

PLANNING CONDITION 9 – SOLAR PV'S & ASHP'S

8461 – GREVILLE ST

22/03/2019 by *Emma Howsham*, reviewed by *Shaun Das*

The development will comply with planning condition 9 to ensure the scheme provides adequate on-site renewable technologies. Prior to commencement, a detailed design showing the location and extent, products, energy efficiencies and confirmed energy and carbon contributions of the photovoltaic cells and air source heat pumps to be installed will be outlined. The metering strategy will monitor renewable energy systems. For each system a life time maintenance schedule will be provided. These systems will be installed and maintained according to these approved details thereafter.

PV PANELS

To meet the renewable technology requirement of a minimum 26% reduction in carbon emissions the PV layout has been reviewed by a PV specialist and a further three panels incorporated into the design to deliver a 13kW peak (8461-M-706-T1). This is the maximum PV possible without re-evaluating the man-safe systems on the roof.

Maintenance of the PV is limited. A minimum of two visual checks per year are required to establish that the panels are not damaged or obscured and that wiring is intact. Set at 10° the panels will be self-cleaning but upon carrying out checks it will confirm that are clean. The inverter may need replacing during the 25 year lifespan of the system. If the inverter is not functioning correctly fault codes will be displayed on the unit and the required action will need to be undertaken. This will be established with a visual check or by meter readings over a length of time.

To monitor performance the meter reads will need to be measured against the expected performance. As detailed above this could be done by remote meters or by onsite reads. These meters will connect to a centralised BMS system to monitor the development.

AIR SOURCE HEAT PUMPS (ASHP)

The lifetime maintenance schedule of a DX system, Splits and VRV systems, is considered to be 15 years in-line with CIBSE/BSRIA documentation. The equipment schedule remains the same during the lifetime of the equipment, and the maintenance schedule is as per the document attached (Daikin Maintenance Checklist). There are no special requirements for component overhauls in line with running hours like the applied equipment.

Meters are used to monitor the energy output of the system and allow for billing. The Power Proportional Distribution (PPD) feature supplies the user with a reasonably calculated apportionment of the total power consumption by the Daikin air-conditioning system to individual indoor units in the system. The PPD feature provides an apportionment methodology that uses highly advanced technology as applied to the many variables in an air-conditioning system. The intent of PPD is to apportion total outdoor unit power consumption back into the respective indoor units that are served by those outdoor units. In other words, for each indoor unit that is exchanging heat, either in the cooling mode or heating mode, its operation is supported by a condensing unit that is consuming energy. PPD mathematically calculates each indoor units portion of that outdoor units total power consumption based upon its return air temperature, electronic expansion valve position and baseline values determined by the factory.

The output from the kw/h power meters meet the following specification: They must be a non-voltage, normally open, momentary contact closure. This is usually a semi-conductor switched output. On the Square D PowerLogic series energy meters it is referred to as an Opto-FET output. (Non -mechanical relay type. FET is a Field Effect Transistor.) They must provide an output of 1 pulse per 1 kW of consumption. This pulse (again the closure of the FET gate), must have a duration or width of 40 – 400 milliseconds.

For general production information of the selected units for this development please see attached Greville St Project Document

Please find the document Daikin Power Proportional Distribution (PPD), which outlines the concept, design and description of the Daikin metering and billing solution, this can be proportioned accurately per fan coil unit.

APPENDIX

8461-M-706-T1 Roof Layout

Greville St Project Document

Daikin Maintenance Checklist

Daikin Power Proportional Distribution (PPD)

DO NOT SCALE

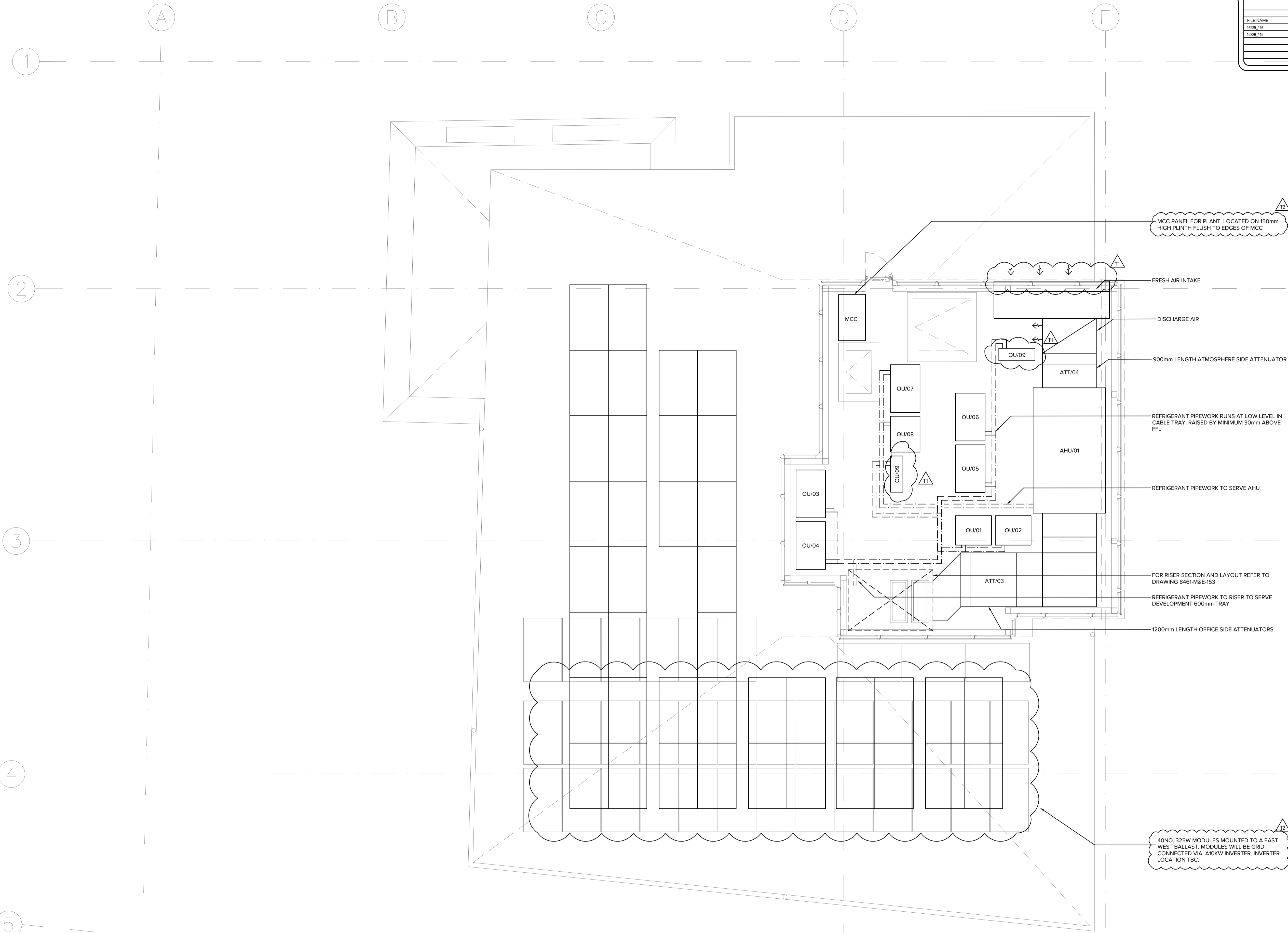
BACKGROUND DRAWING INFORMATION

FILE NAME	ORIGINATOR NAME	DESCRIPTION NAME	REV	DATE RECD
1529_116	FROST ARCHITECTS	PROPOSED ROOF PLAN	P2	17.07.18
1529_115	FROST ARCHITECTS	PROPOSED ROOF PLAN	T1	09.11.18

Notes

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION PURPOSES. DO NOT SCALE OFF THIS DRAWING. ALWAYS WORK TO NOTED DIMENSIONS. ALL DIMENSIONS MUST BE VERIFIED ON SITE BEFORE COMPLETING SHOP DRAWINGS OR SETTING OUT THE WORK. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE TECHNICAL SPECIFICATIONS AND ASSOCIATED EQUIPMENT SCHEDULES AS PREPARED BY XCO2 ENERGY LTD. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL, CIVIL AND STRUCTURAL ENGINEERS DRAWINGS AND ASSOCIATED XCO2 ENERGY LTD. DRAWINGS.

1. THE SUB-CONTRACTORS SHALL SUBMIT INSTALLATION DRAWINGS TO THE CONTRACT ADMINISTRATOR, ARCHITECT AND BUILDING CONTROL INSPECTOR FOR APPROVAL PRIOR TO ANY INSTALLATION
2. THIS DRAWING SHOWS GENERAL REPRESENTATION OF THE EQUIPMENT AND PIPEWORK FINAL POSITIONS AND DIMENSIONS TO BE CONFIRMED ON INSTALLATION DRAWINGS
3. THE SUB CONTRACTOR SHALL ENSURE THEY ARE WORKING TO CURRENT ARCHITECTS DRAWINGS BEFORE COMMENCING WORKS ON SITE. ANY SERVICES INSTALLED TO THE WRONG ARCHITECTS DRAWING WILL BE THE RESPONSIBILITY OF THE SUB CONTRACTOR TO RECTIFY
4. ALL PIPES PASSING THROUGH FIRE COMPARTMENTS SHALL BE PROVIDED WITH FIRE COLLARS AND FIRE SEALS. FIRE STOPPING DETAILED SHALL BE SUBMITTED FOR APPROVAL
5. ALL SERVICES PIPEWORK SHALL BE FULLY INSULATED IN STRICT COMPLIANCE WITH BS 5422:2009. ALL INSULATED PIPEWORK SHALL BE LABELED WITH THE SERVICE TYPE AND THE DIRECTION OF FLOW. TRACE HEATING SHALL BE INSTALLED TO ALL EXTERNAL COLD WATER SERVICES PIPEWORK
6. PIPE SLEEVES SHALL BE PROVIDED FOR ALL PIPES PENETRATING WALLS OR SLABS
7. THE MECHANICAL SUB CONTRACTOR SHALL ENSURE ADEQUATE ACCESS TO COMMISSIONING VALVES AND ISOLATING VALVES TO ALLOW FOR TESTING, INSPECTION AND MAINTENANCE
8. ANTI-VIBRATION MOUNTS SHALL BE INSTALLED TO ALL PUMPS, BOILERS AND PRESSURIZATION SETS REQUIRED
9. ALL PIPES SHALL BE CONCEALED IN WALLS IF POSSIBLE. NO PIPEWORK SHALL BE EXPOSED EXCEPT WITHIN SERVICE VOIDS, RISER BOXINGS ETC.
10. ALL BURIED, CHASED CONCEALED PIPEWORK AND FITTINGS SHALL BE TESTED PRIOR TO MAKING GOOD AND CONCEALED
11. VERTICAL PIPES SHALL DROP PARALLEL TO WALLS. PARTITIONS AND/OR BUILDINGS STRUCTURE. FLOW AND RETURN PIPEWORK SHALL RUN PARALLEL TO EACH OTHER. HORIZONTAL PIPES SHALL BE GRADED TO CLEAR AIR VENT POINTS AND TO DRAIN AT LOW POINTS. MINIMUM DISTANCE BETWEEN PARALLEL PIPES SHALL BE 25mm OR IN THE CASE OF INSULATED PIPES THE FACE OF THE INSULATION
12. THE RUN OF PIPEWORK SHALL BE ARRANGED IN NEAT AND WORKMANLIKE MANNER
13. ALL DOMESTIC WATER SERVICES PIPEWORK SHALL BE FULLY FLUSHED AND CHLORINATED ON COMPLETION OF THE WORKS
14. FIRE COLLARS SHALL BE INSTALLED TO ALL VENTILATION DUCTS WHERE THESE PENETRATE FIRE COMPARTMENTS
15. DUCTWORK CONNECTIONS SHALL BE MADE USING PROPRIETARY FITTINGS AND SEALANT SYSTEM TO ENSURE AIR TIGHTNESS
16. INSULATION TO BE PROVIDED TO THE FRESH AIR INTAKE AND EXHAUST DUCTWORK TO PREVENT CONDENSATION
17. ACCESS TO ALL FIRE DAMPERS ON DUCTWORK REQUIRED



Rev	Date	Description	Chk'd	Appr
T2	20/02/19	ADDITION OF MCC PANEL AND PLINTH. 3 PV PANELS ADDED AND ARRANGEMENT AMENDED.	SD	
T1	14/12/18	AMENDED ATTENUATOR AND CONDENSER REFERENCES. AMENDED CONDENSER SIZE	SD	RC

STAGE 4

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Client: WORKSPACE

Architect: FROST ARCHITECTS

Project: GREVILLE STREET

Title: MECHANICAL SERVICES ROOF HVAC LAYOUT

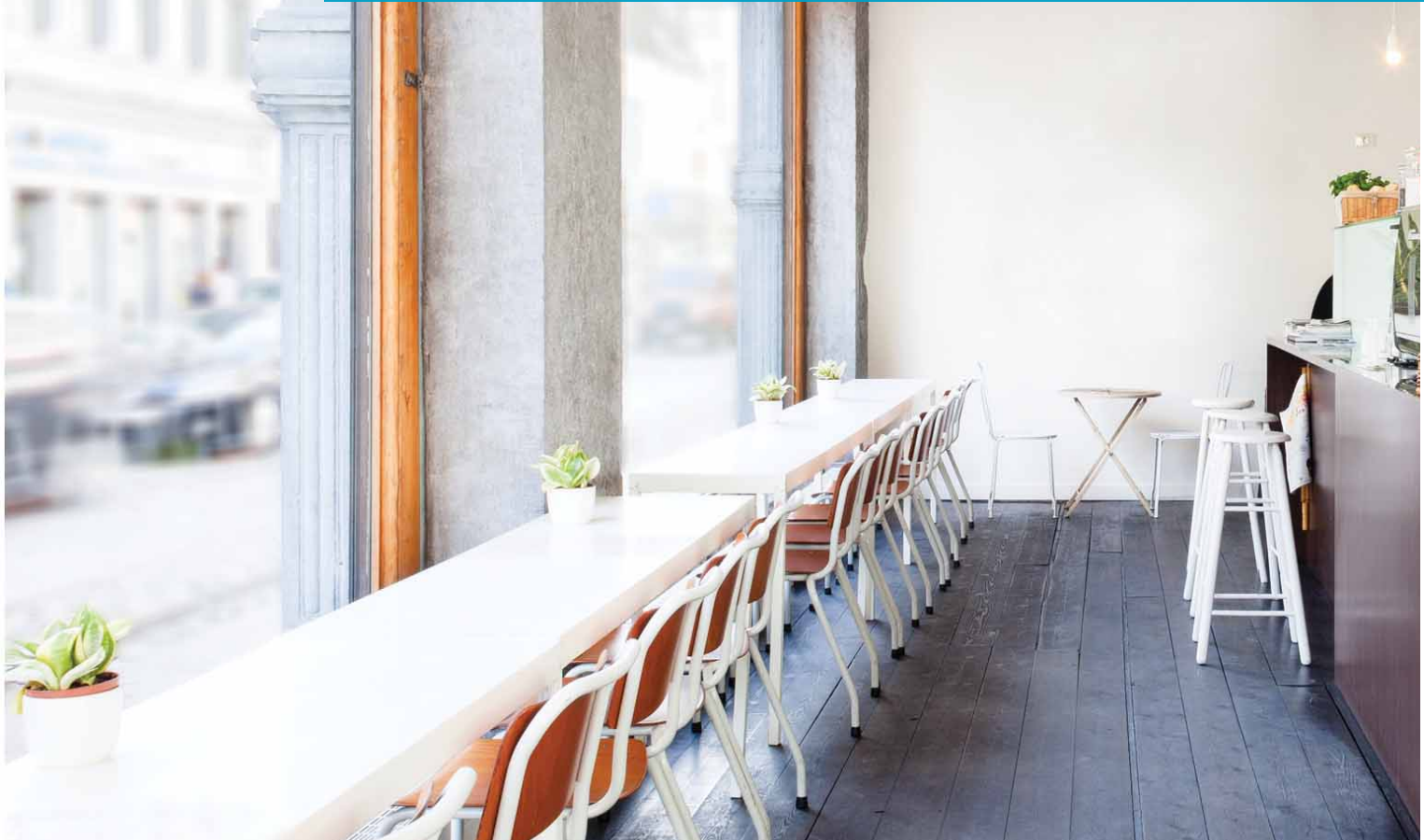
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1:50 @A1	RB	SD	07.12.18

Drawing Number	Revision
8461-M-706	T2



Project
Greville St

06/03/2019



Thank you for considering Daikin VRV systems for your project.

