . 1.83 kW/(m³/s)
SFPe Total sum . . . . . 2.00 kW/(m³/s)

FAN POWER SUPPLY DATA

Voltage, supply flow . . . . . 3x400VAC+PE, 50Hz
Voltage, extract flow . . . . . 3x400VAC+PE, 50Hz
Power, supply flow . . . . . 2 x 2.4 kW
Power, extract flow . . . . . 2 x 1.7 kW
Current, full load, supply flow . . . . . 2 x 3.1 A
Current, full load, extract flow . . . . . 2 x 2.2 A

COILS

	Capacity	Air		Water				Conn
Air cooler	19 kW	26.3 °C, 55.3 %	22 °C, 69.2 %	8 / 13 °C	0.95 l/s	7.0 kPa	Ethylene glycol 20 %	DN32
Air heater	25.6 kW	15 °C, 44.7 %	22 °C, 28.8 %	44 / 39 °C	1.23 l/s	10.7 kPa		DN32

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For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140012	**Customers ref.**	
Unit	5 (E) / AHU4 - Basement Rehearsal	**Our ref.**	Andy Window
Size	036		

TECHNICAL SPECIFICATION

Components listed in direction of air flow

SUPPLY AIR

Data at actual density as given in summary above

Intake/ exhaust section (outdoor version, with door)

Unit size: 036
Installation alternative: Fresh air in end
Damper type: with AluZink damper CEN class 3
Inspection side: right
Pressure drop, dimensioning 4 Pa

Casing end wall
Damper
Width cm : 110
Height in cm : 100
Tightness class : CEN 3
Connection: Flange
Function : Outdoor air
Location: internally end wall
Damper type: 200 mm blade
Material : AlZn
Damper actuator
Duct connection piece
Width cm : 110
Height in cm : 100
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Empty section
Unit size : 036
Length: 030
Inspection side : right

Filter

Inspection side: right

Filter selection
Filter class: F8 - ePM1 70%, glassfibre, short
Filter frame : AZ sheet steel
Prefilter: G4 – coarse, synthetic

Design
Connection side : inlet in end wall
Location: negative pressure
Drain tray: without

Number of filters	4x592x592 L=380	
Pressure drop, start	143	Pa
Pressure drop, dimensioning	218	Pa
Pressure drop, end	293	Pa
Face area	1.4	m^2
Face velocity	2.4	m/s

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring

Filter monitoring

Rotary heat exchanger

Size: 036
Rotor type: Regoterm
Edge-reinforced: no
Foil spacing: Outputvariant 6 (2.1 mm, 270 mm wheel)
Delivery version: Whole rotor
Function lenght: standard
Material: galvanized sheet steel/AlZn
Inspection side: right

Efficiency			
Temperature efficiency according to standard EN 308		82.8	%
Temperature efficiency at 0°C outdoors		82.8	%
Cooling recovery		82.2	%
Humidity efficiency, Summer		0.0	%
Humidity efficiency, Winter		51.8	%
Supply air	**Summer**	**Winter**	
Pressure drop	90	80	Pa
Air temperature	28 / 25.3	-5 / 15.5	°C
Relative humidity	50 / 58.6	99 / 43.4	%
Capacity reduction	10	95	kW
Air flow transfer	303	303	l/s
Face velocity	1.7	1.6	m/s
Exhaust air	**Summer**	**Winter**	
Pressure drop	90	83	Pa
Air temperature	24.7 / 27.4	19.7 / 0.8	°C
Relative humidity	43.1 / 36.7	47.9 / 100	%
Additional throttling	0	0	Pa
Face velocity	1.7	1.7	m/s

Empty section

Unit size : 036
Length: 020
Inspection side : right

Plenum fan

Inspection side: right

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 3
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Two fan wheels in parallel

Speed	1869	Rpm
Max speed	2050	Rpm
Total efficiency	67.1	%
Total static pressure, dimensioning (wet coil)	771	Pa
Dynamic pressure	15	Pa
Fan system input power (absorbed electrical power)	3.61	kW
Temperature rise	1	°C
K factor	8.18	
Fan wheel size	045	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	3.09	kW
Pressure rise	684	Pa
Speed	1759	Rpm

Motor

Motor output	2 x 2.4	kW
Electric current	2 x 3.1	A
Output margin, minimum	10	%

Motor accessories

Air cooler for chilled water

Size: 036
Connection side: right
Material: galvanized sheet steel
Droplet eliminator: without
Design variant: version 3

Coil selection

Use as: Cooling Coil
Calculation principle: input data
Output variant: 2
Fluid passes: 06
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Shunt selection

Shunt control: without

Nom. pipe size	32	
Liquid volume	12.2	l
Pressure drop, dimensioning	39	Pa
Ethylene glycol	20	%
Oversizing	66.0	%
Pressure drop, wet coil	39	Pa
Pressure drop, dry coil	35	Pa
Output	19	kW
Air temperature	26.3 / 22	°C
Relative humidity	55.3 / 69.2	%
Face velocity	2.3	m/s
Water temperature	8 / 13	°C
Water flow	0.95	l/s
Water velocity	0.7	m/s
Pressure drop water	7.0	kPa
Amount of condensation	0.0	l/s

Empty section

Unit size : 036
Length: 035
Inspection side : right

Air heater for hot water

Size: 036
Inspection side: right
Material: galvanized sheet steel

Coil selection

Calculation principle: input data
Output variant: 1
Fluid passes: 04
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Nom. pipe size	32	
Liquid volume	7.4	l
Pressure drop, dimensioning	18	Pa
Control principle for water heater	flow control	
Oversizing	17.4	%
Output	25.6	kW
Air temperature	15 / 22	°C
Face velocity	2.2	m/s
Water temperature	44 / 39	°C
Water flow	1.23	l/s
Water velocity	1.3	m/s
Pressure drop water	10.7	kPa

Humidifier

Unit size: 036
Length in cm: 060
Material: FZ sheet steel
Inspection side: right
Version: Standard

Empty section

Unit size : 036
Length: 010
Inspection side : right

End connection frame

Pressure drop, dimensioning	2	Pa

Casing end wall
Duct connection piece
Width cm : 110
Height in cm : 100
Connection type: flange connection
Material: galvanized sheet steel / AlZn

EXHAUST AIR

Data at actual density as given in summary above

End connection frame

Pressure drop, dimensioning	2	Pa

Casing end wall
Duct connection piece
Width cm : 110
Height in cm : 100
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Filter

Inspection side: left
Filter selection
Filter class: M5 - ePM10 65%, glassfibre, short
Filter frame : AZ sheet steel
Prefilter: without
Design
Connection side : inlet in end wall
Location: negative pressure
Drain tray: without

Number of filters	4x592x592 L=380	
Pressure drop, start	36	Pa
Pressure drop, dimensioning	72	Pa
Pressure drop, end	109	Pa
Face area	1.4	m^2
Face velocity	2.1	m/s

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring
Filter monitoring

Empty section

Unit size : 036
Length: 030
Inspection side : left

Plenum fan

Inspection side: left

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 3
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: mounted cable
Length: 350

Dimensioning data

Two fan wheels in parallel

Speed	1670	Rpm
Max speed	1800	Rpm
Total efficiency	68.5	%
Total static pressure, dimensioning (wet coil)	577	Pa
Dynamic pressure	15	Pa
Fan system input power (absorbed electrical power)	2.65	kW
Temperature rise	0.7	°C
K factor	8.18	
Fan wheel size	045	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	2.41	kW
Pressure rise	536	Pa
Speed	1606	Rpm

Motor

Motor output	2 x 1.7	kW
Electric current	2 x 2.2	A
Output margin, minimum	10	%

Motor accessories

Empty section

Unit size : 036
Length: 025
Inspection side : left

Intake/ exhaust section (outdoor version, with door)

Unit size: 036
Installation alternative: Damper inside on end wall
Damper type: with AluZink damper CEN class 3
Inspection side: left
Pressure drop, dimensioning 13 Pa

Empty section

Unit size : 036
Length: 030
Inspection side : left

Casing end wall

Damper

Width cm : 110
Height in cm : 100
Tightness class : CEN 3
Connection: Flange
Function : extract air
Location: internally end wall
Damper type: 200 mm blade
Material : AlZn

Damper actuator

Duct connection piece

Width cm : 110
Height in cm : 100
Connection type: flange connection
Material: galvanized sheet steel / AlZn

BLOCK LIST

	Length	Width	Height	Volume	Weight
Intake/ exhaust section (outdoor version, with door), Filter *EQGB-036-090-22-1-1-2-1-2-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	950 mm	1550 mm	1781 mm	2.62 m^3	240 kg
Rotary heat exchanger *EQHB-036-055-22-1-1-2-1-5-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	600 mm	2650 mm	3157 mm	5.02 m^3	688 kg
Plenum fan *EQGB-036-160-22-1-1-2-1-3-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1650 mm	1700 mm	1781 mm	5 m^3	378 kg
Air cooler for chilled water , Air heater for hot water, Humidifier, End connection frame *EQGB-036-175-22-1-1-2-1-4-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1800 mm	1550 mm	1781 mm	4.97 m^3	426 kg
End connection frame, Filter, Plenum fan *EQGB-036-130-22-1-1-2-1-2-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1350 mm	1550 mm	1631 mm	3.41 m^3	332 kg
Intake/ exhaust section (outdoor version, with door) *EQGB-036-065-22-1-1-2-1-4-2-1, EQ 2111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	700 mm	1450 mm	1631 mm	1.66 m^3	172 kg
				22.68 m^3	2236 kg

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

CONTROLS

Electrical cabinet

Control cabinet: Assembly: Cabinet side and bottom floor Flange location: Bottom Position: Outdoor IP65 Integrated web server	EQCM-1-01-3-2-2-04-8-0-1
Control panel: Siemens Climatix 600 Modbus TCP Basic web Integrated web server	STCM-03-0-0-2-0-2-1
Semi-graphical HMI	STCZ-77-02-0-1
Communication BACnet IP	STCZ-84-03-1-1
Miniature circuit breaker: Supply air fan 1, 3-phases, 10A	STCZ-89-011-3-010-1-1
Miniature circuit breaker: Supply air fan 2, 3-phases, 10A	STCZ-89-012-3-010-1-1
Miniature circuit breaker: Extract air fan 1, 3-phases, 10A	STCZ-89-021-3-010-1-1
Miniature circuit breaker: Extract air fan 2, 3-phases, 10A	STCZ-89-022-3-010-1-1
Miniature circuit breaker: Manoeuvre control cabinett, 1-phase, 6A	STCZ-89-050-1-006-1-1
Miniature circuit breaker: Socket with personal safety, 1-phase, 6A	STCZ-89-072-1-006-1-1
Miniature circuit breaker: HEX (1st), 1-phase, 10A	STCZ-89-081-1-010-1-1
Miniature circuit breaker: Heat1(pump), 1-phase, 6A	STCZ-89-112-1-006-1-1
Miniature circuit breaker: Cool 1 (pump), 1-phase, 6A	STCZ-89-113-1-006-1-1
Main switch:	STCZ-87-4-3-058-040-0-6-6-05-1
Service socket: EU (type F)	STCZ-92-2-0-1

Configuration

HMI language: English	STDZ-01-03-000-1
Temp control: Extract Air Temp Control	STDZ-05-02-000-1
Cooling recovery: With, based on temperature	STDZ-08-01-000-1
Humidity control: Extract air control	STDZ-10-02-000-1
Humidification control	STDZ-11-01-000-1
Frost protection heat exchanger: Enthalpy	STDZ-13-02-000-1
Fire alarm 1: Both fans stopped	STDZ-15-01-000-1
Fan control: Flow controlled supply and exhaust fans	STDZ-19-01-000-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-1-086-091-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-2-193-203-1
Filter alarm with sensor: extract air filter	STDZ-24-2-2-101-109-1

FUNCTION DESCRIPTION

Starting and stopping the air handling unit
The supply air fan and exhaust air fan are started and stopped according to internal scheduler.
The controller forces the heat exchanger to 100% recovery during start-up.
Mode selection switch is available in web interface and on the operator's control panel along with operation and alarm indication.
The following dampers open before supply/exhaust fan start and close when supply/exhaust fan stop:
- Outdoor air damper
- Exhaust air damper
The following dampers close in the event of a loss of power:
- Outdoor air damper
- Exhaust air damper

Temperature control
If there is an increased heating demand the heating sequence is controlled in the following order:
- Heat exchanger for heat recovery
- Heating coil 1, water
If there is an increased cooling demand the cooling sequence is controlled in the following order:
- Heat exchanger for cooling recovery; if the temperature of the Extract air is lower than the temperature of the Outdoor air. Otherwise blocked.
- Cooling coil 1, water
The rotary heat exchanger is controlled by the control unit by means of a drive unit.
The control unit maintains the extract air temperature at the setpoint by controlling the supply air temperature.
The supply air temperature sensor limits the minimum and maximum supply air temperature.
A risk of frost in heating coil 1 is detected by:
- Return water temperature sensor
If there is a risk of frost in heating coil 1 the air handling unit is stopped.
If there is a risk of frost in heating coil 1 its valve actuator is forced to open. If the risk of frost persists the air handling unit is stopped.
When the air handling unit is stopped the return water temperature in heating coil 1 is maintained at 20°C.
Operation of the circulation pump for heating coil 1 is handled by the control unit and the pump is in operation if there is a heating demand, or if the coil return water temperature falls below 12 °C, or during pump kick function.
Operation of the circulation pump for cooling coil 1 is handled by the control unit and the pump is in operation if there is a heating demand or during pump kick function.

