



HVAC

HC HEAT-EXCHANGERS

HVAC Catalogue

CO₂



V4

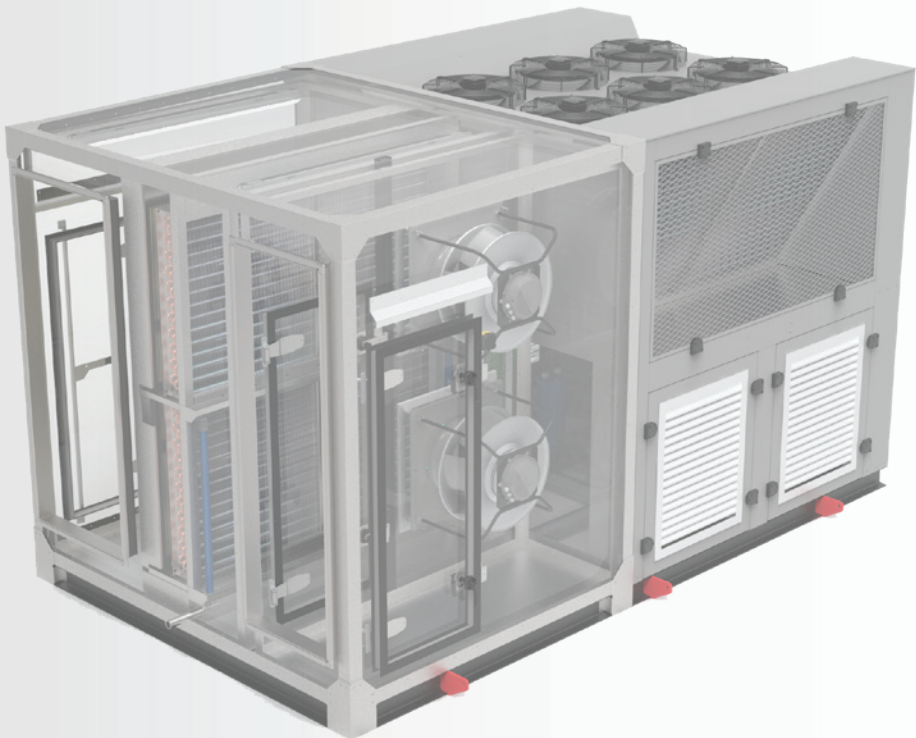


A Proudly South African Company with a Global Reach

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About the HC AHU Range

HC-HVAC offers innovative solutions to both the Commercial and Industrial Air Conditioning markets, whilst creating and sustaining local employment.

We pride ourselves in providing Engineering Excellence with our full range of Air Handling and Rooftop Units. HC Heat-Exchangers' rich engineering heritage, coupled with our desire to remain at the forefront of design and manufacturing technology, ensures our AHU's and RTPU's encompass the latest technology on offer. By ensuring that all of our units' major components are sourced from leading suppliers, who support research and development themselves. This guarantees our clients a world class product engineered to perform.

As a specialist engineering firm we have the experience and capacity to design and manufacture innovative products. By producing units that value energy efficiency we reduce our carbon footprint and protect our environment for future generations.

We understand the increasing need to reduce costs without compromising on quality and energy efficiency - at all levels throughout the value chain. In response to this we offer both a standard range of units, along with custom engineered units to suit site-specific requirements.

Our bespoke solutions allow Air Handling and Rooftop Units to be designed and manufactured in different aspect ratios, as well as in modular form for on-site assembly where required. This modular construction method reduces client site rigging costs, whilst offering a practical solution for sites with limited/restricted access.

Providing Engineering Excellence

With HC Heat-Exchangers you can be assured of professional and knowledgeable assistance during the design, installation and commissioning of any project.

Embracing the latest technologies and promoting a culture of research and development, our Air Handling and Rooftop Units' construction materials and fastening methods have been optimised to ensure reliable operation and trouble free maintenance.

We design and manufacture units of all sizes and capacities, in various construction materials, to suit the market's requirements. Our standard models range from 1m³/s to 40m³/s.

Our Air Handling and Rooftop Units, which form an integral part of a Central Air Conditioning plant, comprise of various components and solutions to assist the designer in achieving the desired conditioned environment. These components are selected based on their ability to contribute to sustainability, energy efficiency and improved Indoor Air Quality (IAQ). The conditioned air would generally be supplied to the conditioned area via a network of ducting. The type of ducting selected is typically based on the environmental, insulation and budgetary requirements.



AHU Range

Depending on the specific requirements, application and climate the designer would select the appropriate type of components for the Air Handling Units. The air would be filtered, cooled and/or heated, humidified and/or dehumidified.



Major Components



Cooling, Heating & Steam Coils

A choice of copper, PU coated, stainless steel, aluminium and aluminium magnesium (AlMg) finned coils are available, whilst the tubing and frame material can vary. The coils are generally copper tubes mechanically bonded to aluminium fins, with copper headers, all contained within a galvanised, aluminium or stainless steel frame. All coils are provided with drain connections and air vents. The tube wall thickness and the test pressures are determined based on the fluid passing through the coil. The cooling coil assembly is fitted on a stainless steel drain pan for condensate removal.



Casing

Various panel finish options: Powder coated steel, AluZinc, Chromadek or Stainless Steel. Insulation options include: Flexible, elastomeric thermal insulation, polyurethane, fire retardant polystyrene, mineral wool or calcium silicate.



Unit Base

Bases are constructed using galvanised steel or stainless steel sheet metal profiles or heavy duty structural steel sections, either painted or hot dip galvanised.



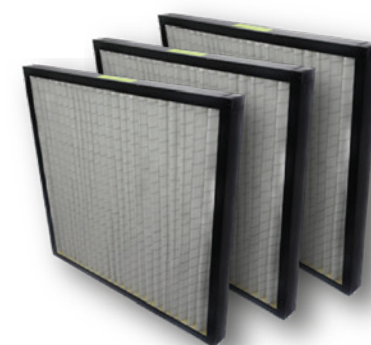
Supply Air Fan

The fans are EC (Electronically Commutated) Plug Fans, with built-in variable speed capability due to the EC brushless DC motor.

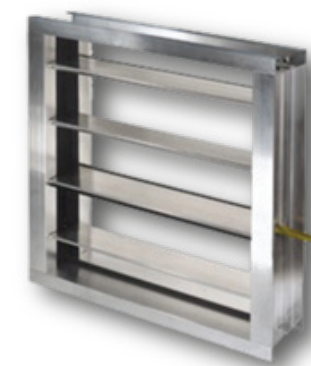
Humidifiers



Steam humidification is preferred, whether generated in a large central boiler and distributed into the Air Handling Units through a network of steam piping, or a portable boiler for each Air Handling Unit with dispersion tubes and nozzles. The alternative is the adiabatic process, where the air is cooled whilst moisture is added into the airstream. This is achieved by either High Pressure Atomising, Air/Water Atomising or Wetted Cellulose Fibre.