Daikin are the world leading manufacturer of VRV systems and HVAC products and are renowned for the highest quality products available in the market.

This report is designed to offer you a complete overview of the system from a legislative perspective and we are happy to discuss any aspects of this report with you. Please note that all information contained herein is produced based on our best current understanding of your requirements and legislative practices.

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2. Energy Efficiency
3. Annual Energy Costs
4. ECA Report and relevant certificates
5. BES6001 Product Declaration
6. Indoor Units Brochures
7. Specification Text

Project Summary

System Name	Efficiencies		Annual Energy Costs	ECA
1. Basement and Ground	EER	COP	Condenser Only £ 1,811.40	EER
	3.75	4.1		PASS
	ESEER	SEER	System Including Indoor Units £ 2,524.73	COP
	6.43	4.24		PASS
	ESCoP	SCoP		
	5.26	4.32		
2. First Floor	EER	COP	Condenser Only £ 2,011.90	EER
	3.01	3.6		Not Compliant
	ESEER	SEER	System Including Indoor Units £ 2,499.87	COP
	5.08	3.88		Not Compliant
	ESCoP	SCoP		
	4.54	3.99		
3. Second Floor	EER	COP	Condenser Only £ 1,182.53	EER
	3.74	3.98		PASS
	ESEER	SEER	System Including Indoor Units £ 1,557.57	COP
	6.3	4.44		PASS
	ESCoP	SCoP		
	5.09	4.34		
4. Third Floor	EER	COP	Condenser Only £ 1,182.53	EER
	3.74	3.98		PASS
	ESEER	SEER	System Including Indoor Units £ 1,557.57	COP
	6.3	4.44		PASS
	ESCoP	SCoP		
	5.09	4.34		
5. Fourth Floor	EER	COP	Condenser Only £ 1,182.53	EER
	3.74	3.98		PASS
	ESEER	SEER	System Including Indoor Units £ 1,438.72	COP
	6.3	4.9		PASS
	ESCoP	SCoP		
	5.09	4.55		



Project Summary (Continued)

System Name	Efficiencies		Annual Energy Costs	ECA
Centralized Controllers	Calculations not available as this group doesn't contain any condensing unit			
PROJECT TOTALS	ESEER	SEER	Without Indoor Units	Project NOT Eligible for ECA
	6.08	4.38	£ 7,370.89	
	ESCoP	SCoP	With Indoor Units	
	5.01	4.48	£ 9,578.46	

All information is provided based on our best understanding of the appropriate legislation at the time. We endeavor to keep this tool in line with that information, however, we cannot be held responsible for any errors or omissions caused from the use of the information contained within this document



Energy Efficiency

System Name	Cooling Condition	Heating Condition	Part Load Preset	EER	CoP	ESEER	SEER	ESCoP	SCoP
1. Basement and Ground	VRT Cooling	VRT Heating	Part L	3.75	4.1	6.43	4.24	5.26	4.49
2. First Floor	VRT Cooling	VRT Heating	Part L	3.01	3.6	5.08	3.88	4.54	4.15
3. Second Floor	VRT Cooling	VRT Heating	Part L	3.74	3.98	6.3	4.44	5.09	4.51
4. Third Floor	VRT Cooling	VRT Heating	Part L	3.74	3.98	6.3	4.44	5.09	4.51
5. Fourth Floor	VRT Cooling	VRT Heating	Part L	3.74	3.98	6.3	4.9	5.09	4.73
Centralized Controllers	Calculations not available as this group doesn't contain any condensing unit								

These efficiency calculations are calculated according to the part load presets. If Part L is shown as the preset then the efficiency calculation is based on the chiller/office application example in the Building Services Non Domestic Compliance guide and are based on performance testing according to EN14511 for cooling and EN14825 in Heating.

In the future, SEER figures will be provided according to test standard EN14825 when Lot 21 comes into force.

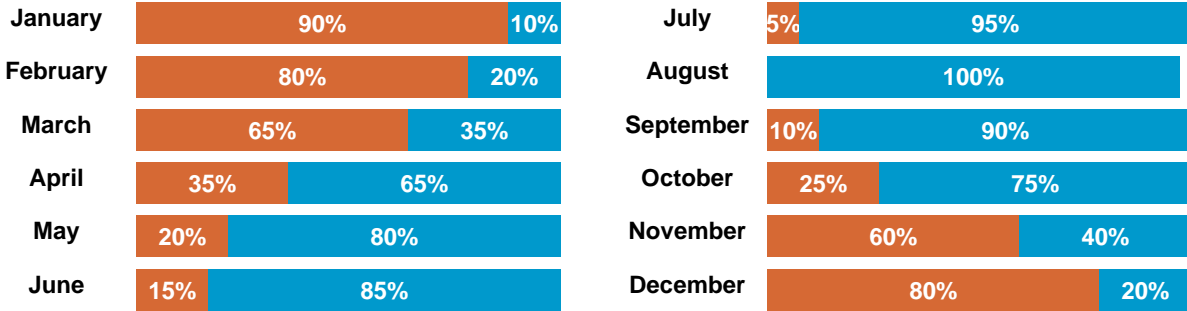
Please note that systems containing AHU's do not contain any elements of the AHU efficiency, please consult the technical data from the AHU to determine the specific fan power.

Annual Running Costs

System Setup

Electricity Price 0.135 £/kWh	Hours / Day 10	Days / Week 5	Weeks / Year 51	Preset Office
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Heating / Cooling distribution



System Name	Condenser Only	System Including Indoor Units
1. Basement and Ground	£ 1,811.40 - 13,417.75 kWh	£ 2,524.73 - 18,701.68 kWh
2. First Floor	£ 2,011.90 - 14,902.96 kWh	£ 2,499.87 - 18,517.55 kWh
3. Second Floor	£ 1,182.53 - 8,759.50 kWh	£ 1,557.57 - 11,537.56 kWh
4. Third Floor	£ 1,182.53 - 8,759.50 kWh	£ 1,557.57 - 11,537.56 kWh
5. Fourth Floor	£ 1,182.53 - 8,759.50 kWh	£ 1,438.72 - 10,657.18 kWh
Centralized Controllers	Calculations not available as this group doesn't contain any condensing unit	

This running cost information is estimated based on the system efficiency, monthly heat cool load variations and the selected load preset and is intended purely as a guide

BES6001 Product Declaration for Daikin VRV Systems

Project: Greville St

BREEAM RSCS Score Level: 5

BES6001 Material Report

Items

Qty.

METAL
2139.36 kg

THERMOPLASTIC (TPO)
308.56 kg

OTHER
404.70 kg

REYQ20T	1
REYQ14T	3
REYQ12T	1
REYQ10T	1
KHFP26A100C	5
FXUQ71A	5
FXSQ50A	26
FXSQ32A	4
FXSQ25A	1
FXAQ50P	1
FXAQ40P	1
FXAQ32P	1
FXAQ25P	2
FXAQ20P	1
DMS502A51	1
DCM601A51	1
DAM412B51	1
CYVM150DK80RBC	1
BS6Q14AV1B	3
BS4Q14AV1B	7
BS1Q10A	2

Daikin are the only HVAC Company worldwide to have this accreditation.

The BES6001 Standard was developed by the BRE to demonstrate responsible sourcing of materials throughout the supply chain by proving product stewardship against social, economic and environmental sustainability criteria.

This standard is recognised by BREEAM, the world's leading building rating scheme. Daikin have been rated 'Very Good' and specifiers and contractors can potentially gain additional BREEAM credits using the information provided in the statement, safe in the knowledge the products have been responsibly sourced and manufactured.



Appendix A

Indoor Units Datasheets





FXAQ-P

Ideal for shops and offices with solid ceilings

Ideal for shops and offices without false ceilings with an extensive range to meet the needs of a variety of different sized facilities.

The Daikin VRV indoor unit range is one of the widest on the market, offering no less than 26 stylish and elegant models in 116 different variants – all designed to maximise comfort, minimise operating noise and simplify installation and servicing.

Designed to fit rooms of any size and shape, Daikin indoor units are also user friendly, ultra reliable, easy to control and quiet in operation.

All indoors units comply with the Ecodesign legislation by adopting DC fans in all indoor units, improving their energy efficiency.

Features and benefits:

- > Ideal solution for shops, restaurants or offices with no or narrow false ceilings
- > Low energy consumption thanks to DC fan motor
- > Can be installed in both new and existing buildings
- > Flat, stylish front panel blends easily within any interior décor and is more easy to clean
- > 15 class unit especially developed for small or well-insulated rooms, such as hotel bedrooms and small offices
- > 5 different discharge angles can be programmed via the remote control
- > Maintenance operations can be performed from the front of the unit



FXAQ15-32P



BRC1E52A/B



BRC7E618

FXAQ-P

Indoor unit			FXAQ15P	FXAQ20P	FXAQ25P	FXAQ32P	FXAQ40P	FXAQ50P	FXAQ63P	
Cooling capacity	Nom.	kW	1.7	2.2	2.8	3.6	4.5	5.6	7.1	
Heating capacity	Nom.	kW	1.9	2.5	3.2	4.0	5.0	6.3	8.0	
Power input - 50Hz	Cooling	Nom.	0.017	0.019	0.028	0.030	0.020	0.033	0.050	
	Heating	Nom.	0.025	0.029	0.034	0.035	0.020	0.039	0.060	
Casing Colour			White (3.0Y8.5/0.5)White (3.0Y8.5/0.5)							
Dimensions	Unit	H x W x D	290x795x238				290x1,050x238			
Weight	Unit		11				14			
Fan-Air flow rate - 50Hz	Cooling	High/Low	m ³ /min	7.0/4.5	7.5/4.5	8/5	8.5/5.5	12/9	15/12	19/14
Sound power level	Cooling	Nom.	dB(A)	-						
Sound pressure level	Cooling	High/Low	dB(A)	34.0/29.0	35.0/29.0	36.0/29.0	37.5/29.0	39.0/34.0	42.0/36.0	47.0/39.0
Refrigerant	Type		R-410A							
Piping connections	Liquid/OD/Gas/OD/Drain	mm	6.35/12.7/VP13 (I.D. 13/O.D. 18)							9.52/15.9/VP13 (I.D. 13/O.D. 18)
Power supply	Phase/Frequency/Voltage	Hz/V	1~/50/220-240							
Current - 50Hz	Maximum fuse amps (MFA)	A	16							

Options & accessories

Adapters and controls	FXAQ 15~63P
BRC1E52A/B Premium wired remote control with full text interface and back light	•
BRC1D52 Standard wired remote control with weekly timer	•*4
Infrared remote control including receiver	BRC7EB518
BRC2E52A Simplified wired remote control for heat recovery	-
BRC3E52A Simplified wired remote control for heat pump	-
DCS302C51 Central remote control	•
DCS301B51 Unified ON/OFF control	•
DST301B51 Schedule timer	•
DCM601A51 Intelligent Touch Manager	•
External wired temperature sensor	KRCS01-1
External wireless temperature sensor	K.RSS
Wiring adapter for external monitoring/control via dry contacts and setpoint control via 0-140 Ω	KRP4A51
Wiring adapter for external central monitoring / control (controls 1 entire system)	KRP2A51
Wiring adapter with 4 output signals (compressor / Error, Fan, Aux. heater, Humidifier output)	-
Wiring adapter with 2 output signals (compressor / Error, Fan)	-
Adapter for multi-tenant (24VAC PCB power interface)	DTA114A61
External control adapter for outdoor unit	DTA104A61
Installation box / Mounting plate for adapter PCBs (For units where there is no space in the switchboard)	KRP4A93
Connector for forced-off contact	standard
Connection to centralised control	standard
Electrical box with earth terminal (2 blocks)	-
Electrical box with earth terminal (3 blocks)	-

Other options	FXAQ 15~63P
Decoration panel (obligatory for cassette units, optional for others, rear panel for FXLQ)	-
Kit for mounting of decoration panel direct onto unit	-
Panel spacer for reducing required installation height	-
Sealing kit for 3-directional or 2 directional air discharge	-
Decoration panel for air discharge	-
Fresh air intake kit	-
Air discharge adapter for round duct	-
Replacement long life filter	-
Drain pump kit	K-KDU572EVE
Sensor kit	-
Noise filter (for electromagnetic use only)	-
L-type piping kit (for upward direction)	-

*4 Not recommended because of the limitation of the functions

The present leaflet is drawn up by way of information only and does not constitute an offer binding upon Daikin UK. Daikin UK has compiled the content of this leaflet to the best of its knowledge. No express or implied warranty is given for the completeness, accuracy, reliability or fitness for particular purpose of its content and the products and services presented therein. Specifications are subject to change without prior notice. Daikin UK explicitly rejects any liability for any direct or indirect damage, in the broadest sense, arising from or related to the use and/or interpretation of this leaflet. All content is copyrighted by Daikin UK.