Fan control
The supply air flow is maintained according to operative setpoint by means of the speed controlled supply air fan.
The extract air flow is maintained according to operative setpoint by means of the speed controlled exhaust air fan.

Humidity control
The relative humidity in the extract air is maintained at the setpoint by controlling the supply air humidity.
The supply air humidity sensor limits the minimum and maximum relative humidity in the supply air.
During humidification the control unit controls heating coil 1 before the humidifier in sequence for increased output.

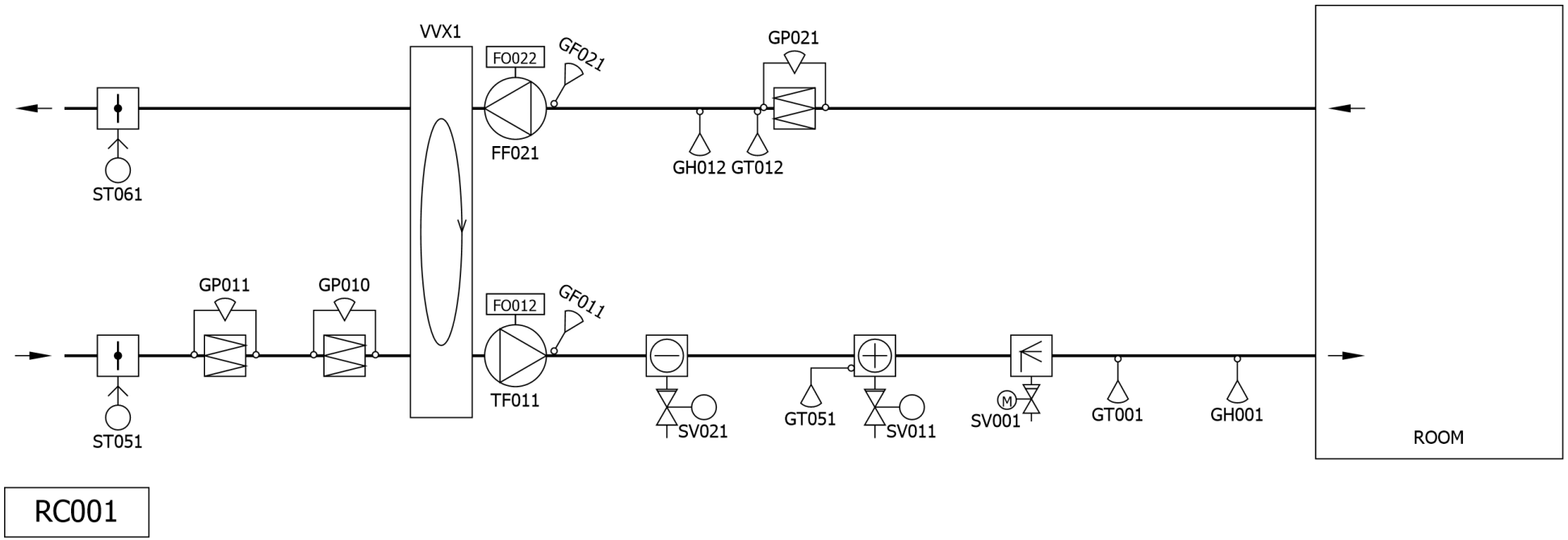
Filter monitoring
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air

Frost protection
When the calculated temperature in the extract air after the rotary heat exchanger drops below the dew point of the exhaust air and set value, recovery is limited so as to prevent the formation of frost.

Fire mode
In case of of fire alarm 1 the air handling unit is stopped.

Alarms are generated for
- Manual operation
- Heat exchanger
- Overload, circulation pump, heating coil 1
- Overload, circulation pump, cooling coil 1
- Overload, circulation pump, recovery
- Control fault, supply air fan
- Control fault, exhaust air fan
- Fault in speed controlled supply air fan
- Fault in speed controlled exhaust air fan
- Fire alarm
- Frost protection, heating coil 1
- Humidifier, supply air
- Prefilter, outdoor air

- Filter, outdoor air
- Filter, extract air
- Temperature sensor fault



RC001

	Customer id	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(E) / AHU4 - Basement Rehearsal	
	Unit	5	**Supply air volume flow rate**	eQ - 036	3000 l/s
	AOC	ACON-03140012	**Extract air volume flow rate**	eQ - 036	3000 l/s

COMPONENT LIST

Description	Reference	Type	Delivery options	
Humidifier	AS030		Not included	
Frequency converter, extract fan 1	FO021	Ziehl-Abegg	Factory installed and connected	
Frequency converter, extract fan 2	FO022	Ziehl-Abegg	Factory installed and connected	
Frequency converter, supply fan 1	FO011	Ziehl-Abegg	Factory installed and connected	
Frequency converter, supply fan 2	FO012	Ziehl-Abegg	Factory installed and connected	
Damper actuator on/off with spring return, exhaust air	ST061	GCA121.1E/FW1	Factory installed and connected	
Semi-graphical HMI		POL871.71/STD HMI	Supplied	
Differential pressure sensor, supply air fan 1	GF011	SE2:QBM70.7000TNFW	Factory installed and connected	
Differential pressure sensor, extract air fan 1	GF021	SE2:QBM70.7000TNFW	Factory installed and connected	
Damper actuator on/off with spring return, outdoor air	ST051	GCA121.1E/FW1	Factory installed and connected	
Humidity/Temperature sensor, supply air	GH001/GT001	FTK140 MODBUS	Supplied with cable and quick connector	
Differential pressure sensor, filter extract air	GP021	SE2:QBM70.7000TNFW	Factory installed and connected	
Humidity/Temperature sensor, extract air	GH012/GT012	FTK140 MODBUS	Factory installed and connected	
Communication BACnet IP		POL908.00/STDBAC net IP	Installed	
Differential pressure sensor prefilter+filter, temperature outdoor air	GP010/GP011/ GT003	SE2:QBM70.7012/FW	Factory installed and connected	
Immersion sensor, return heating 1	GT051	AKF10.190.04 MODBUS	Supplied with cable and quick connector	

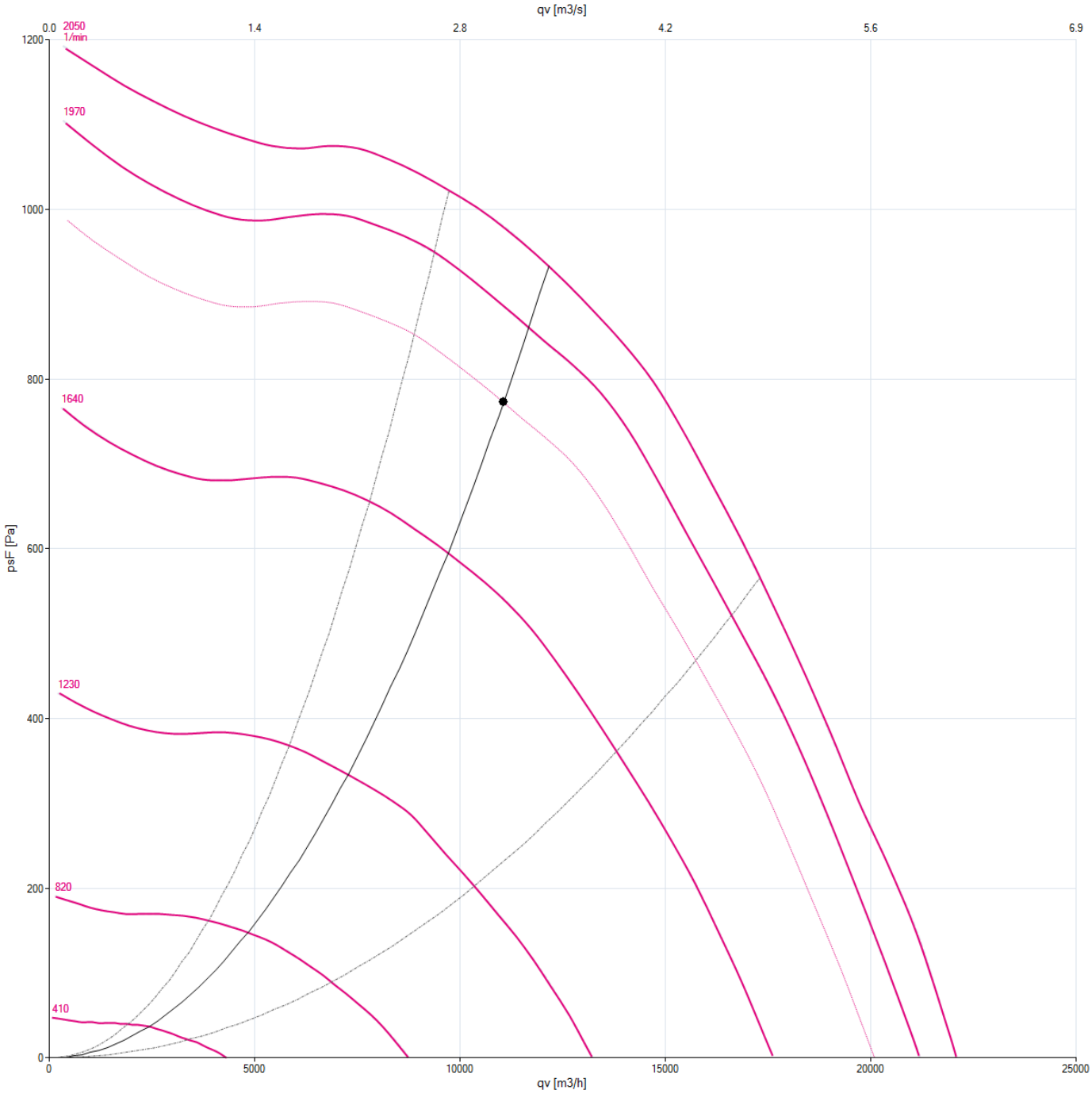
RATED CURRENT

Connection Point	Product code	Rated Voltage	No	Imax	Fmax	CSA
Mains cabling cabinet	STCZ-88	3x400VAC±10%+N+PE, 50Hz	5	14.8 A	80 A	35 mm²
Total				14.8 A		

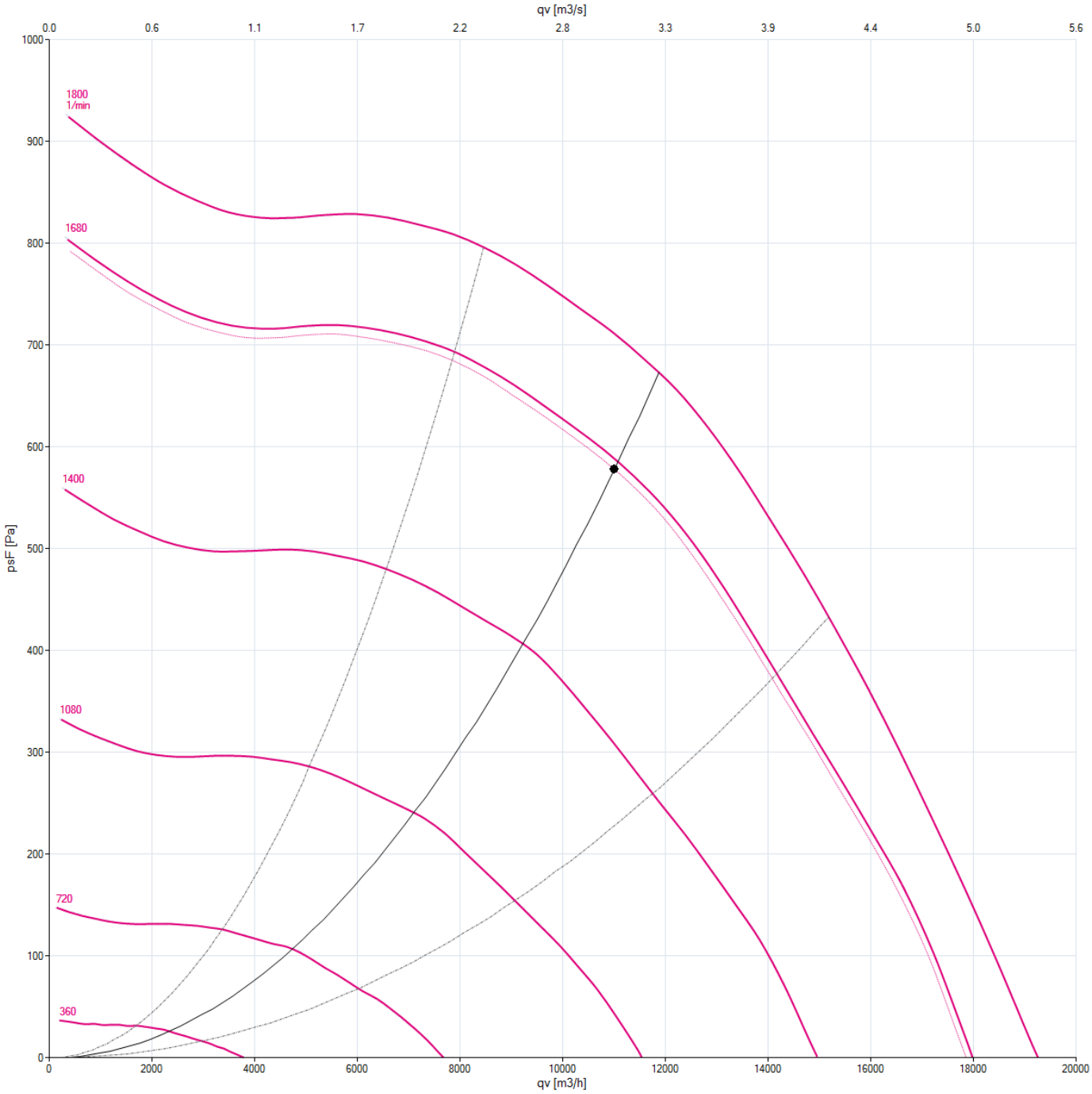
* Note that current for circulation pump is not included. AHU is dimensioned for pumps with max 6A per pump
* Miniature circuit breakers in switch cabinet have C characteristics