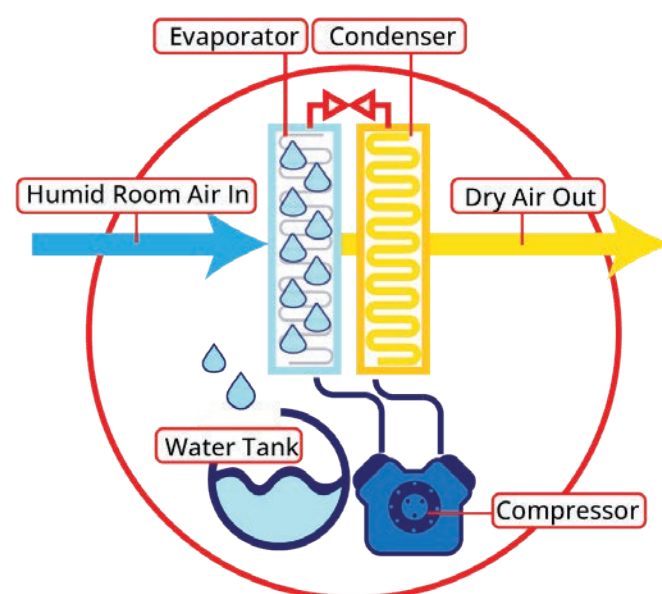
Filters



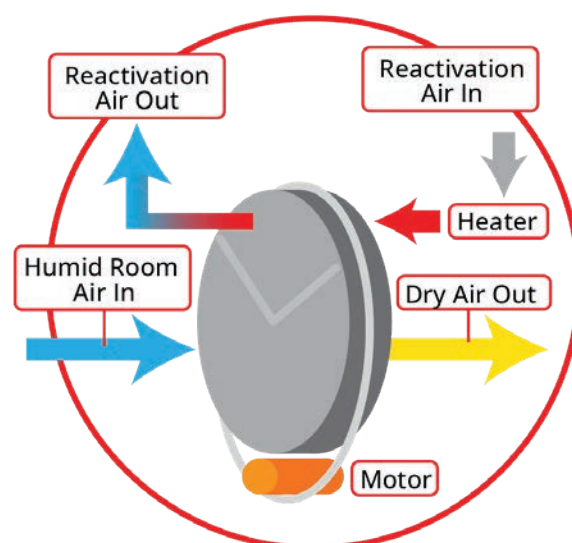
Dampers



Sound Attenuators



Refrigeration Cycle



Desiccant Rotor

De- Humidifiers

There are various types of De-Humidifiers used within the Air Handling Units. The most popular method utilises the refrigeration cycle in a cooling/heatpump mode followed by the dessicant type where air passes through a rotor containing a water absorbent desiccant material.

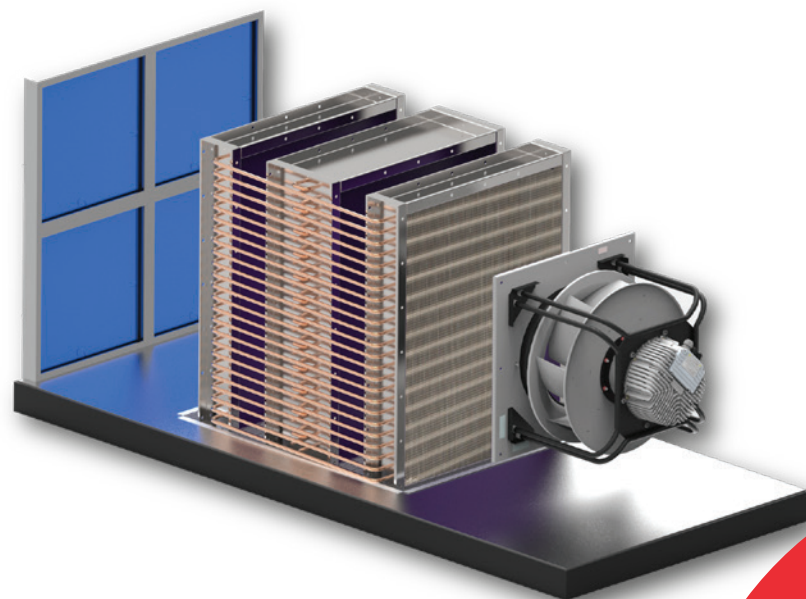
The type of filters used are determined by the environment, climate and required application. Generally, the filters used within our Air Handling Units are: Panel Washable Filters, Bag Filters, Compact Cassette Filters, Carbon Filters, Electrostatic Filters and HEPA Filters.

The dampers can either be motor-driven or manual actuation and control: Outside Air, Return Air, Exhaust Air, etc. The outside air dampers can be controlled automatically via a CO₂ sensor. They are supplied in extruded aluminium, galvanised or stainless steel sections with or without seals.

Maintaining acceptable acoustics is an important component of Indoor Environmental Quality (IEQ). The application and environment in which the AHU is installed determines the acceptable noise levels. Sound levels can be reduced by selecting the appropriate fans, minimising vibration and drive noises or applying a sound absorbing material inside the wall will reduce noise levels.



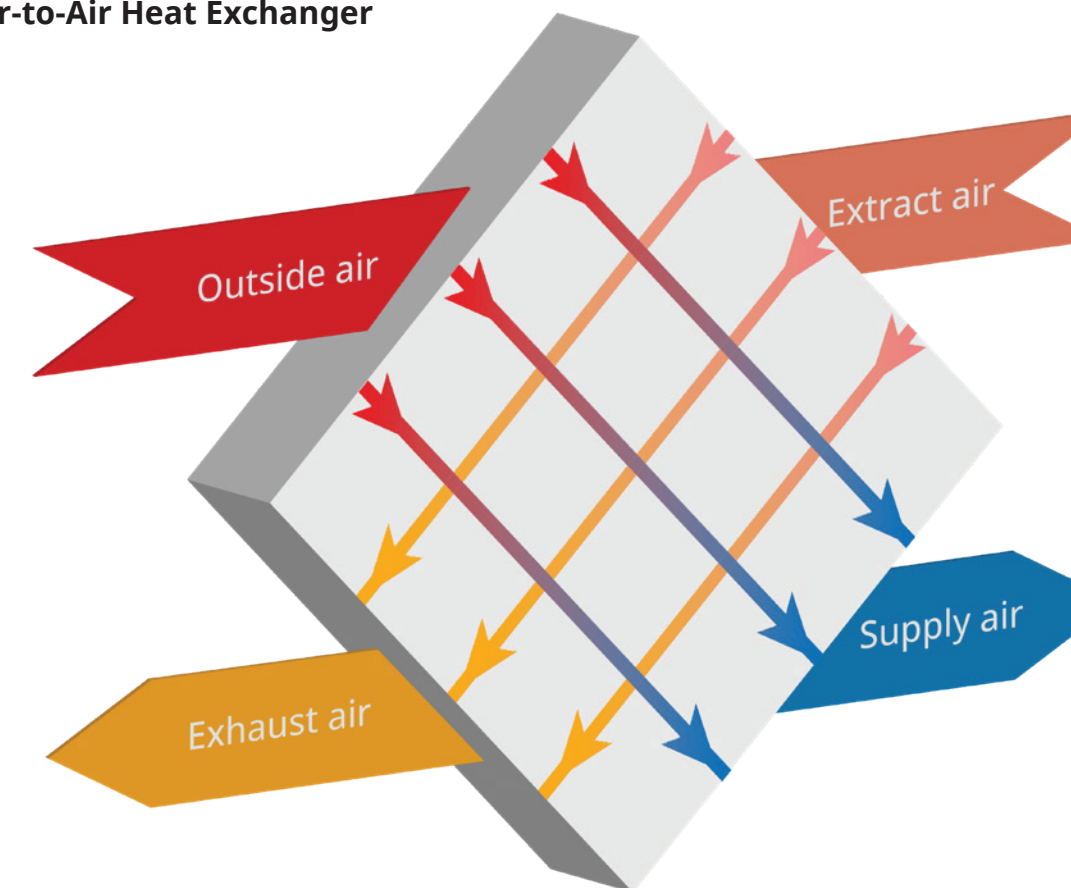
Heat Pipes/ Run Around Coils



Heat pipes have the added advantage of having no moving parts that would be subject to wear and therefore is considered to be virtually maintenance free. Heat pipes can be arranged in airstreams where they are either in a stacked arrangement or in a side-by-side arrangement using the copper tubes sloping down towards the warmer air.

The heat pipes process is an effective method of transferring heat. The typical heat pipe uses Copper tube and Aluminium fin units positioned around a cooling coil. The sealed copper tubes are evacuated and typically charged with R134a refrigerant. It consists of two sections, the pre-cool section placed before the cooling coil and the reheat section placed after the cooling coil. These heat pipes are popular within the HVAC system in tropical climates, especially to treat high levels of fresh air that must be cooled. The pre-cooled air enthalpy is then used later to re-heat the air after the cooling coil. This results in energy saving whilst providing dehumidification. These heat pipes increase the latent cooling capacity at reduced costs.

Air-to-Air Heat Exchanger



Extras

Components that can be included within the Air Handling Units, are:

- Heat pipes / Run-around Coils
- Gas Burners
- Droplet / Moisture Eliminators
- Ultraviolet (UV) disinfection lamps
- Photocatalytic Oxidation Air Cleaners
- Electric Heater Banks
- Cooling / Heating Valves
- Switchboard and Controls
- Electronic or Thermostatic expansion valves
- Rounded internal unit profiles for hygiene type units

Heat Recovery Wheels

These recovery methods utilise a transfer of energy and are extensively used within the industry to achieve energy saving, by removing both sensible and/or latent heat. The wheel is positioned in the unit so that the stale exhaust air is drawn through one half and the outside air through the other in a counter-flow arrangement.