FXSQ-A

Optimum comfort guaranteed no matter the length of ductwork or type of grilles

The FXSQ-A concealed ceiling unit features a 3-step airflow control, which offers improved comfort. Energy consumption is reduced by 20%, compared with the FXSQ-P series, thanks to the use of a new DC fan. The unit is ideal for shops and offices, because it can be used with ducts of varying lengths.

Features and benefits:

- > Automatic air flow adjustment function measures the air volume and static pressure and adjusts it towards the nominal air flow, whatever the length of duct, making installation easier and guaranteeing comfort. Moreover, the ESP can be changed via the wired remote control to optimize the supply air volume
- > Slimmest unit in class, only 245mm
- > Low operating sound level
- > Medium external static pressure up to 150Pa facilitates using flexible ducts of varying lengths
- > Discretely concealed in the ceiling: only the suction and discharge grilles are visible
- > 15 class unit especially developed for small or well-insulated rooms, such as hotel bedrooms, small offices, etc.
- > Reduced energy consumption thanks to specially developed DC fan motor
- > Flexible installation, as the air suction direction can be altered from rear to bottom suction
- > Standard built-in drain pump increases flexibility and installation speed



FXSQ-A



BRC1E52A/B



BRC4C65

FXSQ-A

Indoor Units			FXSQ15A	FXSQ20A	FXSQ25A	FXSQ32A	FXSQ40A	FXSQ50A	FXSQ63A	FXSQ80A	FXSQ100A	FXSQ125A	FXSQ140A	
Capacity	UK Total Cooling	kW	1.4	1.8	2.3	2.9	3.6	4.5	5.7	7.2	9	11.3	12.9	
	UK Sensible Cooling	kW	1.1	1.4	1.8	2.3	2.9	3.6	4.5	5.7	7.2	8.9	10.2	
	Nominal Cooling	kW	1.7	2.2	2.8	3.6	4.5	5.6	7.1	9	11.2	14	16	
	Nominal Heating	kW	1.9	2.5	3.2	4	5	6.3	8	10	12.5	16	18	
Air Flow Rate	High	m ³ /sec	0.145	0.15	0.15	0.15	0.25	0.25	0.35	0.38	0.53	0.6	0.65	
	Low	m ³ /sec	0.1	0.1	0.1	0.11	0.18	0.18	0.25	0.26	0.38	0.43	0.46	
External Static Pressure	High	Pa	150	150	150	150	150	150	150	150	150	150	150	
	Low	Pa	30	30	30	30	30	30	30	40	40	50	50	
Dimensions	Height x Width x Depth	mm	245 x 550 x 800				245 x 700 x 800		245 x 1000 x 800		245 x 1400 x 800		245 x 1550 x 800	
Weight		kg	23.5	23.5	23.5	24	28.5	29	35.5	36.5	46	47	51	
Electrical Details	Power Supply	Phase									1ph			
		Hz									50			
		V									230			
	Running Current	W	41	41	41	45	92	95	95	95	121	157	214	tbc
Fuse Rating	amps									5				
Sound Level	Sound Pressure	High	dBA	29.5	30	30	31	35	35	33	35	36	39	44
		Low	dBA	25	25	25	26	29	29	27	29	31	33	tbc
	Sound Power	dBA	54	54	54	55	60	60	59	61	61	64	tbc	
Piping Connections	Liquid	inch (mm)	1/4 (6.4)	1/4 (6.4)	1/4 (6.4)	1/4 (6.4)	1/4 (6.4)	1/4 (6.4)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	3/8 (9.5)	
	Gas	inch (mm)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)	1/2 (12.7)	5/8 (15.9)	5/8 (15.9)	5/8 (15.9)	5/8 (15.9)	5/8 (15.9)	

Options & accessories

Adapters and controls	FXSQ 15~140A
BRC1E52A/B Premium wired remote control with full text interface and back light	•
BRC1D52 Standard wired remote control with weekly timer	•*4
Infrared remote control including receiver	BRC4C65
BRC2E52A Simplified wired remote control for heat recovery	•
BRC3E52A Simplified wired remote control for heat pump	•
DCS302C51 Central remote control	•
DCS301B51 Unified ON/OFF control	•
DST301B51 Schedule timer	•
DCM601A51 Intelligent Touch Manager	•
External wired temperature sensor	KRCS01-4B
External wireless temperature sensor	K.RSS
Adaptor for wiring (interlock for fresh air intake fan)	-
Wiring adapter for external monitoring/control via dry contacts and setpoint control via 0-140 Ω	KRP4A54
Wiring adapter for external central monitoring / control (controls 1 entire system)	KRP2A53
Wiring adapter with 4 output signals (compressor / Error, Fan, Aux. heater, Humidifier output)	KRP1B56
Wiring adapter with 2 output signals (compressor / Error, Fan)	-
Adapter for multi-tenant (24VAC PCB power interface)	DTA114A61
External control adapter for outdoor unit	DTA10A53
Installation box / Mounting plate for adapter PCBs (For units where there is no space in the switchboard)	KRP1B101
Connector for forced-off contact	-
Connection to centralised control	-
Electrical box with earth terminal (2 blocks)	KJB212A
Electrical box with earth terminal (3 blocks)	KJB311A
Electrical box with earth terminal	-
Digital input adapter	-

Other options	FXSQ 15~32A	FXSQ 40~50A	FXSQ 63~80A	FXSQ 100~140A
Kit for mounting of decoration panel direct onto unit	TBC	TBC	TBC	TBC
Panel spacer for reducing required installation height	-	-	-	-
Sealing kit for 3-directional or 2 directional air discharge	-	-	-	-
Fresh air intake kit	-	-	-	-
Air discharge adapter for round duct	TBC	TBC	TBC	TBC
Filter chamber for bottom suction	-	-	-	-
Replacement long life filter	-	-	-	-
Drain pump kit	standard	standard	standard	standard
Sensor kit	-	-	-	-
Noise filter (for electromagnetic use only)	-	-	-	-

*4 Not recommended because of the limitation of the functions

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FXUQ-A

Ideal for commercial spaces with solid ceilings

Restyled unit with lower profile, sleeker looks, better efficiency and an integrated junction box.

The Daikin VRV indoor unit range is one of the widest on the market, offering no less than 26 stylish and elegant models in 116 different variants – all designed to maximise comfort, minimise operating noise and simplify installation and servicing.

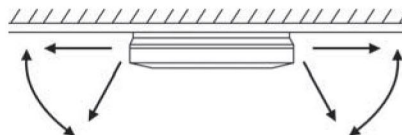
Designed to fit rooms of any size and shape, Daikin indoor units are also user friendly, ultra reliable, easy to control and quiet in operation.

Features and benefits:

- > Ideal solution for commercial spaces with narrow or solid ceilings
- > Separate BEVQ box is no longer needed: the expansion valve is integrated in the indoor unit
- > Low energy consumption thanks to DC fan motor and drain pump
- > Stylish unit blends easily with any interior, as the flaps close entirely when not in operation
- > Improved comfort thanks to automatic air flow adjustment to required load
- > Can be installed in both new and existing buildings
- > Same outlook for all models (unified dimensions)
- > Air flow distribution for ceiling heights up to 3.5m without capacity loss
- > Standard drain pump with 500mm lift
- > Air can be discharged in 5 different angles between 0 and 60°



FXUQ-A



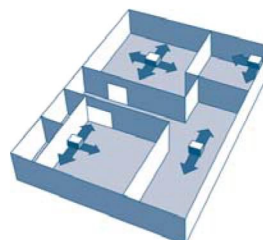
- > Individual flap control: one flap can be easily closed via the wired remote control (BRC1E52) in case you would refurbish or rearrange your interior



BRC1E52A/B



BRC7C58



FXUQ-A

Indoor unit				FXUQ71A	FXUQ100A
Cooling capacity	Nom.		kW	8.0	11.2
Heating capacity	Nom.		kW	9.0	12.5
Power input - 50Hz	Cooling	Nom.	kW	0.090	0.200
	Heating	Nom.	kW	0.073	0.179
Casing Colour				Fresh White	
Dimensions	Unit	H x W x D	mm	198x950x950	
Weight	Unit		kg	26	27
Fan-Air flow rate - 50Hz	Cooling	High/Nom./Low	m ³ /min	22.5/19.5/16.0	31.0/26.0/21.0
	Heating	High/Nom./Low	m ³ /min	22.5/19.5/16.0	31.0/26.0/21.0
Sound power level	Cooling	Nom.	dB(A)	-	
Sound pressure level	Cooling	High/Nom./Low	dB(A)	40.0/38.0/36.0	47.0/44.0/40.0
	Heating	High/Nom./Low	dB(A)	40.0/38.0/36.0	47.0/44.0/40.0
Refrigerant	Type	R-410A			
Piping connections	Liquid/OD/Gas/OD/Drain	mm			
Power supply	Phase/Frequency/Voltage	9.52/15.9/I.D. 20/O.D. 26			
Current - 50Hz	Maximum fuse amps (MFA)	A			
		16			

Options & accessories

Adapters and controls	FXUQ 71~100A
BRC1E52A/B Premium wired remote control with full text interface and back light	•
BRC1D52 Standard wired remote control with weekly timer	•*4
Infrared remote control including receiver	BRC7C58
BRC2E52A Simplified wired remote control for heat recovery	-
BRC3E52A Simplified wired remote control for heat pump	-
DCS302C51 Central remote control	•
DCS301B51 Unified ON/OFF control	•
DST301B51 Schedule timer	•
DCM601A51 Intelligent Touch Manager	•
External wired temperature sensor	KRCS01-4
External wireless temperature sensor	K.RSS
Wiring adapter for external monitoring/control via dry contacts and setpoint control via 0-140 Ω	KRP4A53*2
Wiring adapter for external central monitoring / control (controls 1 entire system)	-
Wiring adapter with 4 output signals (compressor / Error, Fan, Aux. heater, Humidifier output)	-
Wiring adapter with 2 output signals (compressor / Error, Fan)	-
Adapter for multi-tenant (24VAC PCB power interface)	-
External control adapter for outdoor unit	-
Installation box / Mounting plate for adapter PCBs (For units where there is no space in the switchboard)	KRP1B97
Connector for forced-off contact	EKOR05
Connection to centralised control	-
Electrical box with earth terminal (2 blocks)	KJB212A
Electrical box with earth terminal (3 blocks)	KJB311A

Other options	FXUQ 71~100A
Decoration panel (obligatory for cassette units, optional for others, rear panel for FXLQ)	-
Kit for mounting of decoration panel direct onto unit	-
Panel spacer for reducing required installation height	-
Sealing kit for 3-directional or 2 directional air discharge	KDBHP49B140
Decoration panel for air discharge	KDBTP49B140
Fresh air intake kit	-
Air discharge adapter for round duct	-
Replacement long life filter	KAFP551K160
Drain pump kit	-
Sensor kit	-
Noise filter (for electromagnetic use only)	-
L-type piping kit (for upward direction)	-

*2 Installation box is necessary for these adapters

*4 Not recommended because of the limitation of the functions

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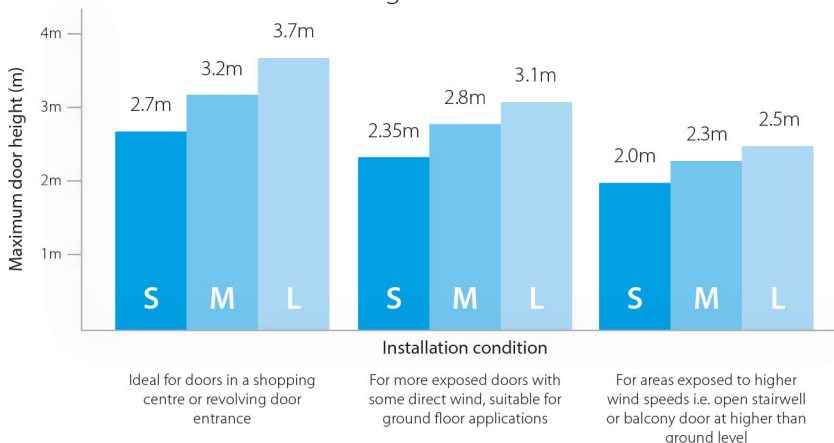
CYVS/M/L - DK - F/C/R

Air curtains are the ideal solution to combat the issue of climate separation across retail outlets or office doorways.

In conjunction with Biddle, Daikin VRV IV heat recovery air curtain solution combines the benefits of the Biddle air curtain technology with the benefits of Daikin VRV IV heat recovery. Using a combination of rectifier technology, air velocity and temperature control they deliver greater comfort to staff and customers alike, all year round, in all weathers.

Easy and fast installation of these systems not only reduces costs but makes expensive water systems, boilers and gas connections redundant. Integrating a Biddle air curtain with Daikin VRV also eliminates the need to install multiple outdoor units thereby reducing installation time and costs further. This combination enables Daikin to offer its customers the ultimate environmentally conscious TOTAL SOLUTION PACKAGE comprising cooling, heating, outdoor-indoor climate separation and fresh air ventilation.