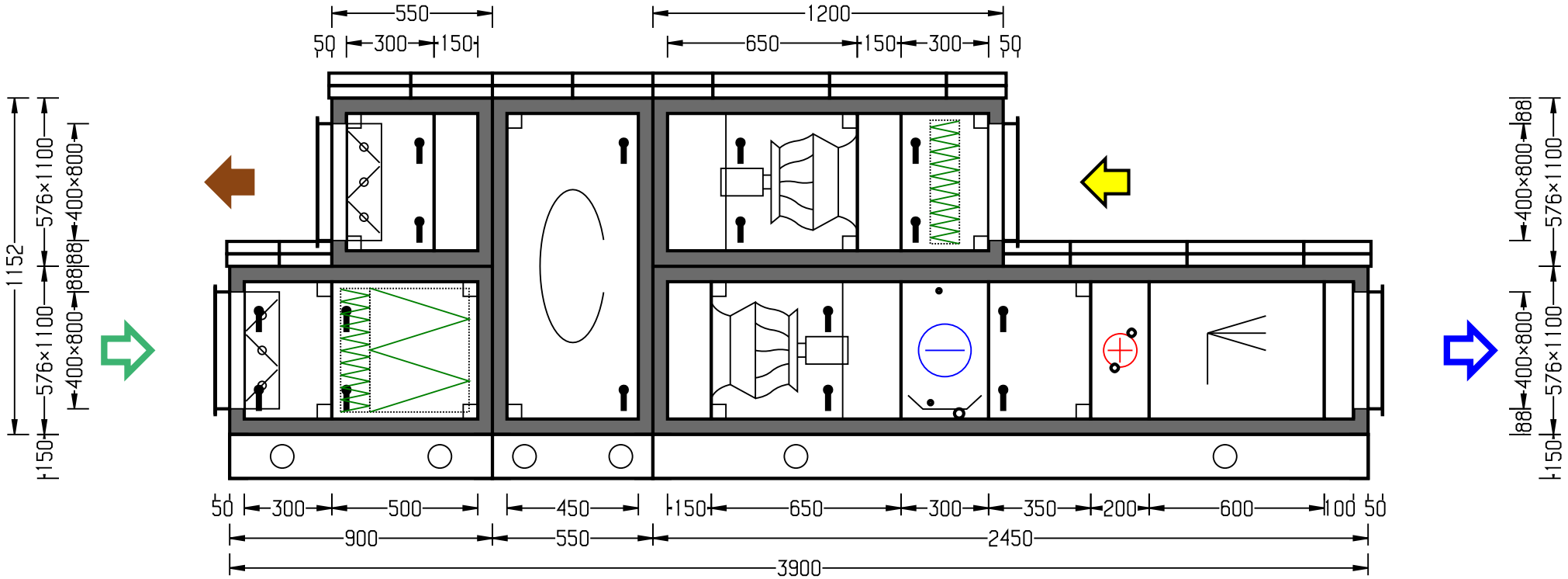
No = Number of conductors
Imax = Maximum current
Fmax = Maximum external fuse
CSAmax = Maximum cross sectional area

FAN CHART - SUPPLY AIR

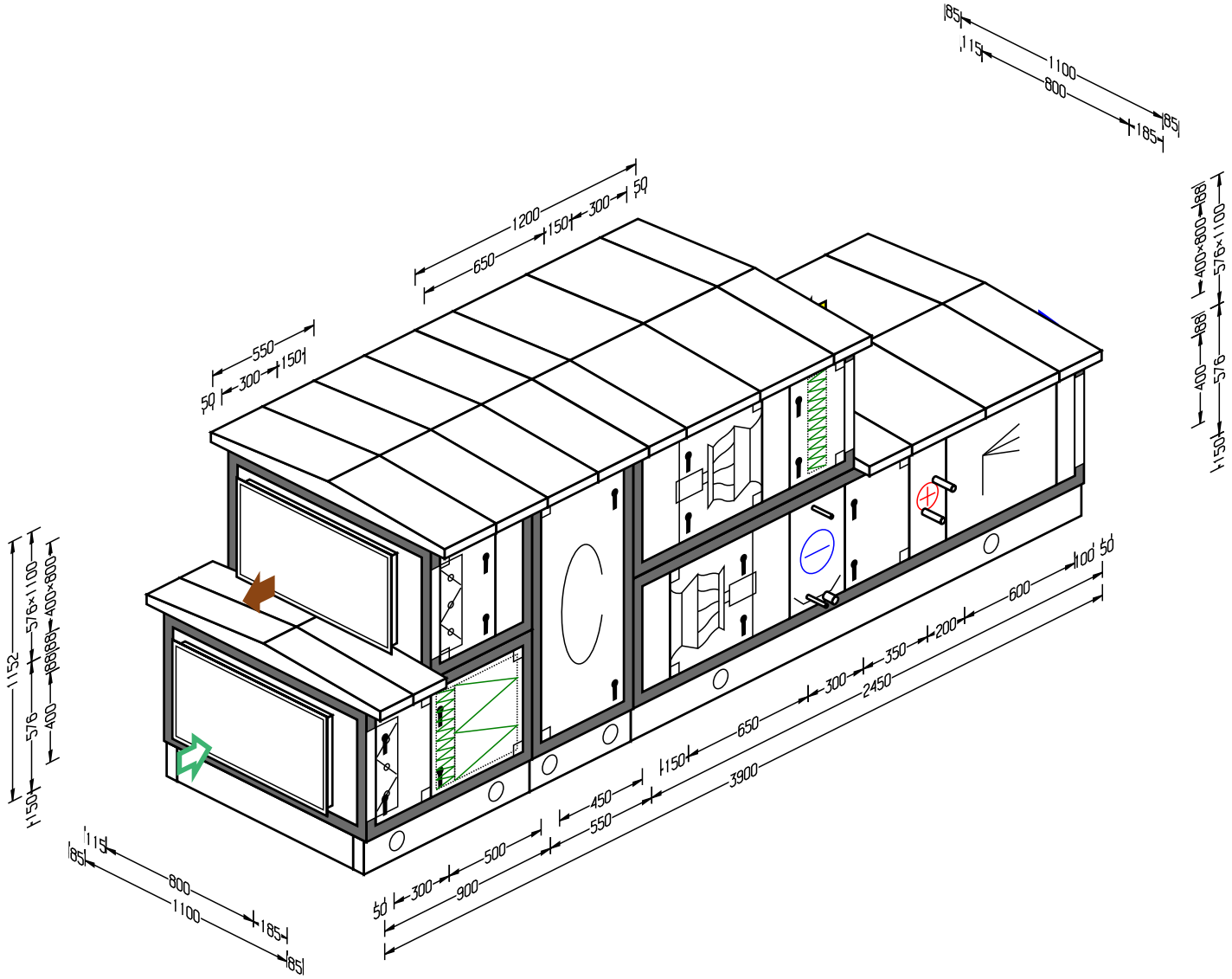


FAN CHART - EXTRACT AIR





From Inspection Side	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(F) / AHU5 - Basement (Other Areas)	
	Unit	6	**Supply air volume flow rate**	eQ - 008	500 l/s
	AOC	ACON-03140013	**Extract air volume flow rate**	eQ - 008	500 l/s



Isometric South West	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(F) / AHU5 - Basement (Other Areas)	
	Unit	6	**Supply air volume flow rate**	eQ - 008	500 l/s
	AOC	ACON-03140013	**Extract air volume flow rate**	eQ - 008	500 l/s

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140013	**Customers ref.**	
Unit	6 (F) / AHU5 - Basement (Other Areas)	**Our ref.**	Andy Window
Size	008		

SUMMARY TECHNICAL SPECIFICATION

DIMENSIONING DATA

Supply air		
Supply air volume flow rate	500	l/s
External static pressure	300	Pa
Internal static pressure	287	Pa
Ref. density	1.2	kg/m³

Exhaust air		
Extract air volume flow rate	500	l/s
External static pressure	300	Pa
Internal static pressure	137	Pa
Ref. density	1.2	kg/m³

Winter		
Design outdoor temperature winter	-5	°C
Dim. humidity winter	99	%
Temperature in, extract air, winter	19	°C
Air humidity in, extract air, winter	50	%

Summer		
Design outdoor temperature summer	28	°C
Dim. humidity summer	50	%
Temperature in, extract air, summer	24	°C
Air humidity in, extract air, summer	45	%

UNIT

Unit type . . . . . eQ
Size 008
Installation . . . . . Outdoor horizontal
Sum filtration supply air . . . . . ePM1 - 70.0%
Total dry weight . . . . . 910 kg
Controls . . . . . with
Transport dimensions . . . . . See block list page
Unit dimensions . . . . . 3900 x 1152 x 1100 mm

CASING

Model box code . . . . . EQ 1111
Thermal insulation T3
Condensation insulation TB3
Casing strength . . . . . D1(M)
Material . . . . . AlZn sheet steel
Leakage class . . . . . L1(M) / L2(R)*

ERP / EUROVENT

Unit type . . . . . NRVU BVU
SFPint . . . . . 281 W/(m³/s)
Dry temperature efficiency (balanced) . . . . . 84.7 %
External leakage rate . . . . . 0.8 %
Internal leakage rate . . . . . 0.0 %
Mixing ratio at winter design temperature . . . . . 0.0 %

Approved according to requirements 2018



	Supply air	Extract air	
Heat exchanger pressure drop	74	74	Pa
Filter energy classification			
Filter pressure drop, start	23	13	Pa
Filter area	0.5	0.5	m²
Filter cross section air velocity	1.1	1.2	m/s
Air flow	500	552	l/s
Total pressure rise	502	409	Pa
Fan fan system effect	0	0	Pa
Fan total efficiency	65.5	65.7	%
Fan system input power (absorbed electrical power) according to SFP	0.392	0.32	kW

Fan system effect is taken into account in fan performance

Summary Energy Calculation	Supply air	Extract air	
Airflow Rate	0.500	0.500	m^3/s
Total Static Pressure	587	437	Pa
Internal Static Pressure	287	137	Pa
Power Input	0.466	0.347	kW
Velocity	1.06	1.06	m/s
Winter Temperature Efficiency HRS (balanced)	85	85	%
Pressure drop HRS	74	74	Pa
Mixing Ratio	0.0		%
Winter Design Temperature	-5.0		°C
Electric Reheater (winter)	No		

SUMMARY

Supply air	v0 [m/s]	Et [%]	tw [°C]	rw [kg/m³]	ts [°C]	rs [kg/m³]	dP* [Pa]
Connection section	1.8			1.3144		1.1638	1
Filter	1.8			1.3144		1.1638	167
Heat exchanger	1.6	84.7	-5 / 15.8	1.3124	28 / 25.1	1.1619	77
Inspection section							0
Plenum fan		65.7	15.8 / 16.5	1.2154	25.1 / 25.9	1.1723	587
Air cooler	1.5			1.2192	25.9 / 22	1.1761	22
Inspection section							0
Air heater	1.5		15 / 22	1.2252		1.1917	20
Humidifier				1.2		1.1915	0
Inspection section							0
Connection section	1.6			1.2		1.1915	0
Supply outlet				1.2		1.1915	300
Exhaust air							
Exhaust inlet							300
Connection section	1.6			1.1997		1.1784	0
Filter	1.6			1.1997		1.1784	57
Inspection section							0
Plenum fan		65.8		1.199		1.1778	437
Heat exchanger	1.6		19.6 / 0.3	1.2019	24.6 / 27.5	1.1806	76
Inspection section							0
Connection section	1.8			1.2879		1.1684	4