The Integral Solution for the Control of AHU



Air quality probes and combined CO₂ and VOC Probes

The probes analyse the quality of the air using a mixed gas VOC (Volatile Organic Compound) sensor and a CO₂ sensor with a range from 350 to 2000 ppm. Commonly used to measure the air quality in offices, hotels, meeting rooms, homes, shops, restaurants and other air handling equipment. The probes allow for quantitative analysis of contamination by polluting gases.

Differential pressure transducer

The differential pressure transducer uses a new ceramic sensor. It provides a voltage or current signal, calibrated and compensated for the temperature. This is ideal for measuring low pressure values in Air-Conditioning systems, rooms, laboratories and clean rooms containing air and non-corrosive gases.



Temperature and humidity probes

CAREL has developed an entire range that can satisfy all the needs of installers and HVAC/R manufacturers for the control of their humidifiers. The range includes temperature and humidity sensors for different applications, featuring socket installation, duct installation, in residential or industrial environments.



Isothermal humidifiers

CAREL produces a complete range of isothermal humidifiers with different outputs, using electric heaters, immersed electrodes or gas boilers, supplied complete with all the accessories required for the installations. In particular, the high energy efficiency and low running costs of gaSteam, our gas-fired humidifier, make this model highly competitive compared to adiabatic humidifiers, while still maintaining the advantages of isothermal humidification.



Adiabatic humidifiers

CAREL produces a complete range of adiabatic humidifiers, with different outputs using atomised water (with and without compressed air). The high efficiency of these units and the complete absence of recirculated water prevents any dangers associated with the Legionella bacteria.



Accessories

CAREL supplies differential air pressure sensors for recording and managing the pressure drop through filters, fans and from all ventilation devices in general.

Servo controls for valves and dampers

All the CAREL controllers can manage any Servo control for dampers and valves. INDUSTRIE TECHNIK has been chosen as our preferred partner for the supply of the actuators.



The pCO sistema range of controllers

The pCO sistema is the result of CAREL's extensive experience in the design and production of programmable controllers for HVAC/R units. The pCO sistema consists of programmable controllers, user interfaces, software tools for developing applications, gateways and communication interfaces, remote management systems, etc.



Electrical panels

CAREL manufactures a complete range of electrical panels, available in versions for 1 or 2 fans, with direct or star-delta starting, suiting the various different controllers in the pCO sistema family, and can also supply special versions based on customer specifications.

A Coherent Concept

Realistic performance specifications, as the performance data of the entire fan is continuously measured by means of the components, namely the high-performance impeller, GreenTech EC motor and control electronics.

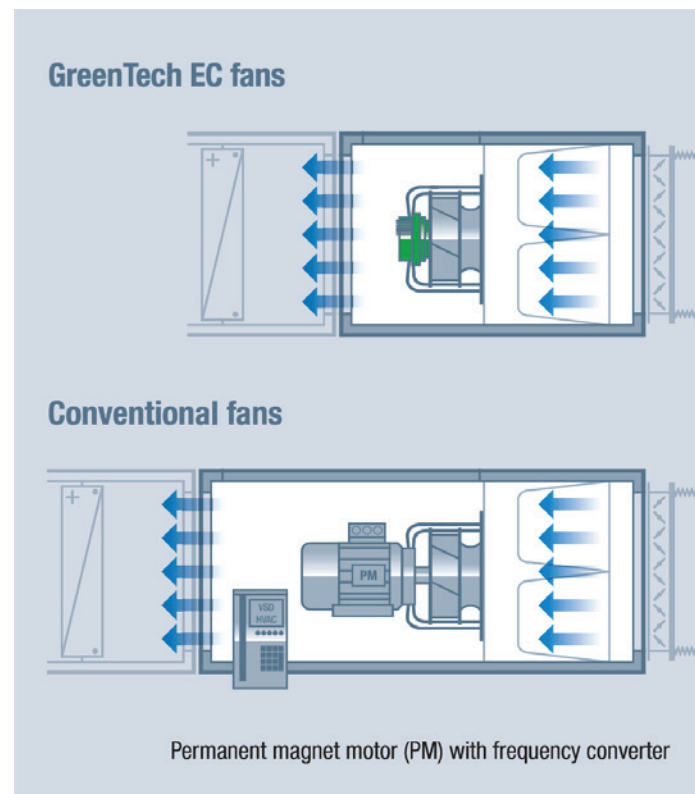
Effective logistics, as a single RadiPac part number includes all components required for all your ventilation demands.

Simple commissioning, as all features necessary for operation are already installed and designed to suit one another.

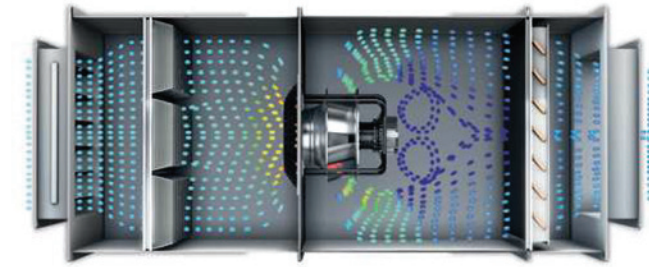
Simple and safe, as the electronics and motor form one unit. This saves space and ensures easy installation by removing the need for an external frequency converter. As the motor and electronics are already perfectly matched to one another and include all necessary motor protections, this makes additional electronic filters and shielded cables unnecessary.

In summary: there is no need for time-consuming programming during commissioning or for additional earthing and screening work.

Plug & Play really is that simple.



Compact design, as the high-performance impeller is mounted directly on the rotor of the external rotor motor. This allows the entire rotating unit to be balanced at the same time.