Biddle Comfort air curtain range



Features and benefits:

- > Provides virtually free air curtain heating via recovered heat from indoor units in cooling mode
- > Connection to the high COP heat recovery system enables COP's of up to 4.36
- > Short payback times – less than 3 years
- > Air curtain rectifier technology – deeply penetrating airstream
- > Constant air velocity technology – all year round efficiency
- > European patent
- > 1.0, 1.5, 2.0 and 2.5 metre door widths
- > Door heights of up to 3.7 metres
- > Choice of colour RAL9010:White or RAL9006:Grey

Selection

- 1) Use the Door Height graph to determine the Air Curtain size relevant to your application
- 2) When you know the size (S/M/L), refer to specific tables to select the model for your required door width

CYVS/M/L - DK - F/C/R



F = Free hanging model



C = Cassette model



R = Recessed model

S Small air curtains:

Maximum Door Width				1.0			1.5			2.0			2.5		
Mounting Height *2				2.7 / 2.0											
Model name				CYVS100DK80*BC			CYVS150DK80*BC			CYVS200DK100*BC			CYVS250DK140*BC		
Type				* = F	* = C	* = R	* = F	* = C	* = R	* = F	* = C	* = R	* = F	* = C	* = R
Heating capacity	speed 3	kW		7.40			9.00			11.60			16.20		
Delta T	Inlet = room temperature	speed 3	kW	15			15			15			16		
Power input (50Hz)	Fan only / Heating	kW		0.23/0.23			0.35/0.35			0.46/0.46			0.58/0.58		
Dimensions	Height	mm		270	270	270	270	270	270	270	270	270	270	270	
	Width	mm		1,000	1,000	1,048	1,500	1,500	1,548	2,000	2,000	2,048	2,500	2,500	2,548
	Depth	mm		590	891	561	590	821	561	590	821	561	590	821	561
Weight		kg		56	59	61	66	83	88	83	102	108	107	129	137
Casing	Colour			white RAL9010			white RAL9010			white RAL9010			white RAL9010		
Minimum requiring ceiling void		mm		420			420			420			420		
Fan - Air flow rate	Heating	speed 3	m³/sec	0.323			0.485			0.647			0.808		
Sound pressure	Heating	speed 3	dB(A)	47			49			50			51		
Refrigerant	Type			R-410A			R-410A			R-410A			R-410A		
Piping connections	Liquid (OD) / Gas	mm		9.52/16.0			9.52/16.0			9.52/16.0			9.52/19.0		
Power supply		ph/V/Hz		1~/230/50			1~/230/50			1~/230/50			1~/230/50		

M Medium air curtains:

Maximum Door Width				1.0			1.5			2.0			2.5		
Mounting Height *2				3.2 / 2.3											
Model name				CYVM100DK80*BC			CYVM150DK80*BC			CYVM200DK100*BC			CYVM250DK140*BC		
Type				* = F	* = C	* = R	* = F	* = C	* = R	* = F	* = C	* = R	* = F	* = C	* = R
Heating capacity	speed 3	kW		9.20			11.00			13.40			19.90		
Delta T	Inlet = room temperature	speed 3	kW	17			14			13			15		
Power input (50Hz)	Fan only / Heating	kW		0.37/0.37			0.56/0.56			0.75/0.75			0.94/0.94		
Dimensions	Height	mm		270	270	270	270	270	270	270	270	270	270	270	
	Width	mm		1,000	1,000	1,048	1,500	1,500	1,548	2,000	2,000	2,048	2,500	2,500	2,548
	Depth	mm		590	891	561	590	821	561	590	821	561	590	821	561
Weight		kg		57	68	66	73	88	93	94	111	117	108	136	144
Casing	Colour			white RAL9010			white RAL9010			white RAL9010			white RAL9010		
Minimum requiring ceiling void		mm		420			420			420			420		
Fan - Air flow rate	Heating	speed 3	m³/sec	0.446			0.669			0.892			1.115		
Sound pressure	Heating	speed 3	dB(A)	50			51			53			54		
Refrigerant	Type			R-410A			R-410A			R-410A			R-410A		
Piping connections	Liquid (OD) / Gas	mm		9.52/16.0			9.52/16.0			9.52/16.0			9.52/19.0		
Power supply		ph/V/Hz		1~/230/50			1~/230/50			1~/230/50			1~/230/50		

L Large air curtains:

Maximum Door Width				1.0			1.5			2.0			2.5		
Mounting Height *2				3.7 / 2.5											
Model name				CYVM100DK80*BC			CYVM150DK80*BC			CYVM200DK100*BC			CYVM250DK140*BC		
Type				* = F	* = C	* = R	* = F	* = C	* = R	* = F	* = C	* = R	* = F	* = C	* = R
Heating capacity	speed 3	kW		9.20			11.00			13.40			19.90		
Delta T	Inlet = room temperature	speed 3	kW	17			14			13			15		
Power input (50Hz)	Fan only / Heating	kW		0.37/0.37			0.56/0.56			0.75/0.75			0.94/0.94		
Dimensions	Height	mm		270	270	270	270	270	270	270	270	270	270	270	
	Width	mm		1,000	1,000	1,048	1,500	1,500	1,548	2,000	2,000	2,048	2,500	2,500	2,548
	Depth	mm		590	891	561	590	821	561	590	821	561	590	821	561
Weight		kg		57	68	66	73	88	93	94	111	117	108	136	144
Casing	Colour			white RAL9010			white RAL9010			white RAL9010			white RAL9010		
Minimum requiring ceiling void		mm		420			420			420			420		
Fan - Air flow rate	Heating	speed 3	m³/sec	0.446			0.669			0.892			1.115		
Sound pressure	Heating	speed 3	dB(A)	50			51			53			54		
Refrigerant	Type			R-410A			R-410A			R-410A			R-410A		
Piping connections	Liquid (OD) / Gas	mm		9.52/16.0			9.52/16.0			9.52/16.0			9.52/19.0		
Power supply		ph/V/Hz		1~/230/50			1~/230/50			1~/230/50			1~/230/50		

Some air curtains may be ECA compliant please see ECA website for details www.daikin.co.uk/ECA

See databook for option details.

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Appendix B

Specification Text





VRV IV Heat Recovery Specification

SYSTEM INTRODUCTION

The Air Conditioning Contractor shall supply, deliver, install, set to work and commission the systems and equipment as detailed in this section of the specification, as shown on the Tender drawings and listed in the Schedule at the end of this section.

- Heating and Cooling will be provided by utilising the Daikin VRV IV R410A series (Inverter, Heat Recovery) systems to provide heating and cooling to the zones as required from the load schedule.
- The Heat Recovery system must utilise a dedicated discharge line in addition to the Liquid and suction pipes to the indoor units. The dedicated discharge line is required to maintain a higher degree of usable heat output in comparison to a two pipe Heat Recovery VRF system.
- The Heat Recovery system must be able to heat continuously during the defrost cycle to gain higher integrated heating capacities.
- The system must be able to vary evaporating and condensing temperatures based on ambient temperatures and/or load to ensure optimum seasonal efficiency and comfort. Or alternatively fix the evaporating temperature for continual very high off coil temperatures.
- Part load conditions must be met by a combination of change of compressor speed and change in refrigerant temperature at a suitable reaction speed which is set at the condenser on commissioning.
- The VRV system will be selected using a minimum target evaporating temperature of 6 Degrees C at the expansion valve of the fan coil in cooling mode, this is to restrict low off coil temperatures to maintain occupant comfort levels and ensure system operating efficiency as per manufacturers data.
- The Heat Recovery systems will have a minimum of 50 step inverter fan control to allow the system to accurately respond to head pressure control requirements.
- The compressor shall respond to control frequencies from 60 to 402Hz to provide stepless capacity control.
- All condenser fans must be capable of at least 78 Pascals of external static pressure.
- The refrigerant must be distributed by the use of a refrigerant networking system (Refnet) to ensure low pipe pressure losses as well as keeping the require pipe work installation space and material used to a minimum compared to other parallel pipe work systems.
- The system must be able to operate a continuous heating during defrost system on multi-unit installations resulting in no cold air dumping.
- Changeover of a fan coil from Heating to Cooling will not prevent any other fan coil on a different BS box port from providing continuous capacity by ensuring that pressure equalisation is performed within the BS box and not across the whole VRV system.
- Both single and Multi BS boxes should be utilised. The single port Branch Selector boxes must not exceed 210mm in height.
- The system must be tested and certified by Eurovent



FEATURES

System operation

The VRV system will control flow of refrigerant through the fan coil unit, by means of an electronic expansion valve fitted in each indoor unit and must be able to utilise single or multiple Branch Selector boxes for optimum flexibility. The Branch Selector Boxes (BSQ) would be fitted with electronic control valves to define heat/cool zones as demanded by the indoor operating condition or user choice.

Minimum operation range

The system has to smoothly operate at ambient temperatures ranging at least from -5CDB to +43CDB in cooling and down to -20CWB and up to +15,5CWB in heating. The system operation must be possible outside above mentioned limits, unless safety devices are activated.

Manufacture and testing

The equipment manufacturer shall be responsible for the manufacture of the compressor, refrigerant oil and refrigerant used within the system to maintain integrity of design and optimise efficiency and reliability of equipment. All equipment shall be run tested in accordance with the following procedures prior to leaving place of manufacture.

- A choke test carried out on the refrigerant piping to detect obstacles
- The pipework shall be tested to 38bar.
- Electronic leak testing shall be carried out to ensure maximum system refrigerant containment.
- System vacuum test to 2 Torr
- Electrical tests shall include flash testing at 1440V AC to ensure that current leaks above 5mA are detected, megger test at 500V DC to ensure resistance levels are above 10 mega Ohm and earth continuity tests.

BREEAM

BES 6001 - The Framework Standard for Responsible Sourcing. The VRV system will be certified with BES 6001 from BRE and added to BRE's Green Book Live website.

As a minimum, 60% of the constituent materials (by both mass and volume) in the assessed product shall be traceable down the supply chain, through appropriate chain of custody evidence, to the organisations which:

- extract and acquire raw materials; or
- recover recycled materials; or
- produce by-products or production residues; or
- process commodity traded chemicals

In addition, the organisation must have a documented system for its purchasing process and the approval of all of its suppliers who provide input materials for the product being assessed. The system must be designed to implement the criteria with respect to the BES 6001 standard. The organisation must also maintain a list of all the suppliers that provide constituent materials for the assessed product. The scheme is recognised by the BREEAM family of certification schemes and the Code for Sustainable Homes where credits can be awarded for construction products independently certified through BES 6001.

The key benefits from having products certified to BES 6001 include:

1. Minimising risk within your product supply chain
2. Securing additional credits within both BREEAM and the Code for Sustainable Homes
3. Providing vital product differentiation and market advantage for certified products
4. Delivering a route to benchmark and achieve continuous improvement regarding the sustainability of construction products



Piping Capabilities

The VRV system will have the ability to sustain refrigerant piping lengths of up to 165m (equivalent piping length has to be at least 190 meters) with a level difference of 90m between fan coil units and condensing unit, providing connection ratios are suitable. The system shall be capable of having up to 1000m of refrigerant pipe work installed. The system shall be capable of having up to 90m from the first refnet to the furthest indoor unit, providing Daikin system design guidelines are used. The elevation between the highest and lowest indoor units must be able to be extended up to 15 meters.

Heat/Cool changeover operation

Pressure equalisation required to change from heating to cooling must be performed within the BS box without causing any other indoor unit attached to a separate BS box port to cease heating or cooling thus lowering the capacity and comfort of the system.

Comms Rooms

The VRV system must be able to operate in cooling down to -20 C and be capable of being used in comms room/switch room applications by a technical cooling setting. This setting will allow low ambient year round cooling.

Automatic refrigerant charging & F-Gas compliant refrigerant containment check

The system will have the capability to automatically charge the correct volume of refrigerant during commissioning and, if automatic charging has been utilised, the system must also have the ability to self-diagnose refrigerant containment for maintenance and service purposes.

The unit shall be capable of carrying out automatically the calculated required additional refrigerant charge necessary to operate the system within its optimum efficiency. This cycle shall be completely automatic and provide a warning to the service technician to indicate when charging has been completed or the charging cylinder is empty.

The refrigerant cycle shall not rely upon float valves, level switches or weighed input of the refrigerant. The calculated refrigerant charge shall be retained within the memory of the outdoor PCB as a reference for a refrigerant containment check which can be carried out as required to verify the correct refrigerant charge remains within the system. The automatic refrigerant charging and containment check facilities shall be capable of being used at any time during the life of the system for any alterations or service operations which may be required.

Emergency operation capability

In the event of compressor failure, the system will allow emergency operation of its other compressors in order to maintain 8 hours of interim capacity whilst spares are sourced.

Sequential start-up

For all systems it will be possible to activate and deactivate the automatic restart of the indoors after power shortage or failure through proper setting at the local control of indoor units. In addition, all systems should keep on operating even in case of a power failure at an indoor unit, either with the installation of optional accessories or by having it as a standard.

The outdoor units will incorporate a "Soft Start" technology, to achieve a very low starting current in order to lower consumption, reduce power requirements of the electrical board and minimise the stress of individual parts of the outdoor unit (e.g. compressor's motor) to extend operating life and reduce lifecycle cost.



Commissioning

The condensing units should have a 7 segment decimal display, displaying detailed error codes, stage of the start-up procedure as well as function and operating data of the system. For the commissioning of a system and in order to properly set all necessary data and values for the optimum operation of it, it is recommended for the starting-up the use of special software provided by the manufacturer of the system. The establishing of the values and the programming should be possible even offline.

Maintenance

For Service and Maintenance of indoor units the system should allow up to 30% of the indoor units to be disconnected without causing a system fault for up to 24 hours to prevent unnecessary whole system downtime for occupants of the conditioned spaces.

Refrigerant

The VRV system must operate with Refrigerant R410A, the refrigerant shall be a zeotropic blend constituted of a maximum of two different refrigerants providing a maximum temperature glide of less than 0.17K to avoid fractionation problems. The equipment manufacturer shall ensure that the equipment is compliant with current RoHS (Restriction of Hazardous substances in electrical and electronic equipment (2002/95/EC)) regulations.

Required certification

All outdoor and indoor units will have to be assembled and properly tested at the manufacturer's factory. They will have to be certified for their safety standards according to European legislation and CE marked. The manufacturer must be certified with the ISO 9001 standard concerning quality and with the ISO14001 for environmental protection and awareness. A Certificate of Conformity shall be supplied with each machine.

Efficiency

All system efficiencies should be calculated according to UK legislative examples as set out in the latest Non Domestic Compliance guide and provided with the conditions at which they are calculated and based on a single evaporating and condensing temperature for both indoor and outdoor units.

Equipment Supplier

Daikin Europe N.V., the manufacturer and Daikin Airconditioning UK Ltd supplier of the equipment, shall be fully certified and registered to comply in the areas of ISO9001 and ISO14001. All equipment will be manufactured by Daikin and be supplied by:

Daikin Airconditioning UK Limited,
The Heights, Brooklands,
Weybridge, Surrey. KT13 0NY
Contact (0845 641 9000)



OUTDOOR UNITS

REYQ-T R410A VRV IV Heat Recovery Condensing Unit

Electrical

Outdoor units will have to be manufactured for operating with a three-phase power supply of 400 V / 50 Hz.

Noise

The noise level - sound pressure - of a single condenser should not exceed 66 dB(A) under laboratory conditions, measured in a semi-anechoic chamber, at a horizontal distance of 1 meter from the unit and at 1.5 meters height from the base of the unit.