**Refers to the fan design case*
Fan system effect is taken into account in fan performance

SOUND POWER LEVELS

standard: EN13053 ISO/CD 13347-2

	Lw per octave band									LwA	
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Fresh air connection	61	63	66	61	56	53	48	46	dB	63	dB(A)
Supply air connection	62	66	72	66	68	60	53	48	dB	71	dB(A)
Extract connection	58	62	63	61	58	54	50	49	dB	63	dB(A)
Exhaust connection	57	62	63	63	63	59	53	49	dB	67	dB(A)
To surroundings	54	57	54	40	33	36	30	30	dB	48	dB(A)

ENERGY

Temperature efficiency (EN308) . . . . . 84.7 %
Heat recovery capacity . . . . . 16.2 kW
SFPv Total sum . . . . . 1.42 kW/(m³/s)
SFPe Total sum . . . . . 1.58 kW/(m³/s)

FAN POWER SUPPLY DATA

Voltage, supply flow . . . . . 1x230VAC+PE, 50Hz
Voltage, extract flow . . . . . 1x230VAC+PE, 50Hz
Power, supply flow . . . . . 0.78 kW
Power, extract flow . . . . . 0.78 kW
Current, full load, supply flow . . . . . 2.9 A
Current, full load, extract flow . . . . . 2.9 A

COILS

	Capacity	Air		Water				Conn
Air cooler	3.29 kW	25.9 °C, 56.7 %	22 °C, 67.7 %	8 / 13 °C	0.16 l/s	11.6 kPa	Ethylene glycol 20 %	DN15
Air heater	4.26 kW	15 °C, 45.8 %	22 °C, 29.5 %	44 / 39 °C	0.21 l/s	12.4 kPa		DN25

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For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

AIR HANDLING UNIT EQ

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140013	**Customers ref.**	
Unit	6 (F) / AHU5 - Basement (Other Areas)	**Our ref.**	Andy Window
Size	008		

TECHNICAL SPECIFICATION

Components listed in direction of air flow

SUPPLY AIR

Data at actual density as given in summary above

Intake/ exhaust section (outdoor version, with door)

Unit size: 008
Installation alternative: Fresh air in end
Damper type: with AluZink damper CEN class 3
Inspection side: right
Pressure drop, dimensioning 1 Pa

Casing end wall

Damper
Width cm : 080
Height in cm : 040
Tightness class : CEN 3
Connection: Flange
Function : Outdoor air
Location: internally end wall
Damper type: 100 mm blade
Material : AlZn

Damper actuator

Duct connection piece
Width cm : 80
Height in cm : 40
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Empty section
Unit size : 008
Length: 030
Inspection side : right

Filter

Inspection side: right

Filter selection
Filter class: F8 - ePM1 70%, glassfibre, short
Filter frame : AZ sheet steel
Prefilter: G4 – coarse, synthetic

Design
Connection side : inlet in end wall
Location: negative pressure
Drain tray: without

Number of filters	1x792x392 L=380	
Pressure drop, start	92	Pa
Pressure drop, dimensioning	167	Pa
Pressure drop, end	242	Pa
Face area	0.3	m^2
Face velocity	1.8	m/s

Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring

Filter monitoring

Rotary heat exchanger

Size: 008
Rotor type: Regoterm
Edge-reinforced: no
Foil spacing: Outputvariant 6 (2.1 mm, 270 mm wheel)
Delivery version: Whole rotor
Function lenght: standard
Material: galvanized sheet steel/AlZn
Inspection side: right

Efficiency			
Temperature efficiency according to standard EN 308		84.7	%
Temperature efficiency at 0°C outdoors		84.7	%
Cooling recovery		84.3	%
Humidity efficiency, Summer		0.0	%
Humidity efficiency, Winter		54.5	%
Supply air	**Summer**	**Winter**	
Pressure drop	77	68	Pa
Air temperature	28 / 25.1	-5 / 15.8	°C
Relative humidity	50 / 59.3	99 / 43.6	%
Capacity reduction	2	16	kW
Air flow transfer	52	52	l/s
Face velocity	1.7	1.6	m/s
Exhaust air	**Summer**	**Winter**	
Pressure drop	76	70	Pa
Air temperature	24.6 / 27.5	19.6 / 0.3	°C
Relative humidity	43.5 / 36.7	48.3 / 100	%
Additional throttling	0	0	Pa
Face velocity	1.7	1.6	m/s

Empty section

Unit size : 008
Length: 015
Inspection side : right

Plenum fan

Inspection side: right

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 2
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP54
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: safety isolating switch
Length: 308

Dimensioning data

Speed	2605	Rpm
Max speed	3110	Rpm
Total efficiency	65.7	%
Total static pressure, dimensioning (wet coil)	587	Pa
Dynamic pressure	11	Pa
Fan system input power (absorbed electrical power)	0.466	kW
Temperature rise	0.8	°C
K factor	42.35	
Fan wheel size	028	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	0.392	kW
Pressure rise	502	Pa
Speed	2424	Rpm

Motor

Motor output	0.78	kW
Electric current	2.9	A
Output margin, minimum	10	%

Motor accessories

Air cooler for chilled water

Size: 008
Connection side: right
Material: galvanized sheet steel
Droplet eliminator: without
Design variant: version 3

Coil selection

Use as: Cooling Coil
Calculation principle: input data
Output variant: 2
Fluid passes: 12
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Shunt selection

Shunt control: without

Nom. pipe size	15	
Liquid volume	2.9	l
Pressure drop, dimensioning	22	Pa
Ethylene glycol	20	%
Oversizing	123.7	%
Pressure drop, wet coil	22	Pa
Pressure drop, dry coil	18	Pa
Output	3.29	kW
Air temperature	25.9 / 22	°C
Relative humidity	56.7 / 67.7	%
Face velocity	1.5	m/s
Water temperature	8 / 13	°C
Water flow	0.16	l/s
Water velocity	0.7	m/s
Pressure drop water	11.6	kPa
Amount of condensation	0.0	l/s

Empty section

Unit size : 008
Length: 035
Inspection side : right

Air heater for hot water

Size: 008
Inspection side: right
Material: galvanized sheet steel
Coil selection
Calculation principle: input data
Output variant: 2
Fluid passes: 10
Fin spacing: 2 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Nom. pipe size	25	
Liquid volume	2.9	l
Pressure drop, dimensioning	20	Pa
Control principle for water heater	flow control	
Oversizing	132.0	%
Output	4.26	kW
Air temperature	15 / 22	°C
Face velocity	1.5	m/s
Water temperature	44 / 39	°C
Water flow	0.21	l/s
Water velocity	0.9	m/s
Pressure drop water	12.4	kPa

Humidifier

Unit size: 008
Length in cm: 060
Material: FZ sheet steel
Inspection side: right
Version: Standard

Empty section

Unit size : 008
Length: 010
Inspection side : right

End connection frame

Pressure drop, dimensioning 0 Pa
Casing end wall
Duct connection piece
Width cm : 80
Height in cm : 40
Connection type: flange connection
Material: galvanized sheet steel / AlZn

EXHAUST AIR

Data at actual density as given in summary above

End connection frame

Pressure drop, dimensioning 0 Pa
Casing end wall
Duct connection piece
Width cm : 80
Height in cm : 40
Connection type: flange connection
Material: galvanized sheet steel / AlZn

Filter

Inspection side: left

Filter selection

Filter class: pleated G4 – coarse, synthetic

Design

Drain tray: without

Number of filters	1x792x392	
Pressure drop, start	32	Pa
Pressure drop, dimensioning	57	Pa
Pressure drop, end	82	Pa
Face area	0.3	m^2
Face velocity	1.6	m/s

Analogue differential pressure sensor

Design: U-tube manometer for air flow measuring

Filter monitoring

Empty section

Unit size : 008
Length: 015
Inspection side : left

Plenum fan

Inspection side: left

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 2
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP54
Design: on motor
Delivery options:

Motor / VSD-accessories

Connection accessories: safety isolating switch
Length: 308

Dimensioning data

Speed	2336	Rpm
Max speed	3110	Rpm
Total efficiency	65.8	%
Total static pressure, dimensioning (wet coil)	437	Pa
Dynamic pressure	11	Pa
Fan system input power (absorbed electrical power)	0.347	kW
Temperature rise	0.6	°C
K factor	42.35	
Fan wheel size	028	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	0.32	kW
Pressure rise	409	Pa
Speed	2257	Rpm

Motor

Motor output	0.78	kW
Electric current	2.9	A
Output margin, minimum	10	%

Motor accessories

Empty section

Unit size : 008
Length: 015
Inspection side : left

Intake/ exhaust section (outdoor version, with door)

Unit size: 008
Installation alternative: Damper inside on end wall
Damper type: with AluZink damper CEN class 3
Inspection side: left
Pressure drop, dimensioning 4 Pa

Empty section
Unit size : 008
Length: 030
Inspection side : left

Casing end wall

Damper
Width cm : 080
Height in cm : 040
Tightness class : CEN 3
Connection: Flange
Function : extract air
Location: internally end wall
Damper type: 100 mm blade
Material : AlZn

Damper actuator

Duct connection piece
Width cm : 80
Height in cm : 40
Connection type: flange connection
Material: galvanized sheet steel / AlZn

BLOCK LIST

	Length	Width	Height	Volume	Weight
Intake/ exhaust section (outdoor version, with door), Filter *EQGA-008-090-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	950 mm	1250 mm	981 mm	1.16 m^3	137 kg
Rotary heat exchanger *EQHA-008-055-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	600 mm	1250 mm	1557 mm	1.17 m^3	179 kg
Plenum fan, Air cooler for chilled water , Air heater for hot water, Humidifier, End connection frame *EQGA-008-245-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	2500 mm	1250 mm	981 mm	3.07 m^3	324 kg
End connection frame, Filter, Plenum fan *EQGA-008-120-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	1250 mm	1250 mm	831 mm	1.3 m^3	152 kg
Intake/ exhaust section (outdoor version, with door) *EQGA-008-055-22-1-1-2-1-1-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	600 mm	1150 mm	831 mm	0.57 m^3	85 kg
				7.27 m^3	878 kg

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

CONTROLS

Electrical cabinet

Control cabinet: Position: Indoor Flange location: Bottom Assembly: Delivered separately Integrated web server	EQCM-1-41-1-2-2-02-8-0-1
Control panel: Siemens Climatix 600 Modbus TCP Basic web Integrated web server	STCM-03-0-0-2-0-1-1
Semi-graphical HMI	STCZ-77-02-0-1
Communication BACnet IP	STCZ-84-03-1-1
Miniature circuit breaker: Supply air fan 1, 1-phase, 10A	STCZ-89-011-1-010-1-1
Miniature circuit breaker: Extract air fan 1, 1-phase, 10A	STCZ-89-021-1-010-1-1
Miniature circuit breaker: Manoeuvre control cabinett, 1-phase, 6A	STCZ-89-050-1-006-1-1
Miniature circuit breaker: Socket with personal safety, 1-phase, 6A	STCZ-89-072-1-006-1-1
Miniature circuit breaker: HEX (1st), 1-phase, 10A	STCZ-89-081-1-010-1-1
Miniature circuit breaker: Heat1(pump), 1-phase, 6A	STCZ-89-112-1-006-1-1
Miniature circuit breaker: Cool 1 (pump), 1-phase, 6A	STCZ-89-113-1-006-1-1
Main switch:	STCZ-87-4-3-028-000-0-0-0-07-1
Service socket: EU (type F)	STCZ-92-2-0-1

Configuration

HMI language: English	STDZ-01-03-000-1
Temp control: Extract Air Temp Control	STDZ-05-02-000-1
Cooling recovery: With, based on temperature	STDZ-08-01-000-1
Humidity control: Extract air control	STDZ-10-02-000-1
Humidification control	STDZ-11-01-000-1
Frost protection heat exchanger: Enthalpy	STDZ-13-02-000-1
Fire alarm 1: Both fans stopped	STDZ-15-01-000-1
Fan control: Flow controlled supply and exhaust fans	STDZ-19-01-000-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-1-071-076-1
Filter alarm with sensor: outdoor air filter	STDZ-24-1-2-155-165-1
Filter alarm with sensor: extract air filter	STDZ-24-2-2-077-082-1

FUNCTION DESCRIPTION

Starting and stopping the air handling unit
The supply air fan and exhaust air fan are started and stopped according to internal scheduler.
The controller forces the heat exchanger to 100% recovery during start-up.
Mode selection switch is available in web interface and on the operator's control panel along with operation and alarm indication.
The following dampers open before supply/exhaust fan start and close when supply/exhaust fan stop:
- Outdoor air damper
- Exhaust air damper
The following dampers close in the event of a loss of power:
- Outdoor air damper
- Exhaust air damper

Temperature control
If there is an increased heating demand the heating sequence is controlled in the following order:
- Heat exchanger for heat recovery
- Heating coil 1, water
If there is an increased cooling demand the cooling sequence is controlled in the following order:
- Heat exchanger for cooling recovery; if the temperature of the Extract air is lower than the temperature of the Outdoor air. Otherwise blocked.
- Cooling coil 1, water
The rotary heat exchanger is controlled by the control unit by means of a drive unit.
The control unit maintains the extract air temperature at the setpoint by controlling the supply air temperature.
The supply air temperature sensor limits the minimum and maximum supply air temperature.
A risk of frost in heating coil 1 is detected by:
- Return water temperature sensor
If there is a risk of frost in heating coil 1 the air handling unit is stopped.
If there is a risk of frost in heating coil 1 its valve actuator is forced to open. If the risk of frost persists the air handling unit is stopped.
When the air handling unit is stopped the return water temperature in heating coil 1 is maintained at 20°C.
Operation of the circulation pump for heating coil 1 is handled by the control unit and the pump is in operation if there is a heating demand, or if the coil return water temperature falls below 12 °C, or during pump kick function.
Operation of the circulation pump for cooling coil 1 is handled by the control unit and the pump is in operation if there is a heating demand or during pump kick function.