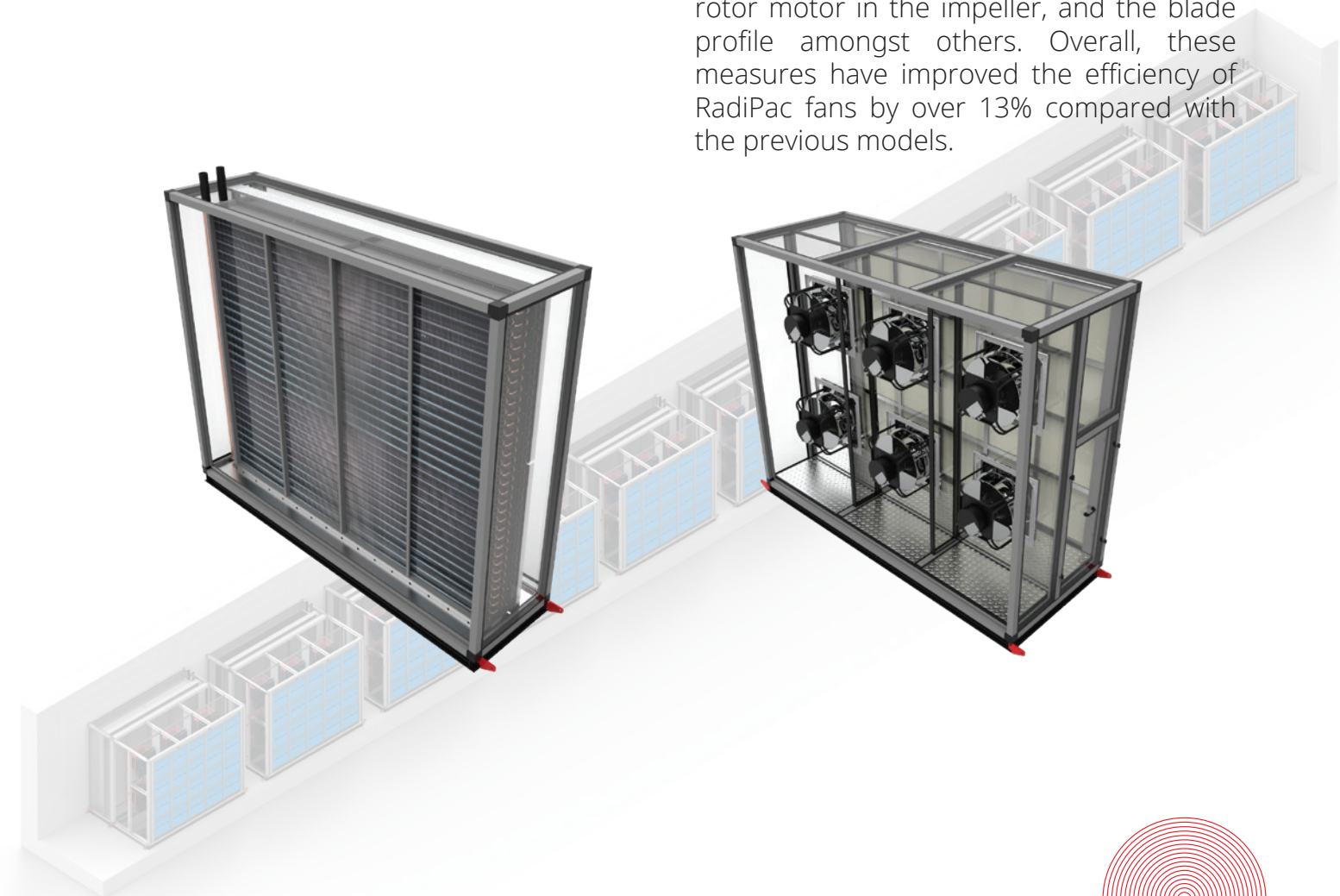
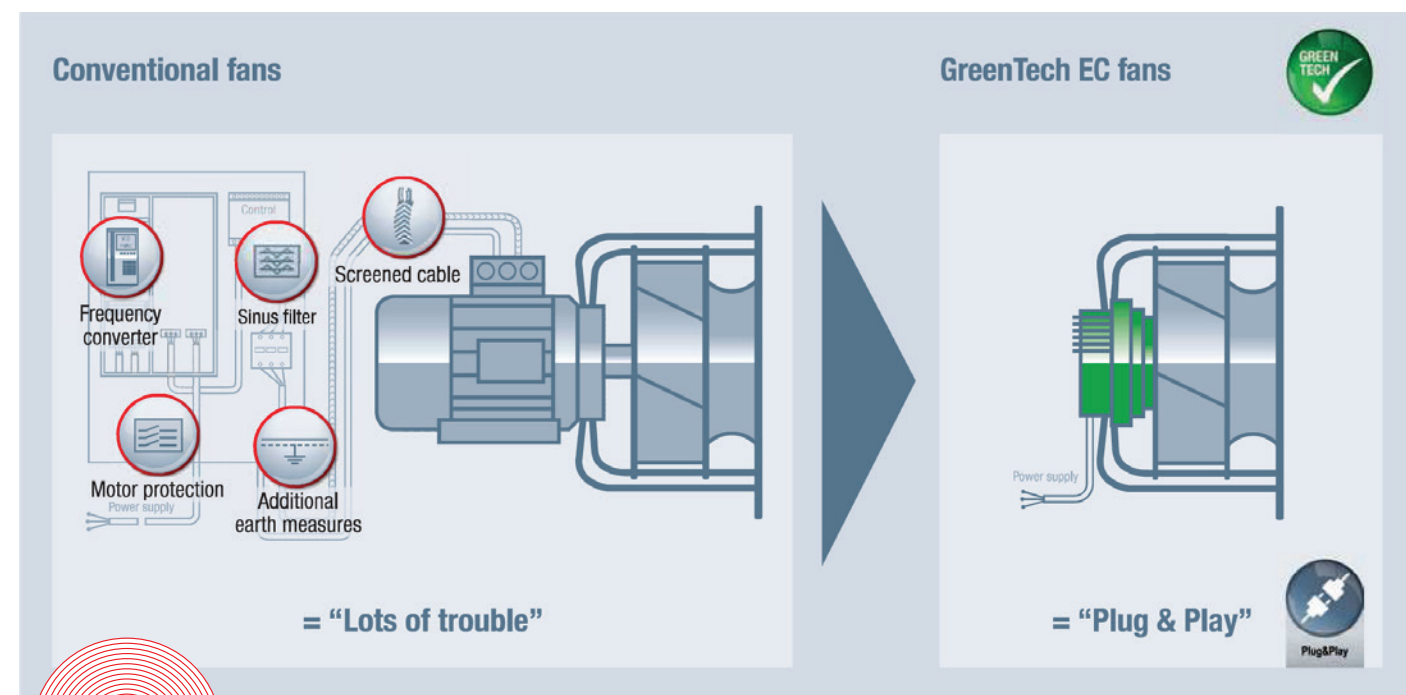
Designed certainty for the system builder.

While developing the RadiPac fans, we took the real conditions of installation in Air Handling Units into consideration. In particular, we optimized the impeller's outflow characteristics and reduced the deflection losses within the Air Handling Unit. In addition, a wide optimum efficiency range with static overall efficiency of 68% enables the fans to work in a wide operating range with lower power consumption.

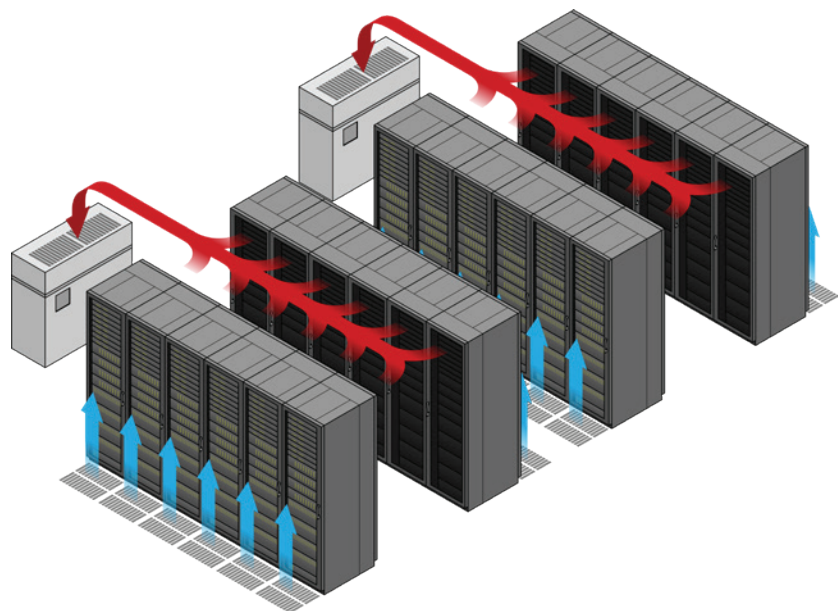
A coherent concept.

The basis for the wide optimum efficiency range is the finely matched interaction of all the fan components. For example, the GreenTech EC motors with efficiencies of well over 90% more than meet the requirements of efficiency class IE4. Likewise, the design of the impeller contributes to increased efficiency and quieter operation.

Improvements include, the air intake into the impeller, the positioning of the external rotor motor in the impeller, and the blade profile amongst others. Overall, these measures have improved the efficiency of RadiPac fans by over 13% compared with the previous models.



Data Centre Air Handling Units



HC HVAC Data Centre units are designed to suit the client's specific requirements. Our range of CRAC and CRAH units are extensive as we specialise in offering bespoke solutions to suit all environmental conditions.

Modern Data Centres are working harder than ever, increasing the demand on our limited natural resources. With the increasing cost of electricity the need for innovative Data Centre designs is crucial to ensure a sustainable future.

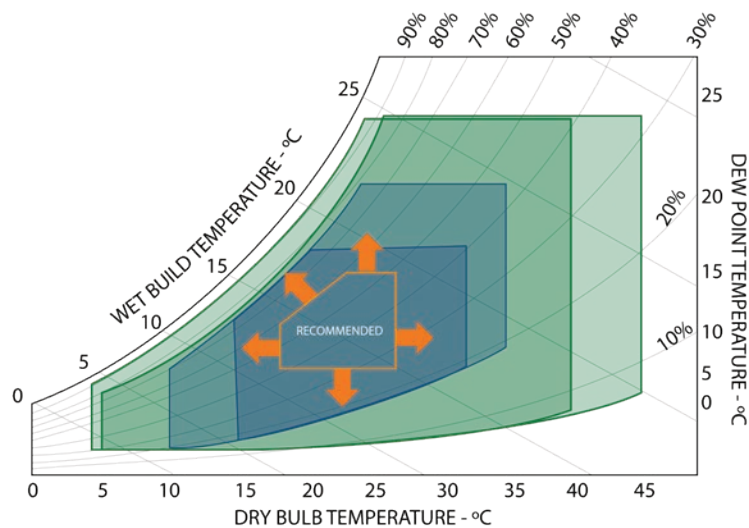
Energy consumption is optimised by the use of innovative technologies and state of the art monitoring systems within Data Centres. The climatic conditions dictate the most economical and environmentally suitable types of systems that could be used in the Data Centre cooling units.