The outdoor unit must be suitable for outdoor installation. The shell/casing of the unit will have to be made of enamelled stainless steel sheet, with polyester thermal powder coating (minimum 70%) for high protection in environments with locations with high air salt content such as adjacent to the sea. The units shall be air-cooled type incorporating heat exchanger coils manufactured from copper tubes and aluminium fins. The air-cooled heat exchanger of the outdoor unit will have to have undergone appropriate treatment for protection and long life efficient operation against atmospheric corrosion. Specifically, the aluminium fins will be coated with a layer of acrylic resin and on top covered with a hydrophilic film or any other material which will provide minimum 5 to 6 times greater resistance to acid rain and salt corrosion. The bottom of the unit will have a sheet of stainless steel for protection against oxidation. The outdoor unit has to have successfully passed at least the following tests:

1. VDA Wechseltest
2. Kesternich test

Component parts

In the outdoor unit there will be either one or two compressors in separate shells, so in case one fails it will not be necessary to replace both. The outdoor units will have axial fan(s) DC inverter driven, air-cooled heat exchanger, piping, wiring and automation, factory-installed electronic expansion valves, oil separator, accumulator at the suction side of the compressor, high & low pressure sensors, protection thermostats, fuses, protection against overcurrent, protection for overloading of the inverter, liquid and gas stop valves and solenoid valves, timers and all the necessary sensors and protection equipment to ensure continuous, safe and smooth operation.

The outdoor unit - and consequently the whole system - will keep on operating even if one compressor is turned off (emergency operation). In case of a multi-outdoor unit system it will be possible to isolate one module, while the rest of the system will continue to operate even if delivering reduced capacity. This ensures continuous air conditioning of the premises, until the cause of the issue ceases to exist.

System Control

All indoor units to be connected to a system must be independently controlled depending on the requirements of each room. The indoor units will be connected to the outdoor unit via the wiring and refrigeration piping network. The wiring cables are not required to be shielded, but the installer is required to ensure power sources do not interfere with the communications signal in accordance with the manufacturers instructions.

The system's operation has to be based on pressure sensors and thermostats, which via a specially designed integrated circuit will control the frequency of the compressor motor (inverter) by varying the compressor's speed resulting in changes to the refrigerant's volume and temperature. The result, combined with ambient temperature and building's load requirements, will always deliver the necessary capacity while maintaining optimum efficiency.

The system will have the ability to perform capacity control from the minimum 9% and up to 100% of the nominal capacity. The capacity delivered by the system should match the building's load. This way the system will consume the minimum required energy, at the highest possible efficiency.



The room temperature for each room must be controlled by a microprocessor, where processing of the various parameters and the corrective settings are proportional and according to the integral - differential method of regulation.

- Parameters: set temperature and return air temperature for the differential control, gas and liquid refrigerant temperatures for controlling the superheat

- Corrective settings; opening of the expansion valve, fan speed

Variable Refrigerant Temperature

The system is required to automatically adjust the evaporating and the condensing temperature in order to always deliver the required capacity for the building's load, whilst maintaining the optimal efficiency. In addition, the facility will be available to provide a set a target refrigerant temperature. This way the delivered capacity will be ambient temperature dependant thus having very high seasonal efficiency. In addition, it has to be possible to operate the system with at least three different set refrigerant temperatures. Higher evaporating temperatures will result in less dehumidification indoors, while the system will deliver mostly or even only sensible capacity. The adjustment of the evaporating and the condensing temperature will have to be easily field set, without any optional accessories prior to or after the commissioning of the system.

Ambient temperature dependant variation of the refrigerant temperature - evaporating and/or condensing is required, and results in even greater energy savings and optimal seasonal efficiencies, as per latest directives of the European Union.

It should also be possible to fix the evaporating temperature at different values in order to have the system operate with different Sensible Heat Factors. This way and depending on the indoor relative humidity the supply air temperature can vary (e.g. higher), thus increasing comfort levels through less cold air supplied in the rooms. At the same time relative humidity levels can be maintained within the comfort zone according to international standards and guidelines.

Variable Refrigerant Temperature - Technical explanation

[Acronyms used here - 'Te' = Target evaporating temperature for cooling. 'Tc' Target condensing temperature for heating]

There are many Variable Refrigerant Temperature settings, all of which are to allow the system to react to the way the customer sees is the best fit for their building/business. All effects are over the entire system and are not variable on a fan coil or zone basis.

Three high level modes (these apply to both heating and cooling, this describes just the cooling function in below examples)

Basic - Standard operation as previous systems, fixed target evaporating temperature, high capacity refrigerant temperature.

Automatic - This mode changes the evaporating temperature based on the system load. The evaporating temperature varies throughout the day, to deliver more capacity, or to be more efficient so that the setpoint temperature can always be met, but at part load it does so, much more efficiently than comparable systems.

Hi Sensible - This mode is for maximum comfort, selection of the system is different when using this mode. In cooling the evaporating temperatures can be set from 7 to 11 degrees in 1 degree increments via field code setting.



Sub modes

For each high level mode there are a set of sub modes, these modes are covered under exclusive patent.

Powerful

This allows very quick reaction to changes in load, and allows the system to reduce to Te 3 C and increase heating to Tc 49 C to quickly move the room temperature back towards its setpoint. This setting is active the moment any fan coil is switched on.

Quick

This allows quick reaction to changes in load, and allows the system to reduce to Te 6 C and increase heating to Tc 46 C to quickly move the room temperature back towards its setpoint. This setting is active the moment any fan coil is switched on.

Mild

This allows quick reaction to changes in load, and allows the system to reduce to Te 6 C and increase heating to Tc 46 C to quickly move the room temperature back towards its setpoint. The system will not react quickly to the change in loads directly on start-up, the system gradually alters Te or Tc temperatures until the setpoint temperatures are met.

Eco

Eco mode does not allow any variation of the refrigerant temperature away from the Te or Tc which has been set under the high level (Hi Sensible) mode, unless the system needs to protect itself.

Continuous Heating During defrost

Multiple condenser VRV systems should incorporate a function that guarantees continuous comfort during defrost cycles as defrost takes place regularly in order to increase efficiency of the system and protect the outdoor units from heat exchanger breaking down by minimising reduction in off coil temperatures.

Compressors

Outdoor units should have a specific function and appropriate devices to prevent refrigerant in liquid phase to return to the compressor. This ensures the specified density of the oil and therefore the adequate lubrication of the compressor. This function increases the efficiency of the system and extends the lifespan of the compressor.

Compressors will have to be hermetically closed scroll type with integrated motor and sound absorbing jacket. They will have a DC inverter driven motor and be able to continuously change the frequency, resulting in a change to the volumetric refrigerant flow from the compressor, in order to accurately and fast respond to the required load. The change in frequency should be done incrementally, but in enough steps so the change of delivered capacity can be approximated as linear. The minimum number of capacity steps will have to be no less than 100.

The motor windings will have to be specially constructed, in order to achieve the safe and smooth operation to avoid hazards due to the continuously changing of frequency and voltage. The compressors will be protected by an electrical crankcase heater to prevent oil condensation at low ambient temperatures.

The oil supply in the compressor will be on the high pressure side, ensuring optimum lubrication of all moving parts. Therefore a separate lubrication system will not be required for the moving parts of the compressor, since the oil in the centre of the crankshaft will be transported across the surface of the rotating parts from the centre to the perimeter. This optimizes the performance of the compressor and minimizes stress and wear, extending its lifetime. The compressors' motors will have a cooling system using compressed gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.

Compressors will alter the rotation speed linearly and consume energy in accordance with cooling and heating loads, ensuring operational autonomy and independent temperature control in each room. The two DC inverter compressors will vary their speed separately controlling the volumetric flow more accurately, with lower power consumption, resulting in higher efficiencies at all loads and connection ratios.

For protecting the compressor from frequent start-stops, there will be an appropriate timer.



Oil recovery

The oil recovery from the piping network and the indoor units has to be achieved by the use of a microprocessor. The oil will be recovered at least once every eight hours, via a special oil recovery function, ensuring smooth operation of compressors.

Fan

The fan motor(s) of the outdoor unit will have to be DC inverter to further increase energy savings, to more accurately adjust the fan speed and reduce noise. The setting of the fan speed will result in precise control of system's performance in accordance with the requirements of indoor and ambient conditions. The DC inverter fan motors will automatically adjust the rotation speed - thus the air flow - and have at least 120 different steps. Each fan will be separately controlled in order to further increase the accuracy of system control.

The impeller will be made of plastic and with a special configuration to achieve greater air flow with low noise level. Outdoor units will have a protective cover over the fan to guard against accidents and to avoid foreign objects entering the units. It will be special design and construction to minimize the external static pressure drop of the fan.

Fans will have a high external static pressure setting in order to reach at least 78 Pa. This will allow the installation / connection of duct(s) for greater flexibility during installation. In case of an outdoor unit with two fans, then each fan will have the ability to be separately ducted.

Local control

Each indoor unit will be controlled by a wall mounted symbol driven wired remote controllers. The length of the connecting wiring of the remote controller to the indoor unit should be able to reach 500 meters. The controller will have a high resolution LCD, which will indicate the various operating parameters of the controlled indoor unit(s), as well as possible error code. The user will be able to switch between simple and detailed mode, by means of displayed parameters.

From the remote controller it will be possible to independently control the louvers of the indoor unit(s), if present. Any energy saving function and / or sensor related to indoors for increasing either efficiency and / or comfort, must also be possible to control by the remote controller.

The local remote controller will have an internal memory to store at least the last 9 error codes. It will be possible to connect, monitor and control at least sixteen (16) indoor units on one remote controller.

For each system it should be evident and clearly indicated which indoor unit is the one determining the operating mode (cooling / heating). Setting and changing this should be possible by the user and without having to shut down the whole system or by cutting off the power supply indoors.

The controller will have a built-in room temperature sensor which in cooperation with the building room air temperature sensor on the indoor unit will accurately control the operation of the unit to reach the set point.

Module combination

The Outdoor unit shall connectable to up to 64 indoor units, with a connection index ratio between 50% - 130% unless otherwise authorised by Daikin Airconditioning UK Ltd, capacity permitting, to one outdoor unit. Each system of outdoor units could eventually be connected to up to 64 indoor units, of different types and sizes, in a single refrigerant circuit and controlled independently in order to take fully advantage of deferral phenomena, reducing the total installed capacity of outdoor units and consequently the power consumption. The total connection ratio of a system will be up to 200%, while always taking into consideration the case of simultaneous operation of indoor units resulting in greater than 130% connection ratio, which will affect the integrated capacity of the system.



The outdoor units will be able to deliver cooling capacities ranging from 8HP (22,4kW) and up to 20HP (56,0kW) in a single shell/housing. A combination of two or three outdoor units will be possible in order to have systems with cooling capacity reaching 54 HP (150,0 kW). No limitations on possible combinations will be accepted while the most appropriate one will be decided primarily for operating at the best possible seasonal efficiency. Aforementioned cooling capacities will have to be clearly mentioned in the manufacturer's official technical documentation and literature and will have to be calculated, based on the following conditions:

- Indoor room air temperature: 27°CDB / 19°CWB.
- Ambient air temperature: 35°CDB.
- Equivalent piping length: 5,0m.
- Height difference: 0m.

Additional features

The unit shall be capable of operating with reduced operational sound pressure levels which can be selected. This feature is provided via an optional adapter PCB DTA104A62 which can accept an external signal for a time clock or other external source. All refrigerant connections both internal within the unit and the external connections to the indoor units shall be brazed. Flared or mechanical connections will not be acceptable on the outdoor unit.

The VRV IV Heat Pump and Heat Recovery Outdoor Units shall be manufactured by Daikin and be supplied by:

Daikin Airconditioning UK Limited,
The Heights, Brooklands,
Weybridge, Surrey. KT13 0NY
Contact (0845 641 9000)

Please refer to enclosed schedules for equipment details.

Standard Commercial Warranty

Daikin Europe N.V. equipment is subject to a three-year non-transferable parts and labour allowance warranty (extendable to 5 years), provided that the system installation complies with the manufacturers recommendations, and is installed and maintained (throughout the warranty period) by a Daikin Airconditioning UK Ltd Approved Installer.

D1 Business Partner / D1+ Premium Business Partner Commercial warranty

Daikin Airconditioning UK Ltd will offer a 7 year parts and labour allowance warranty for Daikin Europe N.V. manufactured products (non-transferable unless previously agreed) providing that:

1. Commissioning sheets are provided to Daikin UK
2. The Daikin equipment is installed by a recognised Daikin Airconditioning UK Ltd D1 or D1+ Business Partner; and
3. The same Daikin Airconditioning UK Ltd D1/D1+ Business Partner that installed the equipment, maintains it throughout the warranty period; and
4. Written records must be available for inspection.



Wall mounted type – Model ref - 'FXAQ-P'

- The unit casing shall be manufactured from heat resistant plastic. The casing colour shall be Ivory White. The back plate and the support frames shall be manufactured from galvanised steel plate.
- The fan shall be multi blade cross flow type, statically and dynamically balanced to ensure low noise and vibration free operation.
- Piping connections will be possible from either side or the back of the unit.
- The heat exchanger coils will be manufactured from copper tubes and aluminium fins. It shall have electronic expansion valve to control refrigerant flow rate in response to the load variation in the conditioned space. The expansion valve shall be controlled by an integral computerised PID control system to maintain correct room temperature.
- The fan coil will be selected using a minimum target evaporating temperature of 6 Degrees C at the expansion valve of the fan coil in cooling mode, this is to restrict low off coil temperatures to maintain occupant comfort levels and ensure system operating efficiency as per manufacturers data.
- The condensate shall be drained from the unit using suitable tube and run directly to a main drainage point.
- The air filters shall be incorporated within the unit and shall be washable resin net type.
- The front panel will be flat with return air from the top of the unit.
- All maintenance functions must be able to be performed from the front of the unit.