Fan control
The supply air flow is maintained according to operative setpoint by means of the speed controlled supply air fan.
The extract air flow is maintained according to operative setpoint by means of the speed controlled exhaust air fan.

Humidity control
The relative humidity in the extract air is maintained at the setpoint by controlling the supply air humidity.
The supply air humidity sensor limits the minimum and maximum relative humidity in the supply air.
During humidification the control unit controls heating coil 1 before the humidifier in sequence for increased output.

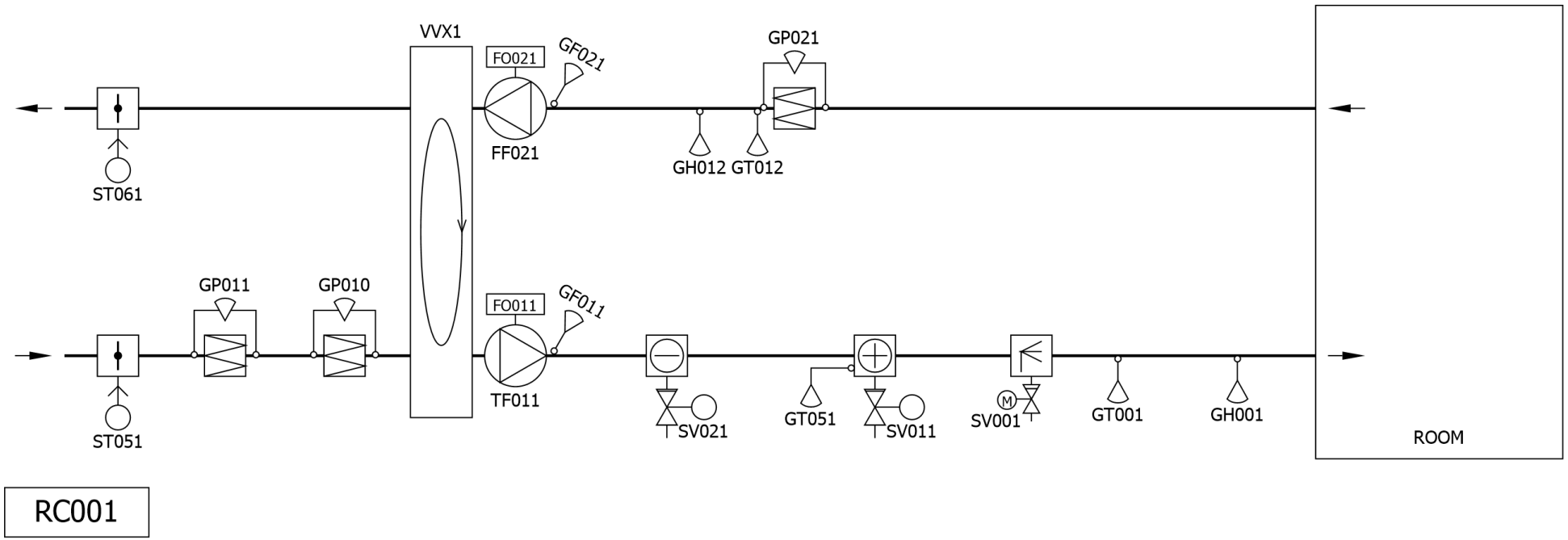
Filter monitoring
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air

Frost protection
When the calculated temperature in the extract air after the rotary heat exchanger drops below the dew point of the exhaust air and set value, recovery is limited so as to prevent the formation of frost.

Fire mode
In case of of fire alarm 1 the air handling unit is stopped.

Alarms are generated for
- Manual operation
- Heat exchanger
- Overload, circulation pump, heating coil 1
- Overload, circulation pump, cooling coil 1
- Overload, circulation pump, recovery
- Control fault, supply air fan
- Control fault, exhaust air fan
- Fault in speed controlled supply air fan
- Fault in speed controlled exhaust air fan
- Fire alarm
- Frost protection, heating coil 1
- Humidifier, supply air
- Prefilter, outdoor air

- Filter, outdoor air
- Filter, extract air
- Temperature sensor fault



	Customer id	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(F) / AHU5 - Basement (Other Areas)	
	Unit	6	**Supply air volume flow rate**	eQ - 008	500 l/s
	AOC	ACON-03140013	**Extract air volume flow rate**	eQ - 008	500 l/s

COMPONENT LIST

Description	Reference	Type	Delivery options	
Frequency converter, supply fan 1	FO011	Ziehl-Abegg	Factory installed and connected	
Frequency converter, extract fan 1	FO021	Ziehl-Abegg	Factory installed and connected	
Humidifier	AS030		Not included	
Damper actuator on/off with spring return, exhaust air	ST061	GMA121.1E/FW1	Factory installed and connected	
Semi-graphical HMI		POL871.71/STD HMI	Supplied	
Differential pressure sensor, supply air fan 1	GF011	SE2:QBM70.7000TNFW	Factory installed and connected	
Differential pressure sensor, extract air fan 1	GF021	SE2:QBM70.7000TNFW	Factory installed and connected	
Damper actuator on/off with spring return, outdoor air	ST051	GMA121.1E/FW1	Factory installed and connected	
Humidity/Temperature sensor, supply air	GH001/GT001	FTK140 MODBUS	Supplied with cable and quick connector	
Differential pressure sensor, filter extract air	GP021	SE2:QBM70.7000TNFW	Factory installed and connected	
Humidity/Temperature sensor, extract air	GH012/GT012	FTK140 MODBUS	Factory installed and connected	
Communication BACnet IP		POL908.00/STDBAC net IP	Installed	
Differential pressure sensor prefilter+filter, temperature outdoor air	GP010/GP011/ GT003	SE2:QBM70.7012/FW	Factory installed and connected	
Immersion sensor, return heating 1	GT051	AKF10.190.04 MODBUS	Supplied with cable and quick connector	

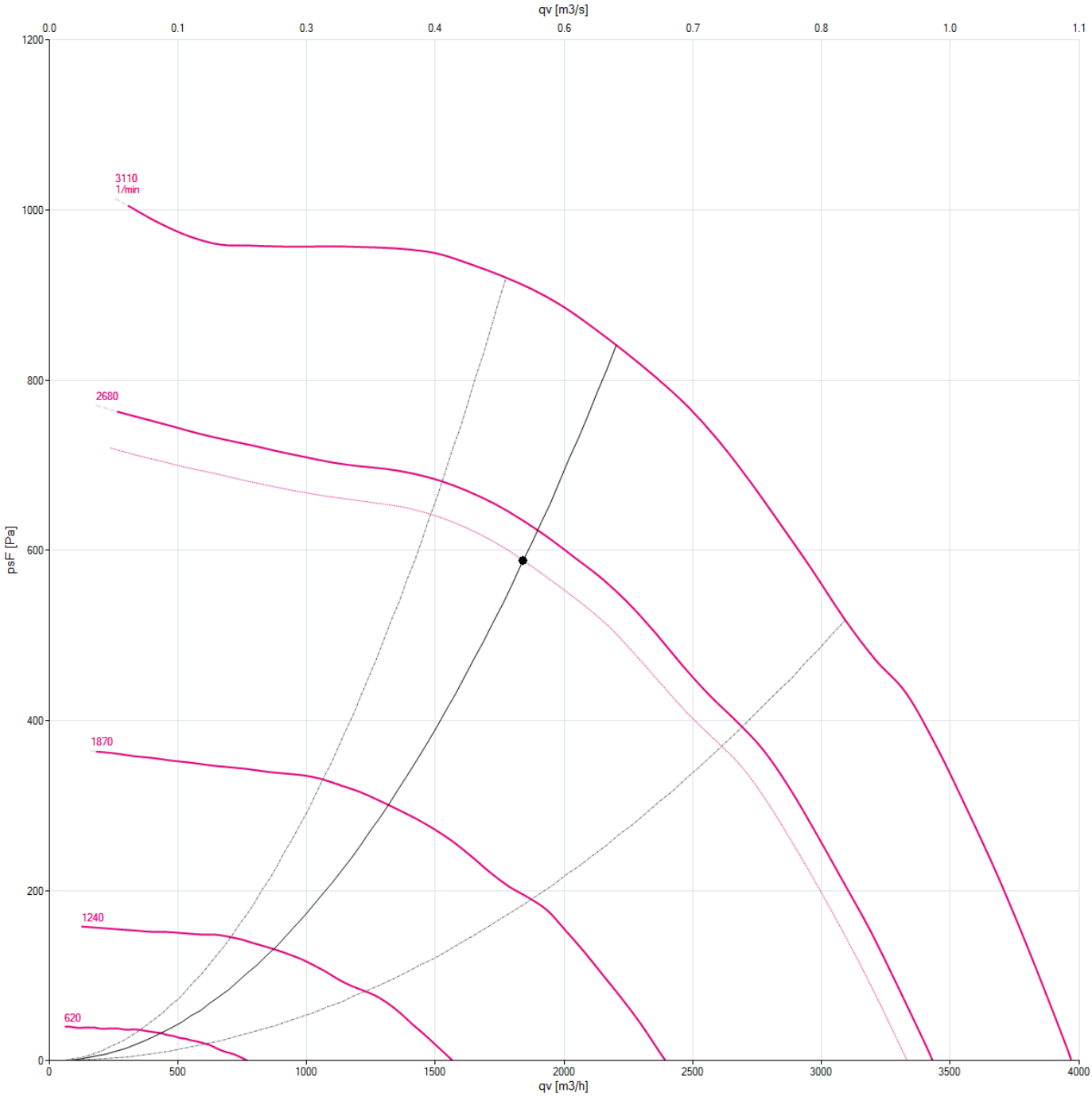
RATED CURRENT

Connection Point	Product code	Rated Voltage	No	Imax	Fmax	CSA
Mains cabling cabinet	STCZ-88	3x400VAC±10%+N+PE, 50Hz	5	8.4 A	63 A	35 mm²
Total				8.4 A		