The following are some of the current global trends for cooling Data Centres:

- Geothermal Cooling Solutions
- Pumped Two-Phase Cooling Solutions
- Immersion Cooling Solutions
- Smart Monitoring and IoT Solutions

Nomenclature

CRAC – Computer Room Air Conditioning
 CRAH – Computer Room Air Handler

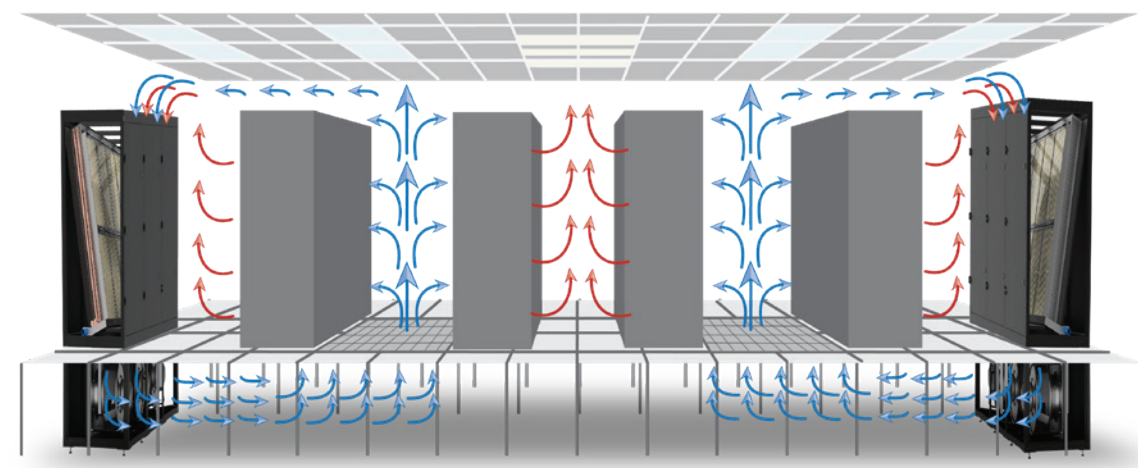
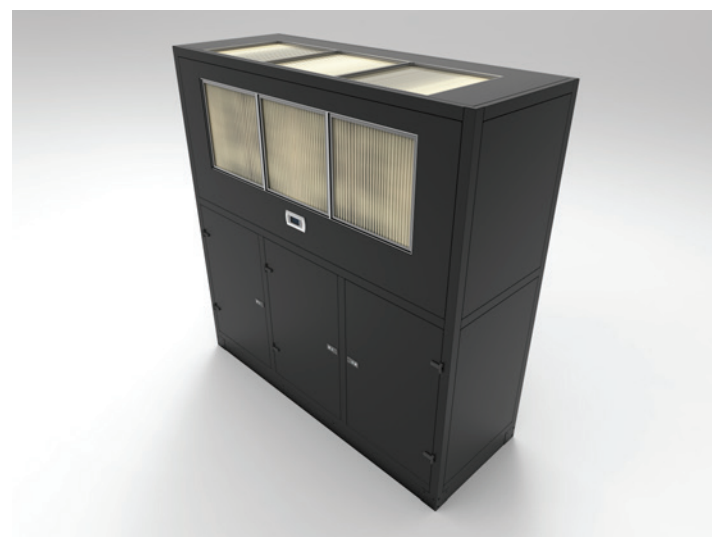


ASHRAE Data Centre Thermal Guide

https://tc0909.ashraetcs.org/documents/ASHRAE_Power_White_Paper_22_June_2016_REVISED.pdf

Class	Equipment Environmental Specifications for Air Cooling						
	Product Operations					Product Power Off	
	Dry-Bulb Temperature °C	Humidity Range Non-Condensing	Maximum Dew Point	Maximum Elevation	Maximum Temperature Change per/hour	Dry-Bulb Temperature °C	Relative Humidity %
Recommended (Suitable for all 4 Classes)							
A1 to A4	18 to 27	-9°C DP to 15°C DP and 60% RH					
Allowable							
A1	15 to 32	-12°C DP & 8% RH to 17°C DP and 80% RH	17	3050	5/20	5 to 45	8 to 80
A2	10 to 35	-12°C DP & 8% RH to 21°C DP and 80% RH	21	3050	5/20	5 to 45	8 to 80
A3	5 to 40	-12°C DP & 8% RH to 24°C DP and 85% RH	24	3050	5/20	5 to 45	8 to 80
A4	5 to 45	-12°C DP & 8% RH to 24°C DP and 90% RH	24	3050	5/20	5 to 45	8 to 80
B	5 to 35	8% RH to 28°C DP and 80% RH	28	3050	NA	5 to 45	8 to 80
C	5 to 40	8% RH to 28°C DP and 80% RH	28	3050	NA	5 to 45	8 to 80

Data Centre Solution



Gas Cooler Options



HWV

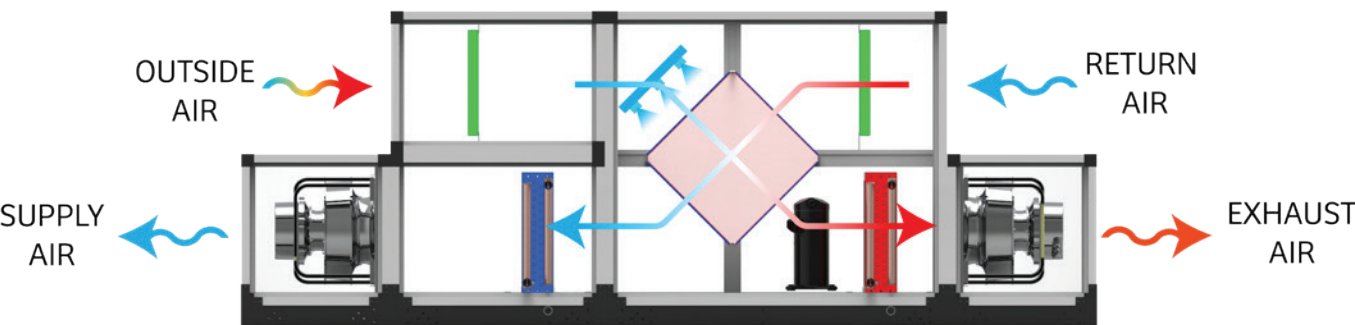
Indirect Adiabatic Evaporative Cooling & Vapour Compression Cooling

This product offers the best in class energy efficient solution to the Air Conditioning industries needs.

There are various operating modes that are available, depending on the specific indoor and outdoor environmental conditions.

The unit has numerous dampers, allowing for the most economical use of existing conditions to achieve the desired results. The unit uses Air-to-Air Plate Heat Exchangers running in Dry mode with additional Adiabatic, cooling available, as well as Direct Expansion or Chilled Water cooling coils to optimise energy efficiency.