Concealed Ceiling Medium ESP Ducted Unit – Model Ref - 'FXSQ-A'

- The unit casing shall be manufactured from galvanised steel plate and shall be fully insulated. The use of a polystyrene only construction for the outer casing will not be acceptable.
- The unit shall not be more than 245mm deep.
- Facility shall be provided for duct connection for introduction of the fresh air in the unit and branch ductwork from the unit.
- The fan coil will be selected using a minimum target evaporating temperature of 6°C at the expansion valve of the fan coil in cooling mode, this is to restrict low off coil temperatures to maintain occupant comfort levels and ensure system operating efficiency as per manufacturers data.
- The fan coils will have a minimum design air off coil temperature of 10.1 °C @ 23 °C air on 46%RH (Target evaporating temperature of 6 °C)
- The fan coils will have a minimum design air off coil temperature of 12.1 °C @ 23 °C air on 46%RH (Target evaporating temperature of 9 °C)
- The return air to the unit shall be through the rear of the unit as standard. A facility shall be provided for alternative return air position through the underside of the unit.
- The fan shall be of the dual suction multi blade type, statically and dynamically balanced to ensure low noise and vibration free operation.
- External static pressure up to 150 Pa enables the use with flexible ducts of varying lengths
- Must be able to change External Static Pressure through wired remote control to allow optimisation of the supply air volume
- Must have multi-tenant capability to enable continuous operation in the event of a loss of local power via an optional PCB
- The heat exchanger coils will be manufactured from copper tubes and aluminium fins. It shall have electronic expansion valve to control refrigerant flow rate in response to the load variation in the conditioned space. The expansion valve shall be controlled by an integral computerised PID control system to maintain correct room temperature.
- A condensate lift pump shall be provided within the unit and shall be capable of discharging 625mm above the drain outlet.
- The condensate shall be drained from the unit using suitable tube and run directly to a main drainage point.
- Sound Power value will be measured to ISO 3744



Ceiling suspended 4 Way type – model ref - 'FXUQ-A'

- The unit casing shall be manufactured from galvanised steel plate. The outer casing shall be moulded plastic and the colour shall be Ivory White. The unit shall as standard allow the application of a 4 way discharge ceiling mounted indoor unit without the need for any ceiling space or any third part modification or encasement of a typical cassette.
- The return air shall be through the bottom grille while the supply air shall be through the 4 No supply air louvers located on the sides of the unit. A facility shall be provided to automatically swing the supply air louvers or lock them at five adjustable settings.
- The fan coil will be selected using a minimum target evaporating temperature of 6 Degrees C at the expansion valve of the fan coil in cooling mode, this is to restrict low off coil temperatures to maintain occupant comfort levels and ensure system operating efficiency as per manufacturers data.
- The fan shall be of the dual suction multi blade type, statically and dynamically balanced to ensure low noise and vibration free operation.
- The unit shall be able to be installed at ceiling heights of 3.5m without any loss of capacity
- The heat exchanger coils will be manufactured from copper tubes and aluminium fins.
- A condensate lift pump shall be provided within the unit and shall be capable of discharging above the drain outlet.
- The condensate shall be drained from the unit using suitable tube and run directly to a main drainage point.
- The air filters shall be incorporated within the unit and shall be mould resistant washable resin net type.
- The electronic expansion valve to control refrigerant flow rate in response to the load variation in the conditioned space shall be built into the unit and shall be controlled by an integral computerised PID control system to maintain correct room temperature.
- The Fan coil will be able to lift condensate 500mm from the top of the unit as standard.



Biddle Air Curtain

- Biddle air curtain(s) will be connected to the Daikin VRV system in order to provide an air barrier between spaces.
- It shall provide a rectified airstream at a constant air velocity
- The units shall be either recessed, cassette or free hanging model
- The unit will be selected to fit a door width of between 1m to 2.5m
- The unit will provide an effective air screen to cover a height of between 2m to 3.7m
- Sound Pressure shall not exceed 54 dBA Sound Pressure



BRC1E53A – Hard Wired Remote Controller

- Local Control will be provided by via BRC1E53A remote controllers mounted as required.
- The controller will provide full language driven menu systems enabling control of start/stop run/fail indication, set point adjustment and fault code diagnosis. Time Clock control shall be flexible with seven independent day settings, five actions per day of ON or OFF which can be can be configured in any desired pattern.
- Display must be able to be altered to a detailed display from the standard display which will show either room or outdoor ambient temperature.
- The controller must be able to provide a quick cool/heat function
- The controller shall contain an internal temperature sensor, which can be used for system control or Fabric Protection control.
- The controller will have the function to be able to show the contact details for the maintenance provider along with model numbers for the condenser and fan coil in the event of a fault.



DCM601A51 Intelligent Touch Manager

- Intelligent Touch Manager System will be provided with a true touch active screen with colour Liquid Crystal Display with Icon displays to provide simple user friendly operation
- Must have no physical buttons, all commands via Touch Screen
- Operate with easy to understand “Windows” operating system
- Have the capacity to control up to 512 Addressable Groups from a single device
- Proportional power consumption to make the controller capable of providing energy monitoring & client billing requests (option)

Controller Display

On/Off selection

Set Point adjustment (Range 16-32 degrees C)

Fan speed adjustment

Heat/cool/auto changeover mode selection

Frost protection set point

Timer settings

Holiday period settings

Priority settings for restriction of local access for start/stop, heat/cool mode and set point adjustment range limitation

Reset ability for malfunction codes and filter maintenance warnings

Indoor Units Monitoring Display

Room set point

Room Temperature Display

Operation mode; Heating or Cooling

Display of number of devices operating within system

- Start/stop operation, set point control, cool/heat mode selection, air volume setting, air flow direction setting and enabling/disabling operation of the remote controllers by group, zone or collectively.
- Monitoring of operation status of the indoor units, filter change indication and error code of the group or the zone.
- Comprehensive schedule set up to start/stop the air conditioning systems. This can be set for year, month, weekday, hour and minute. This will enable normal day-to-day time clock functions as well as yearly holiday set up. Up to 8 settings can be configured up to 13 months in advance and allocated to various groups/zones.
- Volt free forced stop input possible such as fire shut down.
- Flexible Group/ Zone selection
- Remote monitoring of common operation/fault with optional DCS302A52.
- Power proportional distribution with optional memory card DCS002C51 and external kW hour meters.



DCM601A51 Intelligent Touch Manager (Continue)

- Running cost per indoor unit via optional software licence and external kWh meter(s) (option)
- To be connectable to the DNSS preventative maintenance system.
- Possibility to perform monitor operation/fault for 8 separate non-Daikin systems with optional DEC101A51 control board.
- Possibility to perform on/off control and monitor operation/fault for 4 separate non-Daikin systems with optional DEC102A51 control board.
- Password protection for zone, group and schedule set-up functions.
- The controller shall have wide touch screen control colour display and can be wired by a non-polar 2-wire transmission cable to a distance of 1 km away from the outdoor units.
- The controller shall contain an internal power supply system WITHOUT the need for any external power supply, the controller shall accept a direct connection of a 230V AC power supply.



BACnet Gateway

- The BACnet gateway will enable the VRV system to communicate with up to 256 indoor units (via DAM411B51, 128 as standard) to a BACnet compatible BMS.
- The BACnet communications device shall be capable of independent communications to the airconditioning system irrespective of any other connected device. This is to maintain BMS control in the event of secondary communication device failure.
- This system will allow communication of up to 29 control and monitoring points per indoor control group
- The BACnet gateway will allow energy monitoring via optional PPD software (DAM412B51) Additional kW/h meters would be required (supplied by Daikin Airconditioning UK Ltd)



QUALITY ASSURANCE (if required – confirm if applicable)

The VRV installation shall be subject to supervised visits by the specialist representative from Daikin Airconditioning UK Limited.

The Daikin Airconditioning UK Ltd supervisor will ensure correct system installation takes place in accordance with the manufacturer's instructions, relating to refrigerant piping, drainage piping, control wiring, power wiring and equipment location/positioning.

The vital areas of the installation, including brazing, pressure testing and evacuation shall be checked by the Daikin Airconditioning UK Ltd supervisor, prior to commissioning.

Upon Engineers Instructions, up to two brazed joints per pipework system may be removed, at the contractor's expense, for inspection.

Should carbonisation be evident on these joints, the above should be repeated and if further evidence of carbonisation is evident, then the entire pipework system will be removed and refitted at no expense to the contract.

The system will be commissioned in the presence of the Daikin Airconditioning UK Ltd supervisor who will utilise the Daikin Service Checker to confirm correct system operation and to produce a printout of all operational data relating to each individual system

A log of all system settings, serial numbers, and configuration and wiring diagrams shall be compiled and be presented to the client as an independent and impartial 'as fitted' quality manual for the complete VRV installation.



DNSS

The VRV systems will use the Daikin Network Service System via the I-Touch Controller, I-Manager or LC Controller. This facility is a remote monitoring system and will have the ability to:

- Real time continuous monitoring and analysis by monitoring 130 operating parameters of the system. This cannot be carried out by maintenance companies.
- Real time rapid response in case of an actual fault
- Capable of predictive analysis which would help prevent a minor issue becoming a major issue
- Expert analysis by the manufacturer's own trained engineers.
- Reduced any unlikely down time by facilitating quicker repair
- Reduced service visits. As expert engineers would do the analysis before the maintenance company visits the site in most cases one visit would be required to replace part. This would facilitate in reduction of maintenance / repair costs.
- Reduced maintenance cost. As the systems are expertly monitored 24/7 only low level maintenance work should be necessary on site.
- Highlight cases if the maintenance is not carried out properly leading to erratic/inefficient system operation and hence higher energy cost and also leading to user complaints.
- Would highlight refrigerant leaks earlier on; which can avoid expensive repairs if left unchecked. This is also an environmental issue.
- Increased life cycle
- Ensure user satisfaction
- In addition to the above the DNSS system would also be capable of significantly reduce operating cost without sacrificing creature comfort. DNSS would achieves this reduction by manipulating systems operating parameters by analysing equipment loading, building demand and taking the weather conditions into account.



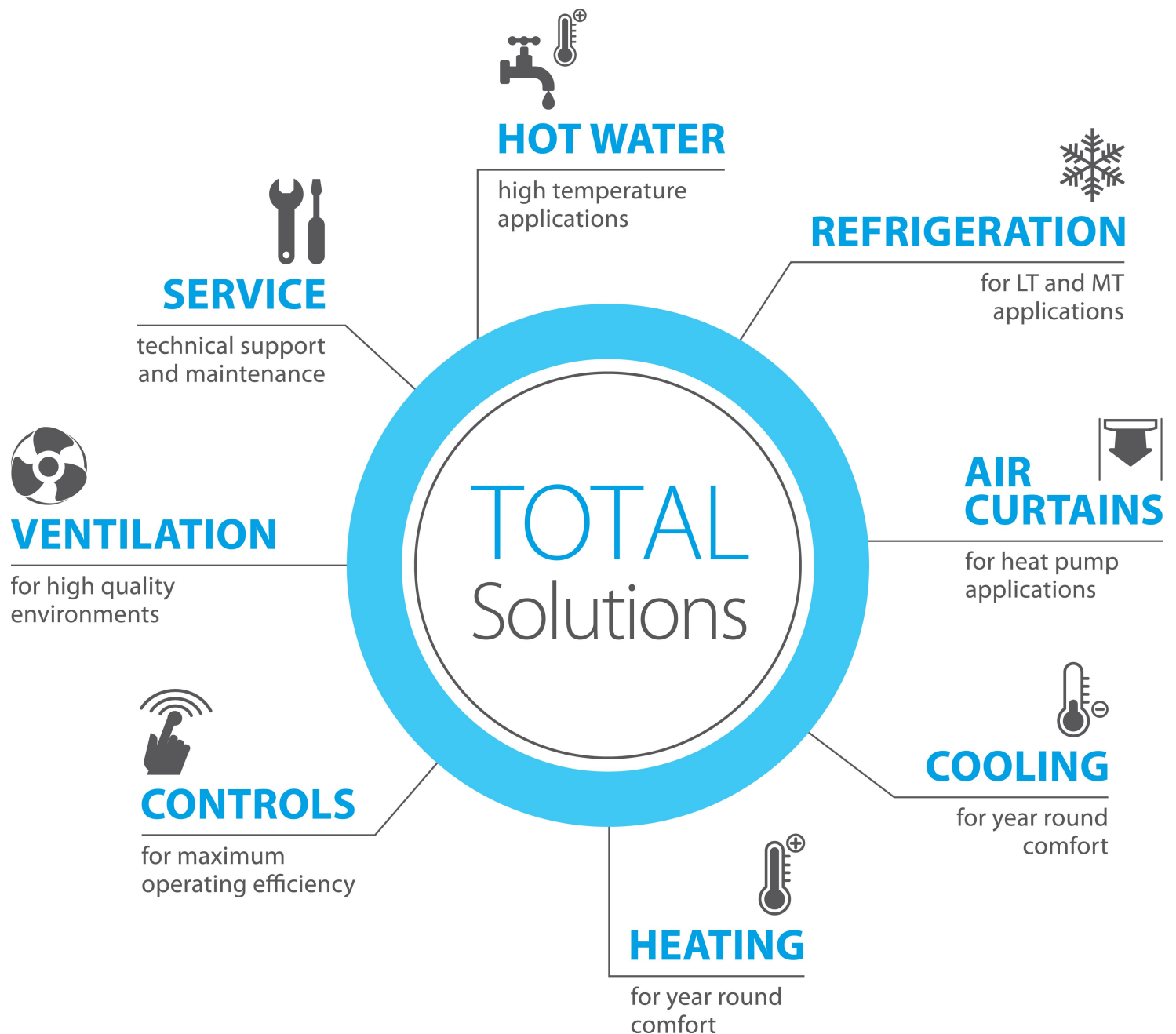
EQUIPMENT HEALTHCHECK

The contractor will allow provision for the Daikin equipment to be checked by Daikin Airconditioning UK Ltd which consists of the following procedures:

- Checking refrigerant levels
- Check of controls setup
- Check the full operational cycle (heating, cooling and heat recovery)
- Produce a full report including Service Checker data
- Suggest operational improvements

FIND AN INSTALLER

Our D1/D1+ accredited installers are extensively trained in Daikin VRV products. If you are looking for an installation company for your project then please visit daikin.co.uk/installer to find one based on your location.



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Power Proportional Distribution (PPD)

1. Description

The Power Proportional Distribution (PPD) feature supplies the user with a reasonably calculated apportionment of the total power consumption by the Daikin air-conditioning system to individual indoor units in the system. Because input to the PPD includes measured pulses in the refrigerant system and because the air-conditioning system includes a number of variables, including operating temperatures and pressures, piping length, heat exchange rates and others, no meter-type apportionment of individual users' consumption can be made. However, the PPD feature provides an apportionment methodology that uses highly advanced technology as applied to the many variables in an air-conditioning system.