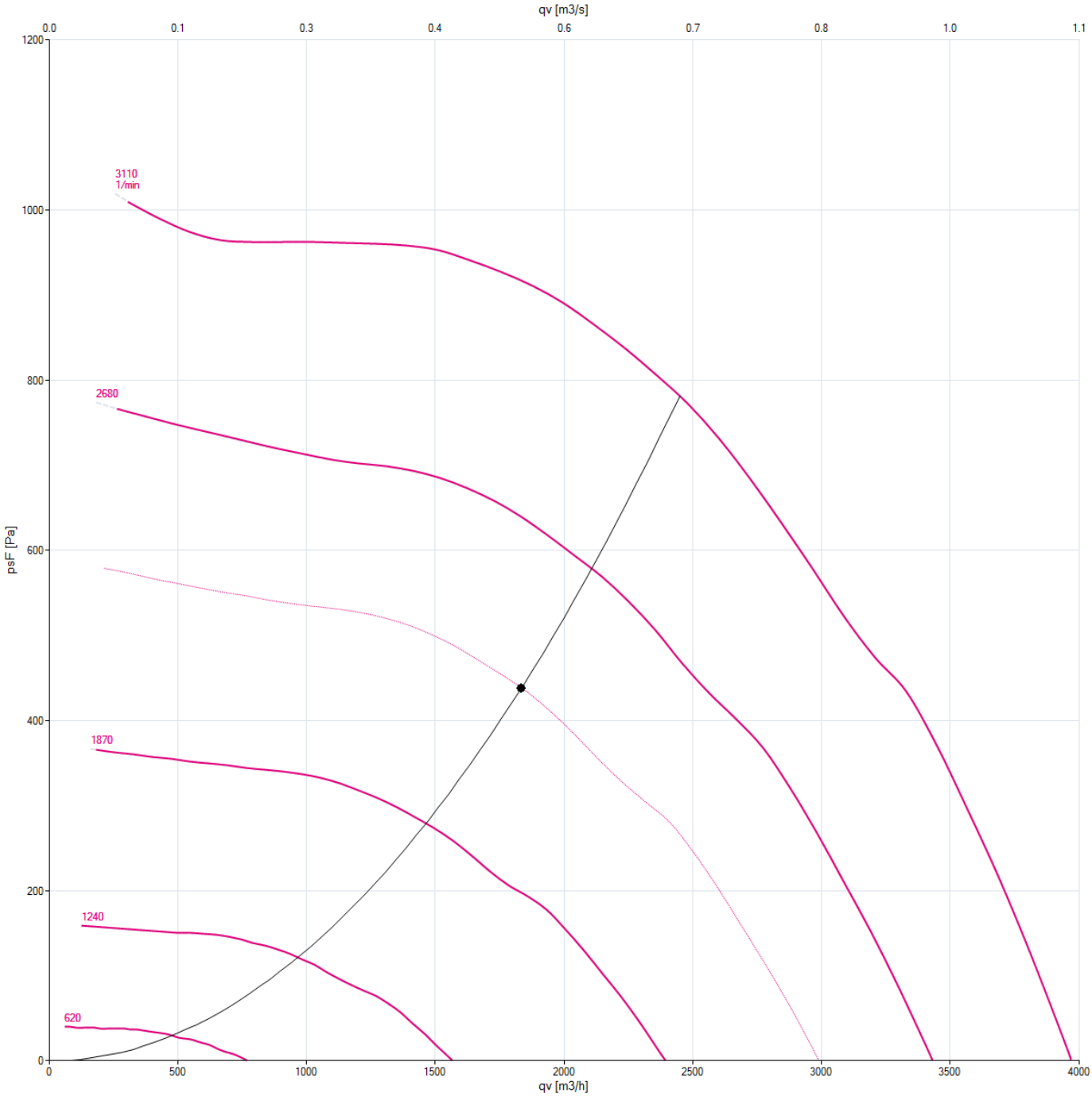
* Note that current for circulation pump is not included. AHU is dimensioned for pumps with max 6A per pump
* Miniature circuit breakers in switch cabinet have C characteristics

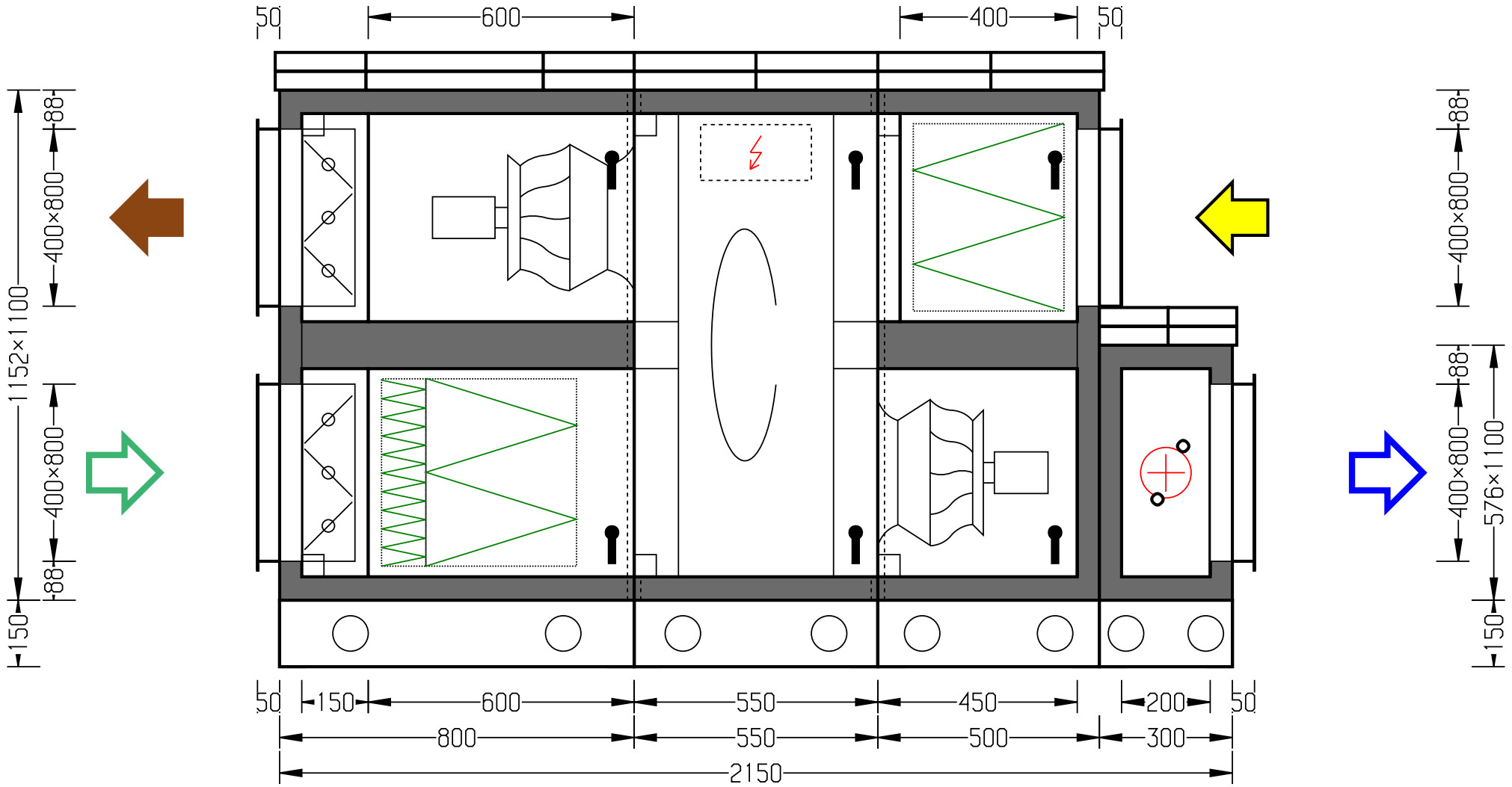
No = Number of conductors
Imax = Maximum current
Fmax = Maximum external fuse
CSAmax = Maximum cross sectional area

FAN CHART - SUPPLY AIR

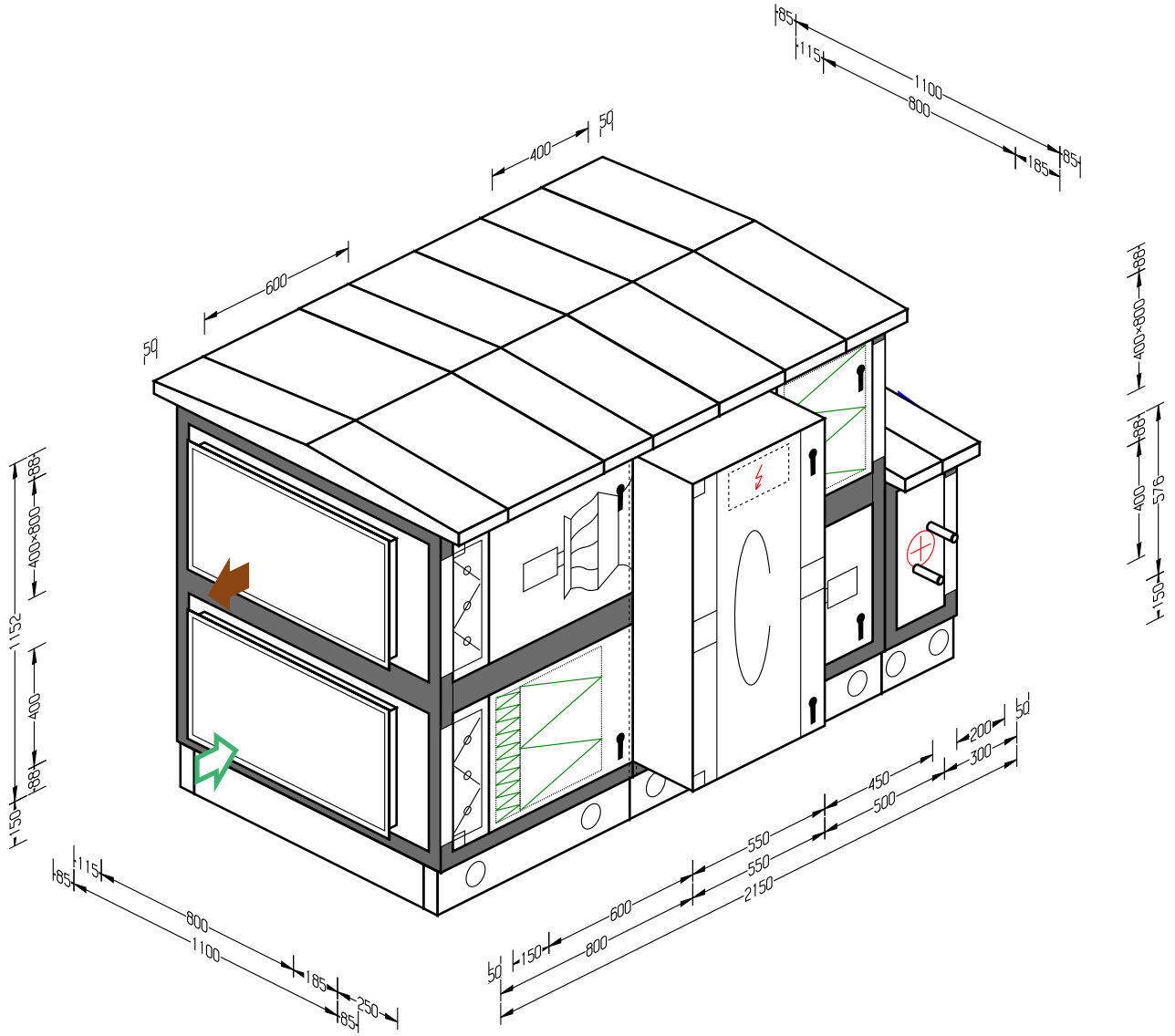


FAN CHART - EXTRACT AIR





From Inspection Side	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(G) / AHU6 Toilet Vent	
	Unit	7	**Supply air volume flow rate**	eQ Prime Side - 008	500 l/s
	AOC	ACON-03140016	**Extract air volume flow rate**	eQ Prime Side - 008	500 l/s



Isometric South West	**Customer id**	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(G) / AHU6 Toilet Vent	
	Unit	7	**Supply air volume flow rate**	eQ Prime Side - 008	500 l/s
	AOC	ACON-03140016	**Extract air volume flow rate**	eQ Prime Side - 008	500 l/s

AIR HANDLING UNIT EQ PRIME SIDE

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140016	**Customers ref.**	
Unit	7 (G) / AHU6 Toilet Vent	**Our ref.**	Andy Window
Size	008		

SUMMARY TECHNICAL SPECIFICATION

DIMENSIONING DATA

Supply air		
Supply air volume flow rate	500	l/s
External static pressure	300	Pa
Internal static pressure	261	Pa
Ref. density	1.2	kg/m³

Exhaust air		
Extract air volume flow rate	500	l/s
External static pressure	300	Pa
Internal static pressure	128	Pa
Ref. density	1.2	kg/m³

Winter		
Design outdoor temperature winter	-5	°C
Dim. humidity winter	99	%
Temperature in, extract air, winter	19	°C
Air humidity in, extract air, winter	50	%

Summer		
Design outdoor temperature summer	28	°C
Dim. humidity summer	50	%
Temperature in, extract air, summer	24	°C
Air humidity in, extract air, summer	45	%

UNIT

Unit type . . . . . eQ Prime Side
Size 008
Installation . . . . . Outdoor horizontal
Sum filtration supply air . . . . . ePM1 - 50.0%
Sum filtration exhaust air . . . . . ePM10 - 50.0%
Total dry weight . . . . . 671 kg
Controls . . . . . with
Transport dimensions . . . . . See block list page
Unit dimensions . . . . . 2150 x 1152 x 1100 mm

CASING

Model box code . . . . . EQ 1111
Thermal insulation T3
Condensation insulation TB3
Casing strength . . . . . D1(M)
Material . . . . . AlZn sheet steel
Leakage class . . . . . L1(M) / L2(R)*