- The following are some of the operating modes:
- Free Cooling.
 - Dry mode - Air to Air Heat Exchanger.
 - Adiabatic with a Wet Pad installed upstream of the Air-to-Air Heat Exchanger.
 - Wet mode – Water is sprayed over the Air-to -Air Heat Exchanger.
 - DX or Chilled water cooling used in combination with the above modes to achieve the desired room condition at the highest Seasonal Energy Efficiency Rating (SEER)

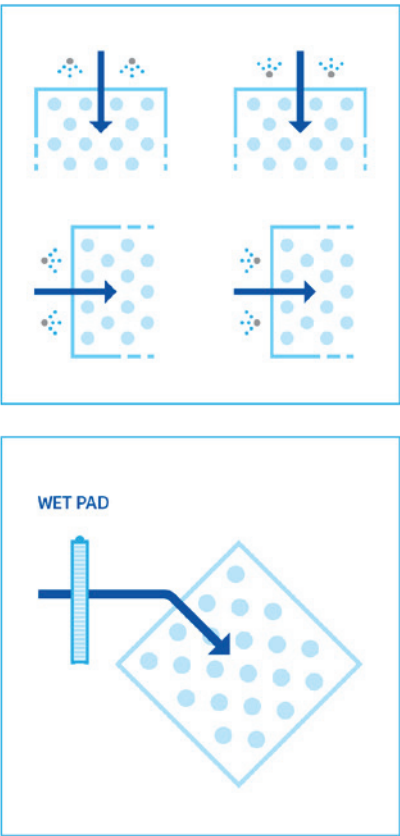


Data Centres are quickly increasing in number and size, so much so that in one year the total electricity used for cooling the Data Centre Equipment can reach approximately 0.5% of the worlds electricity consumption.

Many research programs are focused on the reduction of the primary electrical energy used for Data Centre cooling, for example, research into indirect and adiabatic evaporative cooling, which is the most promising cooling technology.

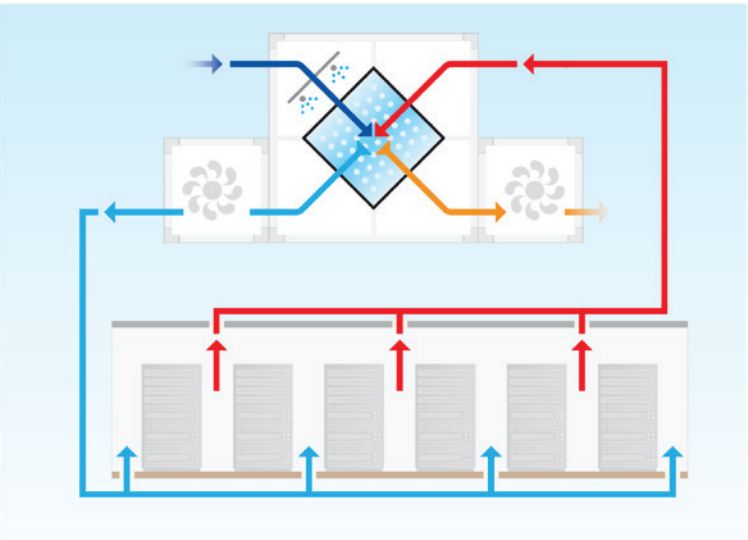
In fact, nowadays, the indoor Data Centre temperature has increased, which also increases the free cooling working hours.

B· Blue is the heart of this system. The air-to-air plate heat exchanger is designed for indirect and adiabatic evaporative cooling applications in the Data Centre environment.



B·Blue Plate Heat Exchanger The Solution

Water	Cost	Maintenance	Heat exchanger
Mains	Cheapest	It is better to use bigger nozzle and to check and clean very often the rack.	Aluminum plate could be used. Side plate with epoxy protection.
Softened	Average price	With softened water some dust can settle on the plate. Maintenance should be made often.	Protection on the aluminum plate it is needed as epoxy protection on the side plate.
Deionized	Higher price. Could be 5 times higher than the mains water	Lowest maintenance	Deionized water is acid. Aluminum protection it is needed to avoid the fretting.



In this application the system is arranged in recirculation mode: the primary air is extracted from the Data Centre, cooled down through the plate heat exchanger in adiabatic mode and finally it is supplied back to the facility.

In the adiabatic cooling approach, the outside air could be cooled down, when needed, through the traditional wet pad installed upstream of the recuperator. Alternatively by means of spraying water directly to the surface of the heat exchanger with its different configurations.

Technical characteristics:	Main Options:
Crossflow, wide range of sizes	AC > Coated Aluminium
More than 70.000 m³/h (41000 CFM)	TV > Coated Casing
More than 73% efficiency	SC > Super Tightness
Low pressure drop	
With or without by-pass and damper	
Minimal maintenance	

Warranty
5 Years

Operating Theatre Air Handling Units



HC-HVAC Operating Theatre Air Handling Units are designed to ensure that contamination of the air with micro-organisms is reduced to acceptable levels.

Airflow and air filtration play a vital role in the effective and efficient prevention of infections caused by airborne pathogens.

Improved Indoor Air Quality (IAC) within the health care environment assists patients to recover quickly and staff to display optimum performance.

For hygienic reasons one-directional airflow is used as a control mechanism in specific rooms; from sterile areas with minimum germ count to less sterile areas where the requirements are less stringent.

Filtration and Air Flow Requirements

Theatre Description	Primary Pleated Efficiency	Secondary Pocket/Bag or Box Efficiency	Tertiary HEPA High Volume Efficiency	Laminar Flow	Particle Count Class	Minimum Fresh air Changes Per Hour	Minimum Total air Changes Per Hour
	20%	95%	99.97 - 99.9999%		ISO 14644-1		
Casualty/ Minor Stitch	X	X			8	5	25
Maternity/ Caesarean	X	X			8	5	25
General Surgery	X	X			7	5	25
Gynaecology	X	X			7	5	25
Ophthalmology	X	X			7	5	25
Urology	X	X			7	5	25
Endoscopy	X	X			7	5	25
Plastic Surgery	X	X	X		6	5	25
Bone Surgery/ Orthopaedic	X	X	X	X	5	5	25
Heart Surgery	X	X	X	X	5	5	25
Vascular	X	X	X	X	5	5	25
Neuro Surgery	X	X	X	X	5	5	25
Transplants	X	X	X	X	5	5	25

www.gics.org.za

Pharmaceutical Air Handling Units



HC-HVAC Cleanroom and Pharmaceutical Air Handling Units are designed to ensure that temperature, humidity and pressurization within controlled environments are maintained to the appropriate design levels whilst meeting the required ISO 14644-1 Cleanroom Standards.

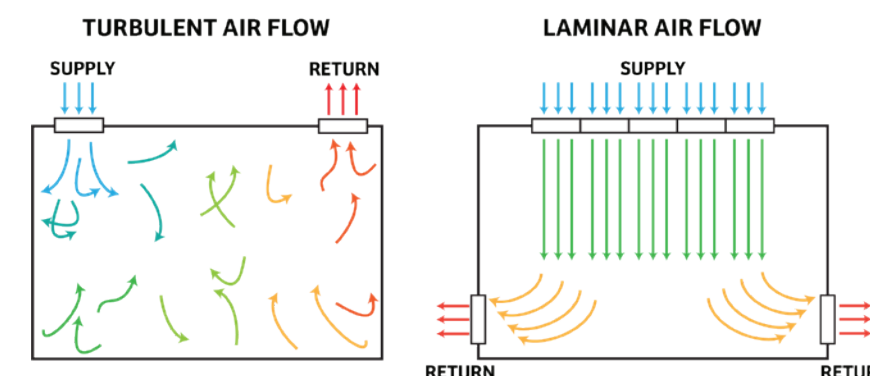
Air change rate, pressurization, temperature control and humidity control are all critical factors for Cleanroom and Bio-pharmaceutical applications.

Unidirectional flow is more effective in continuously sweeping particles from the air due to the piston effect created by the uniform air velocity.

A pressure differential of 12-14 Pa is maintained between the clean and adjacent unclean areas. A positive pressure hierarchy of cleanliness levels, this coupled with the use of airlocks ensures standards are met.

Air Lock

An intermediate room between adjacent areas with different cleanliness levels to prevent airborne cross contamination.