The intent of PPD is to apportion total outdoor unit power consumption back into the respective indoor units that are served by those outdoor units. In other words, for each indoor unit that is exchanging heat, either in the cooling mode or heating mode, its operation is supported by a condensing unit that is consuming energy. PPD mathematically calculates each indoor units portion of that outdoor units total power consumption based upon its return air temperature, electronic expansion valve position and baseline values determined by the factory. PPD is compatible with Daikin VRV 2-pipe heat pump technology and VRV 3-pipe heat recovery technology.

2. Application and Design

The quantity and specification for the kWh meter on a PPD project will depend upon the equipment type, the expectation for PPD results and the configuration of the line voltage electrical wiring that is servicing the VRV condensing units.

To control costs and reduce overall complexity, the optimum situation is the application of the kWh meter to the electrical distribution panel (breaker panel) that is serving the Daikin outdoor units. In this case, the overall power consumption of several outdoor units can be captured by a single kWh meter – a reduction of cost and installation / commissioning complexity. The caveat to this approach is the requirement that the panel in question must not serve any other equipment or ancillary devices in the facility. Otherwise, a kWh meter would have to be specified and applied to each individual outdoor unit. Daikin AC strongly recommends that project managers and project engineers consider the electrical distribution system design at the earliest stages of project design to ensure that deployment, installation and commissioning of the equipment is feasible and within reasonable budget allowances. PPD and the accompany hardware and software requirements is a multi-tenant billing solution that demands an acute engineering focus.

The Daikin indoor units (FCU's) power consumption is not considered in the PPD results unless it is specifically required that this information is incorporated into the PPD solution. In this case, kWh meters would again be required on the panel(s) serving ONLY Daikin FCU's. Otherwise, it is generally assumed that indoor unit power consumption – which is relatively insignificant unless you are applying high CFM ducted units – is captured as part of the tenant sub-metering for internal power consumption (i.e. lights, plugs, appliances.)

Outdoor units for Daikin VRV 2-pipe heat pump, VRV 3-pipe heat recovery and single phase VRV-S systems can be provided power from the same electrical distribution panel from a PPD perspective unless the owners requires capabilities for benchmarking performance from the range of technology applied on his project. This rule does not supersede or otherwise modify the electrical requirements as mandated by national, state and local codes. Primary electrical system design principals still apply and take precedence over any guidance provided by Daikin AC with regards to PPD.

PPD Application with an Intelligent Touch Controller

An Intelligent Touch Controller can accommodate up to three (3) Pi's (pulse inputs) from the power meters. In actual application, these power meters must be measuring power consumption from condensing units that are serving indoor units that are under management by the Intelligent Touch controller to which the power meter is associated. In the case of having several condensing units on the project, it is possible to sub-meter the entire panel that is serving those condensing units as long as 1) there are no other devices being served power by that distribution panel and 2) the



condensing units are serving refrigerant to the indoor units that are under management by the Intelligent Touch Controller that is receiving that power meters pulse input.

The Intelligent Touch Controller can natively accommodate up to 3 pulse inputs. That number rises to 6 pulse inputs whenever a DIII-Net Plus Adapter option (DCS601A72) is added to the Intelligent Touch Controller.

Internal PPD results are stored within the Intelligent Touch Controller for up to 12 months.

PPD Application with Intelligent Manager III

The Daikin Intelligent Manager III multi-zone control architecture is based on the application of Intelligent Processing Units (IPU's) which serve as the hardware interface to the Daikin VRV air conditioning apparatus. A project may include from one to four total IPU's with two or four DIII-Net communication buses depending upon the scope of work, equipment quantity (VRV condensing units and indoor units), building geometry and control requirements. Intelligent Manager III systems are offered in packages that are selected based upon each individual projects specifications. Each sub IPU can accommodate a total of 20 pulse inputs (Pi). The primary IPU reserves Pi-1 for the power loss input signal and allows for the integration of up to 19 power meter pulse signals. Power meter pulse inputs to any respective IPU must be associated with a management point that exists within the same IPU.

Due to the applied nature and commissioning requirements of the Intelligent Manager III control system, this product is designed, engineered and commissioned by Daikin AC for each project. This includes the design and commissioning of the PPD option when applied to the Intelligent Manager III system.

Internal PPD results are temporarily stored within the Intelligent Manager III IPU's for up to 2 days and subsequently written to the PC hard drive for permanent storage.

Power Meter Specifications

The pulse output from the power meters will terminate directly to the Pi (pulse inputs) on the Intelligent Touch Controller. There are three (3) pulse inputs on a Daikin Intelligent Touch Controller. The output from the power meters must meet the following specification:

* Must be a non-voltage, normally open, momentary contact closure. This is usually a semi-conductor switched output. On the Square D PowerLogic series energy meters it is referred to as an Opto-FET output. (Non mechanical relay type. FET is a Field Effect Transistor.)

* Must provide an output of 1 pulse per 1 kW of consumption. This pulse (again the closure of the FET gate), must have a duration or width of 40 – 400 milliseconds.

Daikin AC has tested and approved for application either one of the two following power meter products:

1. Square D PowerLogic series energy meter

http://www.powerlogic.com/product.cfm/c_id/1/sc_id/6/p_id/24

2. Veris Industries Hawkeye 8163 series energy meter

<http://www.veris.com/product.asp?idMainCategory=45&idCategory=227&idProduct=112>

3. Setup and Commissioning

At this time, configuration and commissioning of PPD when applied with either the Intelligent Touch Controller or the Intelligent Manager III multi-zone controller products is facilitated by Daikin AC engineering personnel including representatives of Daikin AC's control engineering group or Daikin AC's field service force.

4. PPD Calculation Results and Billing

The PPD results will not include the indoor units power consumption, which would include the fan of the fan-coil unit and the power consumed by the onboard electronics. It is generally assumed that this power consumption is accounted for in the tenants or end-users sub-metered power for their internal usage. However, it is a PPD option to sub-meter the indoor unit power consumption and include the pulses in the power group configuration of the software. With this approach, the PPD results will include both outdoor and indoor units. Just remember that the PPD output results (the Excel .csv files) will not be inclusive of indoor unit power consumption unless the indoor units have been specifically sub-metered with the pulse inputs having been configured in the power group setups.

PPD Data Output and Accounting

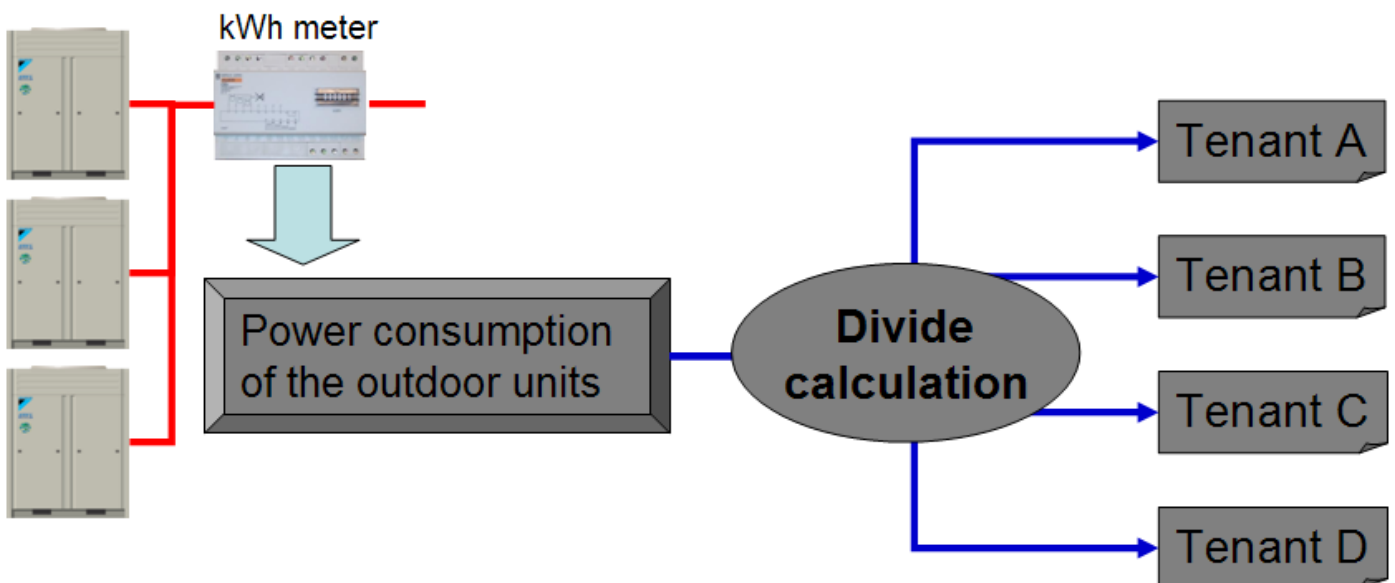
The HVAC system administrator should be aware that they will get relatively raw data output as a result of PPD data retrieval. This means a series of Excel .csv (comma separated values) files indicating individual indoor units and their respective watt-hour power consumption data over various blocks of time. Organization, formatting, compilation and presentation of this data in an end-user billable format is the sole responsibility of the building owner.

5. Exclusions

- PPD Technology is not compatible with the Daikin family of RA and RA Multi (single-split and multi-split) air conditioning heat pump products.
- Daikin does not make any claims to or guarantees of any specific metric of performance or accuracy of the PPD technology as the variable nature of installation integrity, quality (field installation) and conformance to design requirements (VRV system application and engineering) can vary significantly from project to project and are often outside the control of Daikin AC.

6. Technology and Application Diagrams

Concept:



PPD Calculation Logic:

Logic-1

Every 20 sec for each indoor unit

Calculate temporary power consumption index

Sum up

- Rated power consumption of outdoor unit for this indoor unit (Cooling/Heating)
- Return air temperature
- EEV Thermo-step (from the opening ratio of the electronic expansion valve)
- Coefficient of the indoor unit

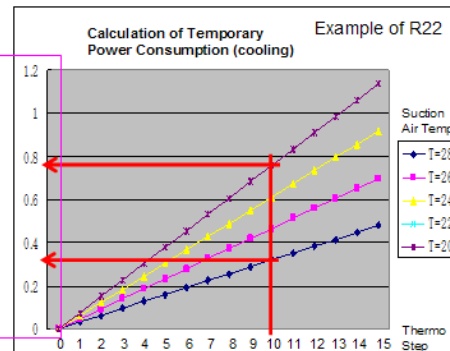
【For cooling】

Temporary power consumption index

$$= \frac{\text{Cooling rated outdoor unit power consumption for this indoor unit}}{10} \times (a1 + a2 \times \text{Suction air Temp.}) \times \text{Thermo step}$$

Fixed value depends on the indoor unit capacity

Note: a1, a2, 10 are fixed factors.



Every 1 hour

A •Power consumption of outdoor units during 1 hour (← kWh pulse)

B •Sum of temporary power consumption index of indoor unit in 1 hour

Divide **A** into each indoor unit with proportion of **B**

PPD Result

PPD Calculation Logic Continued

The Daikin outdoor units will consume a small amount of energy even when the connected load is satisfied and not demanding any cooling or heating capacity. This energy consumption comes from the compressor crankcase heaters and the small amount of energy required to power the control PCB. The following diagrams detail how this small amount of energy is considered in the PPD calculation and output data.

Logic-2

When the outdoor unit has stopped during 1 hour in total

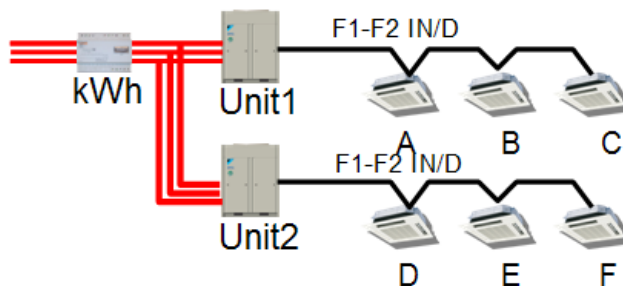
Fixed value is assigned to indoor units connected to the stopped outdoor unit

The value is decided by the model of the indoor unit

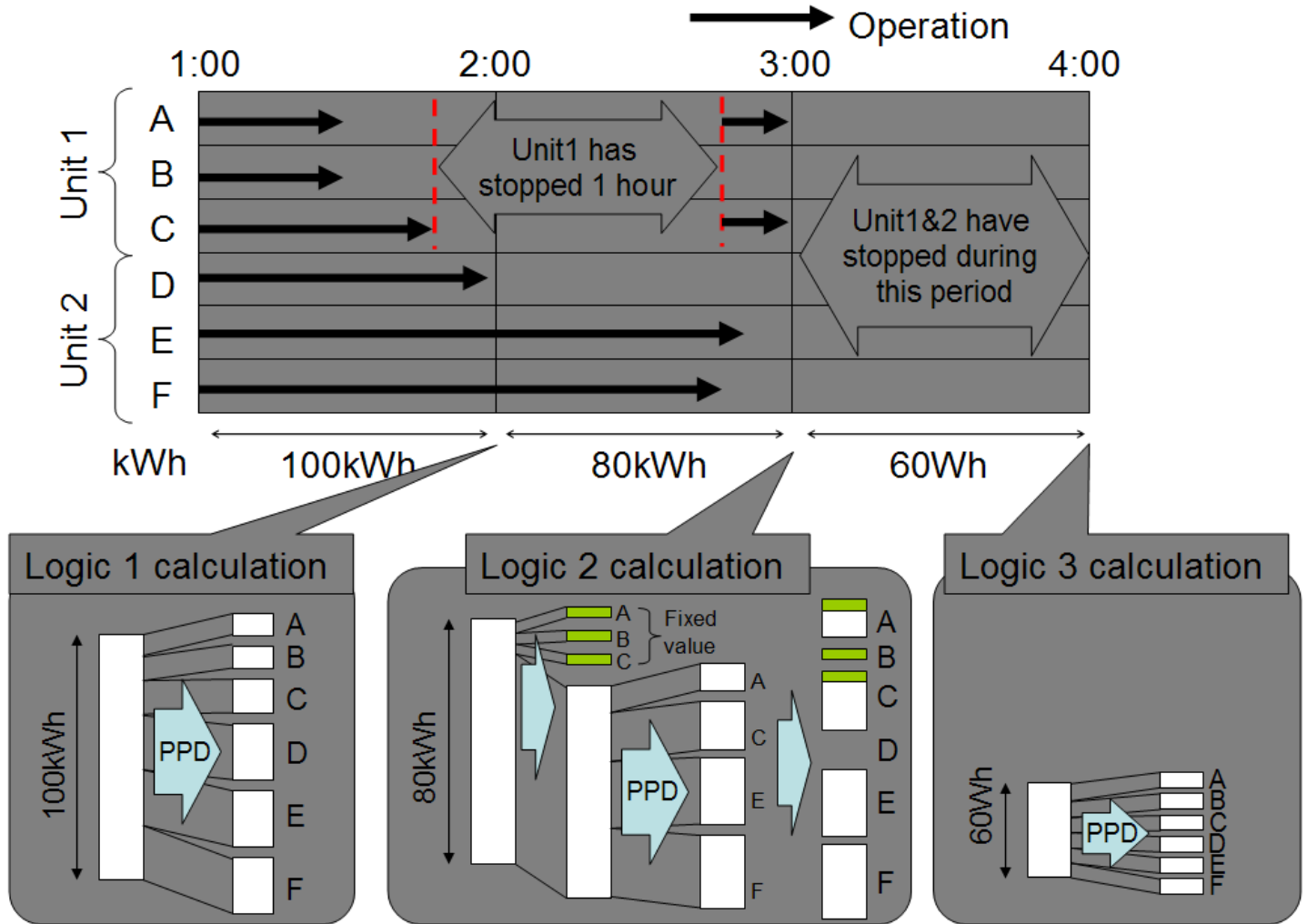
Logic-3

When all outdoor units have stopped during the calculation period

Power consumption of the outdoor unit is divided by coefficient of each indoor unit