ERP / EUROVENT

Unit type . . . . . NRVU BVU
SFPint . . . . . 263 W/(m³/s)
Dry temperature efficiency (balanced) . . . . . 86.3 %
External leakage rate . . . . . 0.5 %
Internal leakage rate . . . . . 0.0 %
Mixing ratio at winter design temperature . . . . . 0.0 %

Approved according to requirements 2018



	Supply air	Extract air	
Heat exchanger pressure drop	62	62	Pa
Filter energy classification	C	E	
Filter pressure drop, start	22	12	Pa
Filter area	0.5	0.5	m²
Filter cross section air velocity	1.0	1.1	m/s
Air flow	500	561	l/s
Total pressure rise	471	394	Pa
Fan fan system effect	0	0	Pa
Fan total efficiency	58.8	61.7	%
Fan system input power (absorbed electrical power) according to SFP	0.406	0.366	kW

Fan system effect is taken into account in fan performance

Summary Energy Calculation	Supply air	Extract air	
Airflow Rate	0.500	0.500	m^3/s
Total Static Pressure	561	428	Pa
Internal Static Pressure	261	128	Pa
Power Input	0.496	0.422	kW
Velocity	1.06	1.06	m/s
Winter Temperature Efficiency HRS (balanced)	86	86	%
Pressure drop HRS	62	62	Pa
Mixing Ratio	0.0		%
Winter Design Temperature	-5.0		°C
Electric Reheater (winter)	No		

SUMMARY

Supply air	v0 [m/s]	Et [%]	tw [°C]	rw [kg/m³]	ts [°C]	rs [kg/m³]	dP* [Pa]
Connection section	1.9			1.3144		1.1638	2
Filter	1.9			1.3144		1.1638	176
Heat exchanger	1.4	86.3	-5 / 15.7	1.3123	28 / 24.6	1.1618	65
Plenum fan		58.4	15.7 / 16.5	1.2147	24.6 / 25.4	1.1765	561
Connection section				1.2179		1.1798	0
Air heater	1.5		16.5 / 25	1.2175		1.1798	18
Connection section				1.1829		1.1796	0
Supply outlet				1.1829		1.1796	300
Exhaust air							
Exhaust inlet							300
Connection section				1.1997		1.1784	0
Filter	1.6			1.1997		1.1784	62
Heat exchanger	1.4		19 / -1.7	1.199	24 / 27.4	1.1777	64
Plenum fan		63.2		1.2927		1.1615	428
Connection section	1.9			1.2955		1.1642	2

**Refers to the fan design case*
Fan system effect is taken into account in fan performance

SOUND POWER LEVELS

standard: EN13053 ISO/CD 13347-2

	Lw per octave band									LwA	
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Fresh air connection	57	69	60	57	49	46	40	35	dB	59	dB(A)
Supply air connection	63	81	71	67	68	66	60	56	dB	73	dB(A)
Extract connection	53	59	53	54	46	43	37	34	dB	54	dB(A)
Exhaust connection	61	70	66	66	67	66	62	59	dB	72	dB(A)
To surroundings	51	64	50	39	30	34	30	30	dB	49	dB(A)

ENERGY

Temperature efficiency (EN308) . . . . . 86.3 %
Heat recovery capacity . . . . . 18.4 kW
SFPv Total sum . . . . . 1.54 kW/(m^3/s)
SFPe Total sum . . . . . 1.72 kW/(m^3/s)

FAN POWER SUPPLY DATA

Voltage, supply flow . . . . . 3x400VAC+PE, 50Hz
Voltage, extract flow . . . . . 3x400VAC+PE, 50Hz
Power, supply flow . . . . . 2.4 kW
Power, extract flow . . . . . 2.4 kW
Current, full load, supply flow . . . . . 3 A
Current, full load, extract flow . . . . . 3 A

COILS

	Capacity	Air		Water				Conn
Air heater	5.2 kW	16.5 °C, 54.1 %	25 °C, 32 %	44 / 39 °C	0.25 l/s	3.9 kPa		DN25

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and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

AIR HANDLING UNIT EQ PRIME SIDE

Project	3014 () / RNCM - New AHUs	**Customer**	Dodd Group
Unit	ACON-03140016	**Customers ref.**	
Unit	7 (G) / AHU6 Toilet Vent	**Our ref.**	Andy Window
Size	008		

TECHNICAL SPECIFICATION

Components listed in direction of air flow

SUPPLY AIR

Data at actual density as given in summary above

Intake air section

Size: 008
Material: AZ sheet steel
Inspection side: right
Pressure drop, dimensioning 2 Pa
Damper
Width cm : 080
Height in cm : 040
Tightness class : CEN 3
Connection: Flange
Function : Outdoor air
Location: internally end wall
Damper type: 100 mm blade
Material : AlZn
Damper actuator
Duct connection piece
Connection: Flange
Material, frame: galvanized sheet steel / AlZn

Filter function

Size: 008
Inspection side: right
Material: AZ sheet steel
Connection side : inlet in end wall, withdrawable filter frame
Filter length: Short bag (vertical pockets only)
Filter type: Glassfibre, Delbag
Filter frame : galvanized sheet steel
Prefilter: G4 – coarse, synthetic
Filter class: F7 - ePM1 55%, glassfibre
Number of filters 1x792x392x380
Pressure drop, start 101 Pa
Pressure drop, dimensioning 176 Pa
Pressure drop, end 251 Pa
Pressure drop filter 161 Pa
Pressure drop prefilter 89 Pa
Face area 0.3 m^2
Face velocity 1.9 m/s
Filter
Filter
Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring
Filter monitoring

Rotary heat exchanger

Size: 008
Inspection side: right
Rotor type: RegAsorp
Foil spacing: output variant 6 (2.1, 270mm wheel)

Efficiency			
Temperature efficiency according to standard EN 308		86.3	%
Temperature efficiency at 0°C outdoors		86.3	%
Cooling recovery		86.1	%
Humidity efficiency, Summer		83.8	%
Humidity efficiency, Winter		87.8	%
Supply air	**Summer**	**Winter**	
Pressure drop	65	57	Pa
Air temperature	28 / 24.6	-5 / 15.7	°C
Relative humidity	50 / 46.4	99 / 56.8	%
Capacity reduction	7	18	kW
Air flow transfer	93	95	l/s
Face velocity	1.4	1.4	m/s
Exhaust air	**Summer**	**Winter**	
Pressure drop	64	59	Pa
Air temperature	24 / 27.4	19 / -1.7	°C
Relative humidity	45 / 49.2	50 / 91.2	%
Additional throttling	0	0	Pa
Face velocity	1.4	1.4	m/s

Plenum fan

Inspection side: right

Fan selection		
Impeller type: Bluefin (composite)		
Fan size: size 3		
Anti-vibration mountings: wall mounted		
Motor selection		
Motor type: EC-motor		
Motor control		
Manufacture, type: EC-motor ZA		
Housing protection: IP55		
Design: on motor		
Delivery options:		
Dimensioning data		
Speed	2169	Rpm
Max speed	3700	Rpm
Total efficiency	58.4	%
Total static pressure, dimensioning (wet coil)	561	Pa
Dynamic pressure	7	Pa
Fan system input power (absorbed electrical power)	0.496	kW
Temperature rise	0.8	°C
K factor	33.96	
Fan wheel size	031	
SFP Calculation		
Fan system input power (absorbed electrical power) according to SFP	0.406	kW
Pressure rise	471	Pa
Speed	1990	Rpm
Motor		
Motor output	2.4	kW
Electric current	3.0	A
Doorstop (for doors on pressurized units)		
Motor cable		

Intake air section

Size: 008
Material: AZ sheet steel
Inspection side: right

Pressure drop, dimensioning	0	Pa

Air heater for hot water

Size: 008
Inspection side: right
Material: galvanized sheet steel
Coil selection
Calculation principle: input data
Output variant: 3
Fluid passes: 08
Fin spacing: 3 mm
Design: normal face area
Material, coil: Cu/Al, MS header

Nom. pipe size	25	
Liquid volume	4.1	l
Pressure drop, dimensioning	18	Pa
Control principle for water heater	flow control	
Oversizing	96.9	%
Output	5.2	kW
Air temperature	16.5 / 25	°C
Face velocity	1.5	m/s
Water temperature	44 / 39	°C
Water flow	0.25	l/s
Water velocity	0.6	m/s
Pressure drop water	3.9	kPa

Valve / valve actuator
Calculated kvs value: 2.5
Type of exchanger:
Frost protection sensor

Casing end wall

Pressure drop, dimensioning	0	Pa

Duct connection piece
Width cm : 80
Height in cm : 40
Connection type: flange connection
Material: galvanized sheet steel / AlZn

EXHAUST AIR

Data at actual density as given in summary above

Intake air section

Size: 008
Material: AZ sheet steel
Inspection side: left

Pressure drop, dimensioning	0	Pa

Duct connection piece
Connection: Flange
Material, frame: galvanized sheet steel / AlZn

Filter function

Size: 008
Inspection side: left
Material: AZ sheet steel
Connection side : inlet in end wall
Filter length: Short bag (vertical pockets only)
Filter type: Synthetic, Delbag
Filter frame : galvanized sheet steel
Prefilter: without
Filter class: M5 - ePM10 50%, synthetic

Number of filters	1x792x392x380	
Pressure drop, start	31	Pa
Pressure drop, dimensioning	62	Pa
Pressure drop, end	93	Pa
Face area	0.3	m^2
Face velocity	1.6	m/s

Filter
Analogue differential pressure sensor
Design: U-tube manometer for air flow measuring
Filter monitoring

Plenum fan

Inspection side: left

Fan selection

Impeller type: Bluefin (composite)
Fan size: size 3
Anti-vibration mountings: wall mounted

Motor selection

Motor type: EC-motor

Motor control

Manufacture, type: EC-motor ZA
Housing protection: IP55
Design: on motor
Delivery options:

Dimensioning data

Speed	2027	Rpm
Max speed	3700	Rpm
Total efficiency	63.2	%
Total static pressure, dimensioning (wet coil)	428	Pa
Dynamic pressure	10	Pa
Fan system input power (absorbed electrical power)	0.422	kW
Temperature rise	0.6	°C
K factor	33.96	
Fan wheel size	031	

SFP Calculation

Fan system input power (absorbed electrical power) according to SFP	0.366	kW
Pressure rise	394	Pa
Speed	1903	Rpm

Motor

Motor output	2.4	kW
Electric current	3.0	A

Doorstop (for doors on pressurized units)

Motor cable

Intake air section

Size: 008
Material: AZ sheet steel
Inspection side: left

Pressure drop, dimensioning	2	Pa

Damper

Width cm : 080
Height in cm : 040
Tightness class : CEN 3
Connection: Flange
Function : extract air
Location: internally end wall
Damper type: 100 mm blade
Material : AlZn

Damper actuator

Duct connection piece

Connection: Flange
Material, frame: galvanized sheet steel / AlZn

BLOCK LIST

	Length	Width	Height	Volume	Weight
Intake air section, Filter function, Plenum fan *EQHC-008-080-22-1-1-2-1-2-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	900 mm	1250 mm	1557 mm	1.75 m^3	220 kg
Rotary heat exchanger *EQHC-008-055-22-1-1-2-1-3-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	600 mm	1500 mm	1557 mm	1.4 m^3	211 kg
Filter function, Plenum fan, Intake air section *EQHC-008-050-22-1-1-2-1-4-2-1, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	600 mm	1250 mm	1557 mm	1.17 m^3	148 kg
Air heater for hot water, Casing end wall *EQGA-008-030-22-1-1-2-1-1-2-2, EQ 1111, AlZn sheet steel, T3, TB3, L1(M) / L2(R)*, D1(M)*	400 mm	1250 mm	981 mm	0.49 m^3	92 kg
				4.81 m^3	671 kg

**Flakt Group eQ AHUs are leakage class L2 real unit as certified by Eurovent.*
For units were the casing has; (i) a customised or special design that differs from standard module box, (ii) nonstandard components penetrating the casing that is non-standard for a real unit,
and (iii) where holes or penetrations are made in casing after delivery to site, the leakage class cannot be guaranteed. This also includes damage to the unit from handling and transportation".