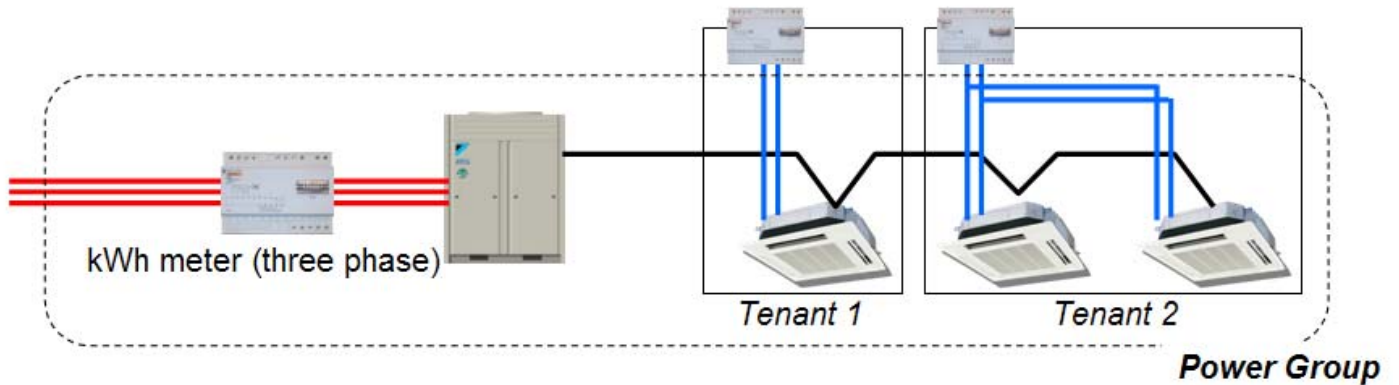
PPD Calculation Logic Continued



PPD Indoor Unit Power Consumption

The Daikin indoor units (FCU's) power consumption is not considered in the PPD results unless it is specifically required that this information is incorporated into the PPD solution. In this case, kWh meters would again be required on the panel(s) serving ONLY Daikin FCU's. Otherwise, it is generally assumed that indoor unit power consumption – which is relatively insignificant unless you are applying high CFM ducted units – is captured as part of the tenant sub-metering for internal power consumption (i.e. lights, plugs, appliances.)

Tenant level kWh meter capturing energy consumption for plugs, lights and appliances may consider the VRV indoor unit power consumption.



Accessing PPD Data Results

The HVAC system administrator should be aware that they will get relatively raw data output as a result of PPD data retrieval. This means a series of Excel .csv (comma separated values) files indicating individual indoor units and their respective watt-hour power consumption data over various blocks of time. Organization, formatting, compilation and presentation of this data in an end-user billable format is the sole responsibility of the building owner.

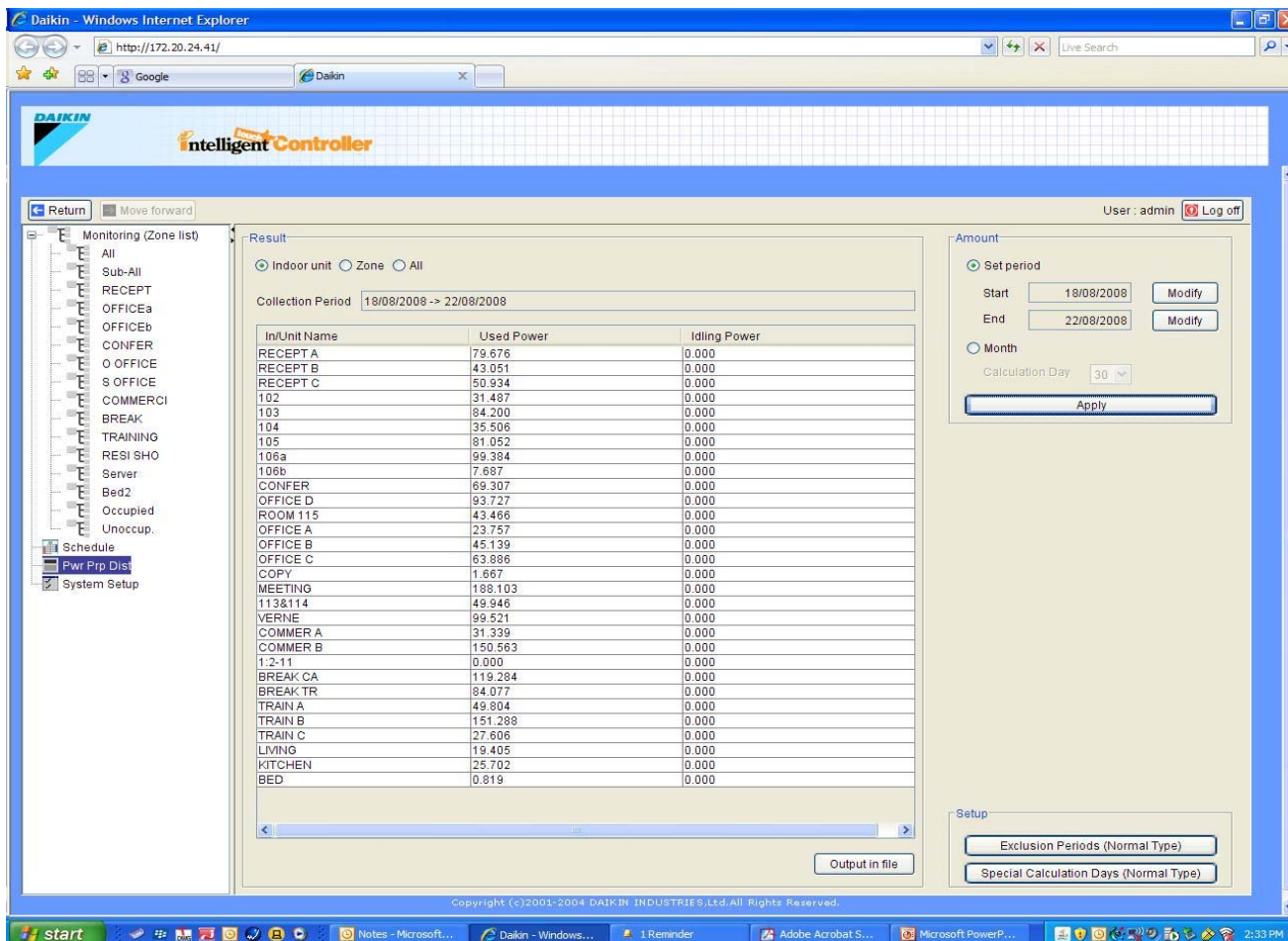
Accessing PPD Results Data for the Intelligent Touch Controller

PPD results data (Microsoft Excel .csv files) can be accessed directly through the device through a download to a user supplied PCMCIA memory card slot or can be accessed through the web option available for the Intelligent Touch Controller. The web option is highly recommended owing to the efficiency and convenience of this method as well as the ability to retrieve the data from an offsite location.

Accessing PPD Results Data for the Intelligent Manager III

PPD results data (Microsoft Excel .csv files) for an Intelligent Manager III application can be accessed directly through the Intelligent Manager's local PC user interface or can be retrieved through the web access option that is available for the Intelligent Manager III product family.

Example Screenshot of PPD Data Access via Web Access Option (Internet Explorer® Version 7.0 shown)



The screenshot shows the Daikin Intelligent Controller web interface in Internet Explorer. The main content area displays a table of power consumption data for various indoor units over a collection period from 18/08/2008 to 22/08/2008. The table has three columns: In/Unit Name, Used Power, and Idling Power. The data is as follows:

In/Unit Name	Used Power	Idling Power
RECEPT A	79.676	0.000
RECEPT B	43.051	0.000
RECEPT C	50.934	0.000
102	31.487	0.000
103	84.200	0.000
104	35.506	0.000
105	81.052	0.000
106a	99.384	0.000
106b	7.687	0.000
CONFER	69.307	0.000
OFFICE D	93.727	0.000
ROOM 115	43.466	0.000
OFFICE A	23.757	0.000
OFFICE B	45.139	0.000
OFFICE C	63.886	0.000
COPY	1.667	0.000
MEETING	188.103	0.000
113&114	49.946	0.000
VERNE	99.521	0.000
COMMER A	31.339	0.000
COMMER B	150.563	0.000
1.2-11	0.000	0.000
BREAK CA	119.284	0.000
BREAK TR	84.077	0.000
TRAIN A	49.804	0.000
TRAIN B	151.283	0.000
TRAIN C	27.606	0.000
LIVING	19.405	0.000
KITCHEN	25.702	0.000
BED	0.819	0.000

The interface also includes a sidebar for monitoring zones, a 'Result' section with radio buttons for 'Indoor unit', 'Zone', and 'All', and a 'Collection Period' field. On the right, there are 'Amount' settings for 'Set period' (Start: 18/08/2008, End: 22/08/2008) and 'Month' (Calculation Day: 30). At the bottom right, there are 'Setup' options for 'Exclusion Periods (Normal Type)' and 'Special Calculation Days (Normal Type)'. An 'Output in file' button is located at the bottom of the table.



Example Screenshot of Microsoft Excel® .csv PPD Data Output – 5 Day Date Range

Microsoft Excel - (2008-08-27) PPD EXAMPLE for DACA Carrollton TX - 20080818_20080822									
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	A	B	C	D	E	F	G	H	I
1	Start Date	Nb of Days	A/C Type	Undistributed Power Amount	Period Type				
2	20080818	5	0	0	0				
3									
4	A/C Unit No	In/Unit Name	HP Code	Daytime Used Pwr	Nighttime Used	Daytime Idle Pwr	Nighttime Idle Pwr	Gas Amount	
5	0	'RECEPT A	70	79676	0	0	0	0	0
6	1	'RECEPT B	70	43051	0	0	0	0	0
7	2	'RECEPT C	70	50934	0	0	0	0	0
8	4	'102	70	31487	0	0	0	0	0
9	5	'103	70	84200	0	0	0	0	0
10	6	'104	70	35506	0	0	0	0	0
11	8	'105	70	81052	0	0	0	0	0
12	9	'106a	70	99384	0	0	0	0	0
13	10	'106b	70	7687	0	0	0	0	0
14	12	'CONFER	8c	69307	0	0	0	0	0
15	13	'OFFICE D	70	93727	0	0	0	0	0
16	14	'ROOM 115	38	43466	0	0	0	0	0
17	16	'OFFICE A	70	23757	0	0	0	0	0
18	17	'OFFICE B	70	45139	0	0	0	0	0
19	18	'OFFICE C	70	63886	0	0	0	0	0
20	20	'COPY	38	1667	0	0	0	0	0
21	21	'MEETING	38	188103	0	0	0	0	0
22	22	'113&114	38	49946	0	0	0	0	0
23	23	'VERNE	70	99521	0	0	0	0	0
24	25	'COMMER A	70	31339	0	0	0	0	0
25	26	'COMMER B	70	150563	0	0	0	0	0
26	27	'1:2-11	70	0	0	0	0	0	0
27	29	'BREAK CA	8c	119284	0	0	0	0	0
28	30	'BREAK TR	8c	84077	0	0	0	0	0
29	32	'TRAIN A	70	49804	0	0	0	0	0
30	33	'TRAIN B	38	151288	0	0	0	0	0
31	34	'TRAIN C	70	27606	0	0	0	0	0
32	36	'LIVING	47	19405	0	0	0	0	0
33	37	'KITCHEN	38	25702	0	0	0	0	0
34	38	'BED	24	819	0	0	0	0	0
35									



Example Screenshot of Microsoft Excel® .csv PPD Data Output – Hourly Example

Microsoft Excel - (2008-08-27) PPD EXAMPLE for DACA Carrollton TX - HOURLY																
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R48 0																
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
1	PPD Hourly Data (Wh)															
2	Note: Date and Time mean the calculation time of PPD.															
3	The value of 3:00 is a result between the calculation time just before 3:00 and 3:00.															
4	RECEPT A	RECEPT B	RECEPT C	'1:1-03	'102	'103	'104	'1:1-07	'105	'106a	'106b	'1:1-11	'CONFER	'OFFICE D	ROOM 11	'1:1-15
5	0	0	0	-1	0	0	0	-1	0	0	0	-1	0	0	0	-1
6	2008.8.18	1:00														
7	42	42	42	0	42	42	42	0	42	42	42	0	53	42	26	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	2008.8.18	2:00														
12	42	42	42	0	42	42	42	0	42	42	42	0	53	42	26	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	2008.8.18	3:00														
17	42	42	42	0	42	42	42	0	42	42	42	0	53	42	26	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	2008.8.18	4:00														
22	42	42	42	0	42	42	42	0	42	42	42	0	53	42	26	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	2008.8.18	5:00														
27	42	42	42	0	42	42	42	0	42	42	42	0	53	42	26	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	2008.8.18	6:00														
32	42	42	42	0	42	42	42	0	42	42	42	0	53	42	26	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	2008.8.18	7:00														
37	42	42	42	0	0	0	738	0	42	42	42	0	53	42	26	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	2008.8.18	8:00														
42	1306	1353	207	0	1613	1053	1171	0	1578	230	902	0	1873	1372	793	0
43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	2008.8.18	9:00														
47	851	21	0	0	1615	1575	596	0	815	583	42	0	366	990	536	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0