CONTROLS

Electrical cabinet

Switch cabinet:	STSE-008-1-2-2-00-00-1
Placement: Infront of the unit	
Design: Outdoor	
Communication: Ethernet and integrated 4G modem	
Modbus TCP / Modbus RTU / BACnet IP / BACnet MSTP	
Integrated web server	
Miniature circuit breaker: Supply air fan 1, 3-phases, 10A	STCZ-89-011-3-010-1-1
Miniature circuit breaker: Extract air fan 1, 3-phases, 10A	STCZ-89-021-3-010-1-1
Miniature circuit breaker: Manoeuvre control cabinett, 1-phase, 10A	STCZ-89-050-1-010-1-1
Miniature circuit breaker: Heat1(pump), 1-phase, 6A	STCZ-89-112-1-006-1-1
Miniature circuit breaker: Spare 1, 1-phase, 6A	STCZ-89-998-1-006-1-1

Configuration

Temp control: Supply Air Temp Control	STDZ-05-01-000-4
Fire alarm 1: Both fans stopped	STDZ-15-01-000-4
Fan control: Flow controlled supply and exhaust fans	STDZ-19-01-000-4
Filter alarm with sensor: outdoor air filter	STDZ-24-1-1-084-089-4
Filter alarm with sensor: outdoor air filter	STDZ-24-1-2-151-161-4
Filter alarm with sensor: extract air filter	STDZ-24-2-2-086-093-4

FUNCTION DESCRIPTION

Starting and stopping the air handling unit
The supply air fan and exhaust air fan are started and stopped according to internal scheduler.
The controller forces the heat exchanger to 100% recovery during start-up if the outdoor temperature is below 10°C.
Mode selection switch is available in web interface and on the operator's control panel along with operation and alarm indication.
The following dampers open before supply/exhaust fan start and close when supply/exhaust fan stop:
- Outdoor air damper
- Exhaust air damper

The following dampers close in the event of a loss of power:
- Outdoor air damper
- Exhaust air damper

Temperature control
The control unit maintains the supply air temperature at the setpoint.
The outdoor temperature is measured by the DDC.
If there is an increased heating demand the heating sequence is controlled in the following order:
- Heat exchanger for heat recovery
- Heating coil 1, water

If there is an increased cooling demand the cooling sequence is controlled in the following order:
The rotary heat exchanger is controlled by the control unit.
Heating coil 1 is controlled by the control unit by means of a valve actuator.
Operation of the circulation pump for heating coil 1 is handled by the control unit and the pump is in operation if there is a heating demand, or if the coil return water temperature falls below 12 °C, or during pump kick function.
When the air handling unit is stopped the return water temperature in heating coil 1 is maintained at 20°C.
A risk of frost in heating coil 1 is detected by:
- Return water temperature sensor

If there is a risk of frost in heating coil 1 its valve actuator is forced to open. If the risk of frost persists the air handling unit is stopped.

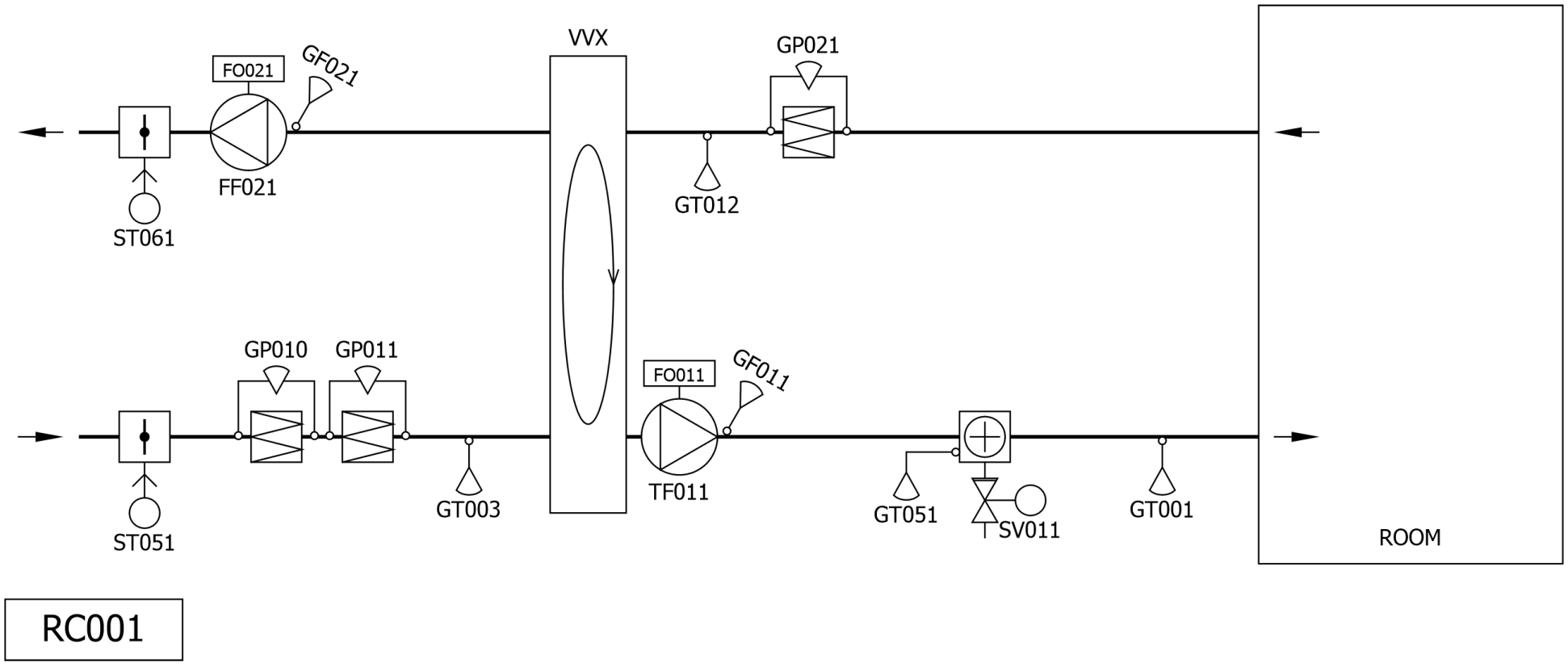
Fan control
The supply air flow is maintained according to operative setpoint by means of the speed controlled supply air fan.
The extract air flow is maintained according to operative setpoint by means of the speed controlled exhaust air fan.

Filter monitoring
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air

Fire mode
In case of fire alarm 1 the AHU is stopped (fire in supply or extract air).
In case of fire alarm 1, the following dampers are controlled to close:
- Outdoor air damper
- Exhaust air damper

Signal on fire input 1 in the controller activates fire alarm 1.

Alarms are generated for
- Manual operation
- Heat exchanger
- Overload, circulation pump, heating coil 1 (only if the pump's alarm output is connected to the controller)
- Control fault, supply air fan
- Control fault, exhaust air fan
- Fault in speed controlled supply air fan
- Fault in speed controlled exhaust air fan
- Fire alarm
- Frost protection, heating coil 1
- Prefilter, outdoor air
- Filter, outdoor air
- Filter, extract air
- Temperature sensor fault
- Pressure sensor fault



	Customer id	69028	**Project name**	RNCM - New AHUs	
	Project	3014	**Unit name**	(G) / AHU6 Toilet Vent	
	Unit	7	**Supply air volume flow rate**	eQ Prime Side - 008	500 l/s
	AOC	ACON-03140016	**Extract air volume flow rate**	eQ Prime Side - 008	500 l/s

COMPONENT LIST

Description	Reference	Type	Delivery options	
Rotary heat exchanger, motor		OJ DRHX-1055-MAD5	Factory installed and connected	
Rotary heat exchanger, control unit	VVX1	OJ-MRHX-3P02N-03C5	Factory installed and connected	
Extract air fan 1	FF021	GR31I-ZID.DC.CR	Factory installed and connected	
Supply air fan 1	TF011	GR31I-ZID.DC.CR	Factory installed and connected	
Cabinet heating	EH01	Calesco PO104153-00 230V	Factory installed and connected	
AHU DDC with modem	RC001	F 02 94 75	Factory installed and connected	
Touch Display	HMI1	HMI-WEB7 addon	Supplied	
Valve actuator, heating 1	SV011	SAS61.03, heating 1	Supplied	
2-Port Valve		VVG44.15-2.5, heating 1	Supplied	
Damper actuator on/off with spring return, outdoor air	ST051	GMA 121.1E	Factory installed and connected	
Damper actuator on/off with spring return, exhaust air	ST061	GMA 121.1E	Factory installed and connected	
Immersion sensor, return heating 1	GT051	PT1000 TF14	Supplied with cable	
Temperature sensor, outdoor air	GT003	AHC3.782.244-58	Factory installed and connected	
Flow sensor, extract fan	GF021	F-VS5	Factory installed and connected	
Differential pressure sensor, outdoor air filter	GP011	F-VS5	Factory installed and connected	
Temperature sensor, supply air	GT001	PT1000 AKF1019207	Supplied with cable	
Flow sensor, supply fan	GF011	F-VS5	Factory installed and connected	

Differential pressure sensor, extract air filter	GP021	F-VS5	Factory installed and connected	
Differential pressure sensor, prefilter outdoor air	GP010	F 04 81 02	Factory installed and connected	

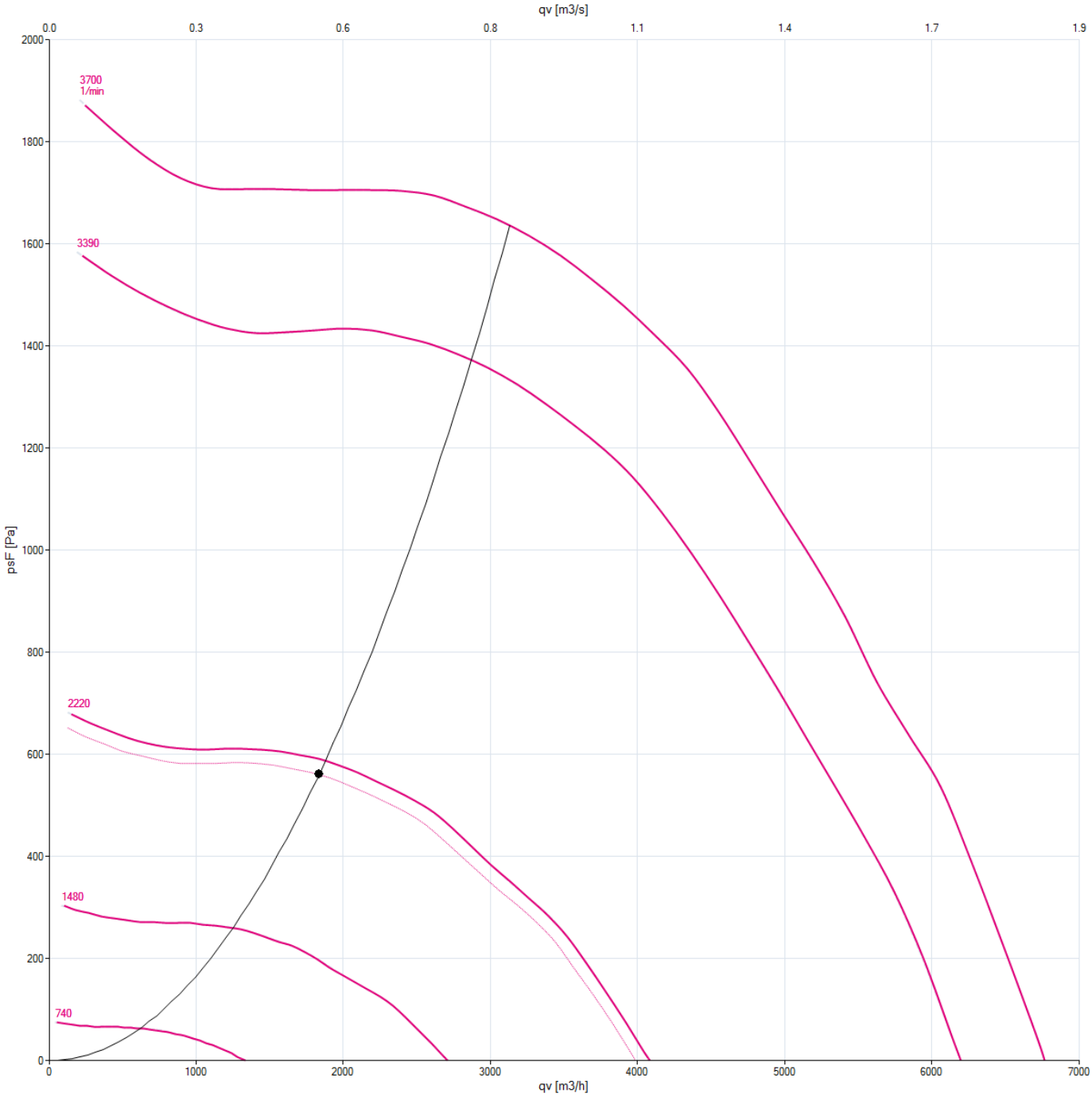
RATED CURRENT

Connection Point	Product code	Rated Voltage	No	Imax	Fmax	CSA
Switch cabinet	STSE	3x400VAC±10%+N+PE, 50Hz	5	7.8 A	63 A	35 mm²
Total				7.8 A		

* Note that current for circulation pump is not included. AHU is dimensioned for pumps with max 6A per pump
* Miniature circuit breakers in switch cabinet have C characteristics

No = Number of conductors
Imax = Maximum current
Fmax = Maximum external fuse
CSAmax = Maximum cross sectional area

FAN CHART - SUPPLY AIR



FAN CHART - EXTRACT AIR