ISO 14644-1 Cleanroom Standards

Class	Maximum Particles/m ³						FED STD 209E Equivalent
	≥0.1 µm	≥0.1 µm	≥0.1 µm	≥0.1 µm	≥0.1 µm	≥0.1 µm	
ISO 1	10	2.37	1.02	0.35	0.083	0.0029	
ISO 2	100	23.7	10.2	3.5	0.83	0.029	
ISO 3	1 000	237	102	35	8.3	0.29	Class 1
ISO 4	10 000	2 370	1 020	352	83	2.9	Class 10
ISO 5	100 000	23 700	10 200	3 520	832	29	Class 100
ISO 6	1.0 x 10 ⁶	237 000	102 000	35 200	8 320	293	Class 1 000
ISO 7	1.0 x 10 ⁷	2.37 x 10 ⁶	1 020 000	352 000	83 200	2 930	Class 10 000
ISO 8	1.0 x 10 ⁸	2.37 x 10 ⁷	1.02 x 10 ⁷	3 520 000	832 000	29 300	Class 100 000
ISO 9	1.0 x 10 ⁹	2.37 x 10 ⁸	1.02 x 10 ⁸	35 200 000	8 320 000	293 000	Room Air

www.biosafety-cabinets.com/2016/01/what-you-need-to-know-about-ulpa-filters.html

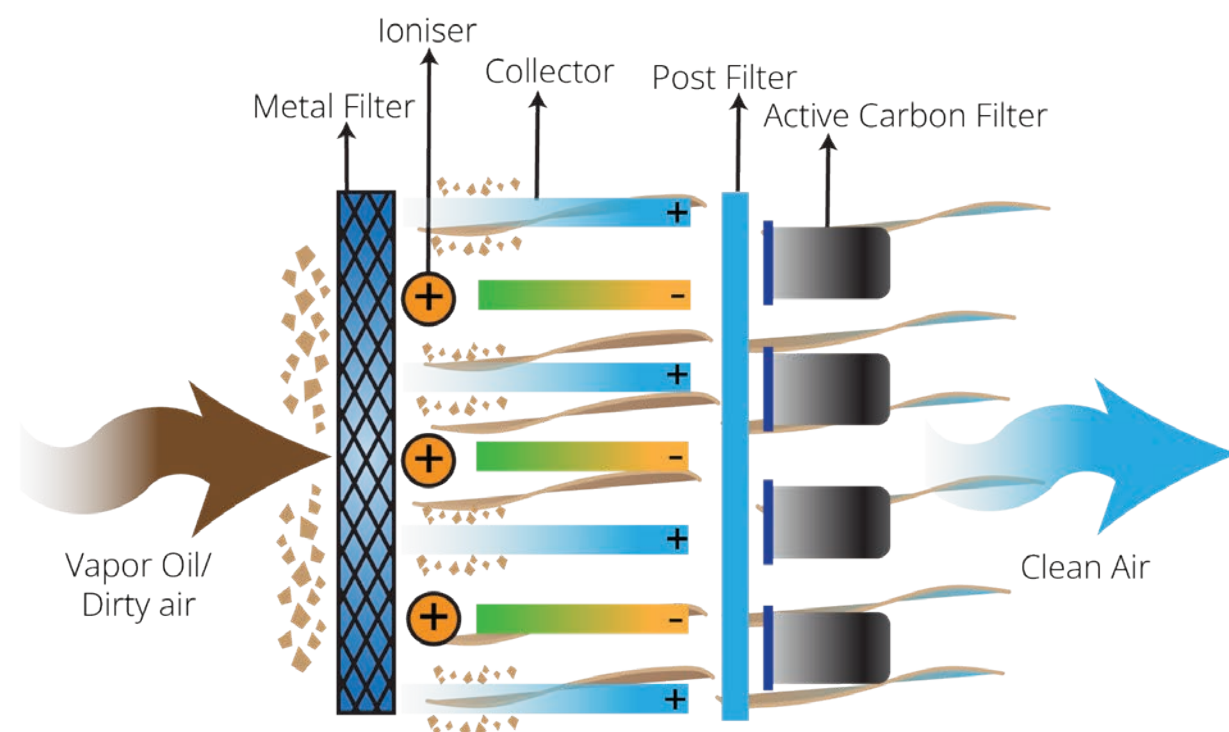
Ecology Air Handling Unit



Activated Carbon Filter

HC-HVAC Ecology units are designed for commercial kitchen exhaust systems to control the environmental emission generated from kitchen extract systems.

The Air Handling Unit consists of Mechanical Filters, Electrostatic Precipitators and Activated Carbon Filters. This allows the unit to efficiently remove the smoke, grease particles and bad odour from the kitchen before the air is exhausted to the environment.



Ecology AHU Filtration Process



Dedicated Outside Air Systems (DOAS)

Dedicated Outside Air Systems have allowed the HVAC industry to address the challenges facing the built environment.

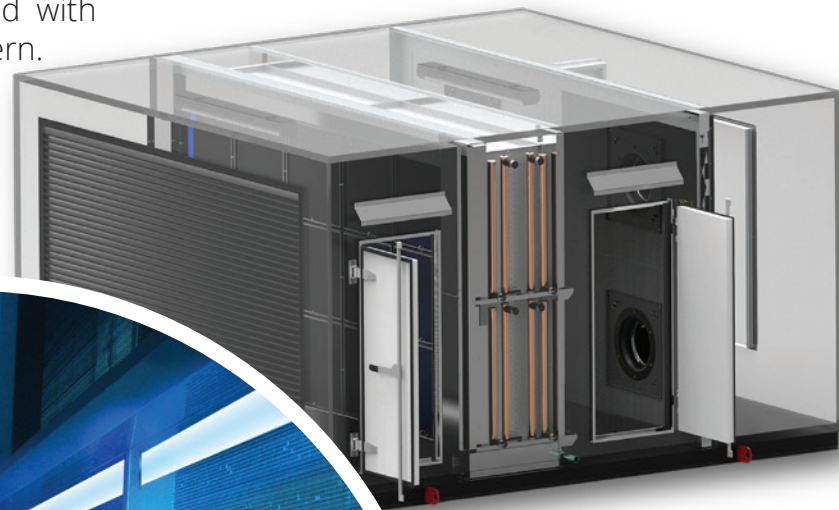
Industry leaders have become very familiar with the following terminologies:

- Indoor Air Quality (IAQ)
- Indoor Environmental Quality (IEQ)
- Sick Building Syndrome (SBS)
- Volatile Organic Compounds (VOC)
- Total Volatile Organic Compounds (TVOC)
- Carbon dioxide (CO₂)
- Air changes per hour (ACPH)
- Minimum Ventilation Rates (MVR)

The importance of Indoor Air Quality cannot be overstated, however the cost associated with providing the ideal IAQ has been a concern.

This has resulted in legislation detailing the minimum ventilation rates for different occupancy classifications. With the new VRV/F Hybrid DOAS Rooftop Units, we can offer a solution to Indoor Air Quality concerns. In certain cases air change rates should be prioritised in lieu of merely complying with minimum ventilation rates.

A Dedicated Outside Air System conditions all the outside air introduced into the building and delivers it to each occupied space, either directly or in conjunction with local or central HVAC units serving those same spaces.



A DOAS system can be designed to provide:

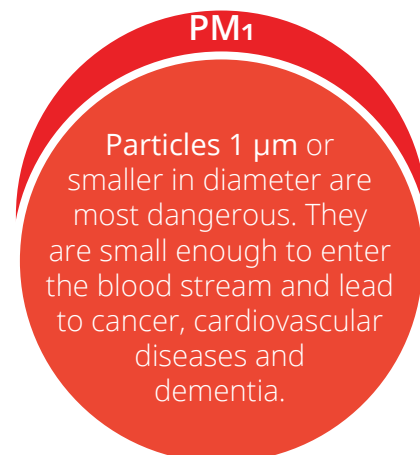
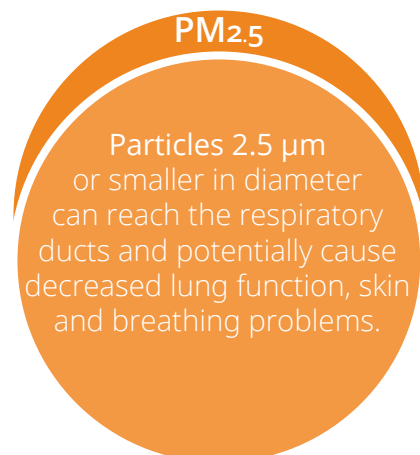
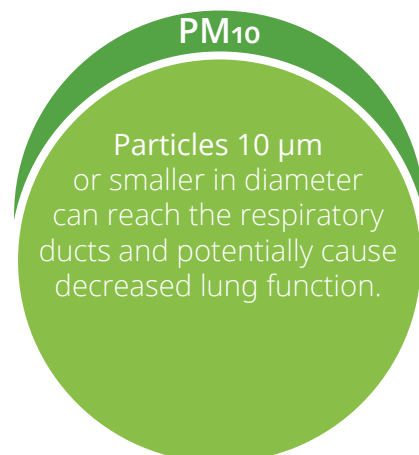
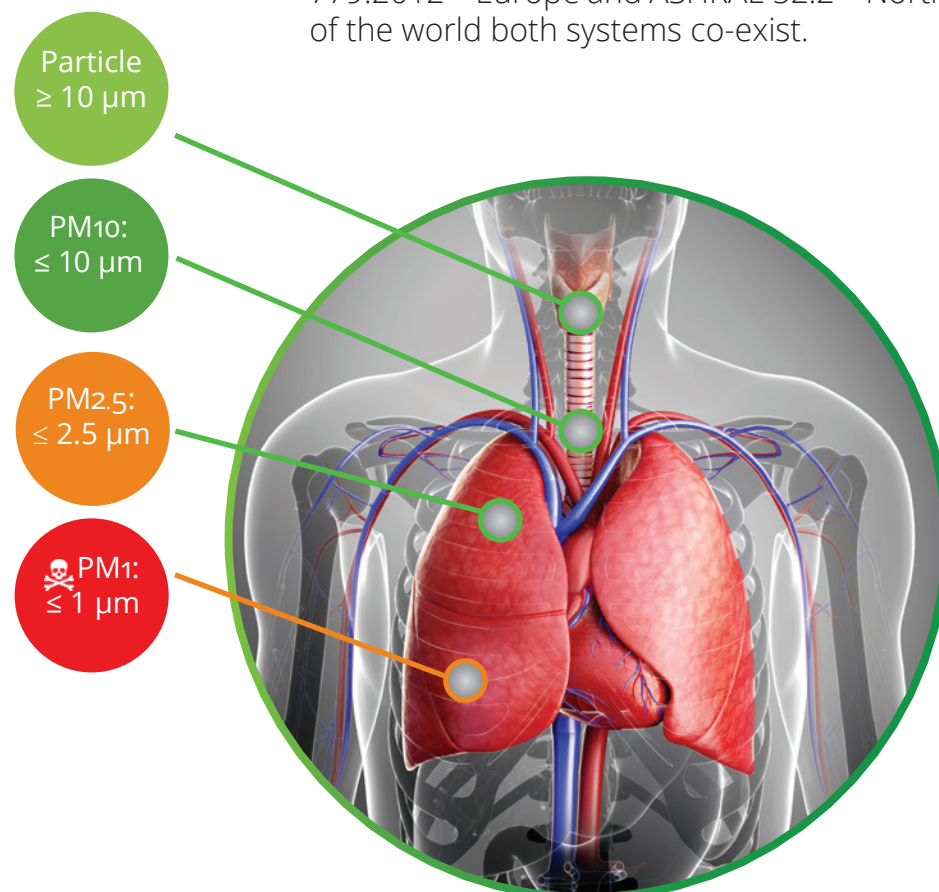
- High quality and durability in terms of corrosion resistance material etc.
- Appropriate filtration
- Humidity Control
- Heat Recovery Wheels
- Air-to-Air Heat Exchangers
- Heating and Cooling to maintain occupant thermal comfort
- Positive Building Pressurisation
- Enhanced Serviceability
- Integrated controls to reduce energy costs



Filter Testing Classification

The adoption of the new ISO 16890 standards makes it possible for a harmonised global method of characterising the efficiency of filters.

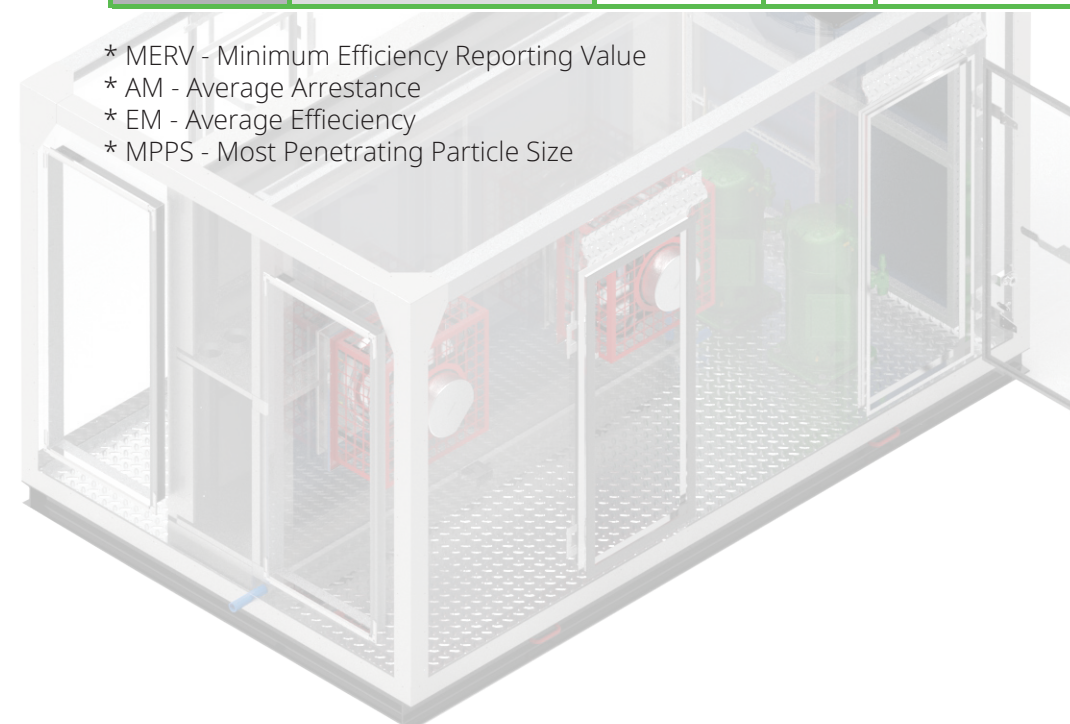
The two most popular systems that have been used of late are EN 779:2012 – Europe and ASHRAE 52.2 – North America. In many parts of the world both systems co-exist.



Air Filters and Efficiency

Classification	Arrestance or Dust Spot Efficiency	US ASHRAE 52.2	EN779 Class		Typical Controlled Contaminant
PRE Filter (G Class)	AFI < 65%	MERV 1	G 1	Am < 65%	Particle bigger than 10.0µm Pollen Spanish moss Dust mites Sanding dust Spray paint dust Textile fibers
	AFI 65-70%	MERV 2	G 2	65% ≤ Am < 80%	
	AFI 70-75%	MERV 3			
	AFI 75-80%	MERV 4			
	AFI 80-85%	MERV 5	G 3	80% ≤ Am < 90%	Particle within 3.0µm - 10.0µm Mold Spores Hairspray Ceme dust Snuff Powdered milk
	AFI 85-90%	MERV 6			
	NBS 30-35%	MERV 7	G 4	90% ≤ Am	
	NBS 25-30%	MERV 8			
MEDIUM Filter (F Class)	NBS 40-45%	MERV 9	F 5	40% ≤ Em < 60%	Particle within 1.0µm - 3.0µm Lead dust Milled flour Coal du Nebulizer drop Welding fume
	NBS 50-55%	MERV 10			
	NBS 60-65%	MERV 11	F 6	60% ≤ Em < 80%	
	NBS 70-75%	MERV 12			
	NBS 80-85%	MERV 13	F 7	80% ≤ Em < 90%	Particle within 0.3µm - 1.0µm All bacteria Cooking oil Smoke Copier toner Face powder Pair pigments
	NBS 90-95%	MERV 14	F 8	90% ≤ Em < 95%	
	NBS > 95%	MERV 15	F 9	95% ≤ Em	
HEPA Filter (H Class)	≥ 95% at 0.3µm	MERV 16	H10	≥ 85% at MPPS	Particle 0.3µm - 1.0µm
	≥ 99.97% at 0.3µm	MERV 17	H11	≥ 99.97% at MPPS	Particle 0.12µm - 0.5µm Virus (unattached) Carbon dus Sea salt All combustion smoke Radon progeny
	≥ 99.99% at 0.3µm	MERV 18	H12	≥ 99.9% at MPPS	
	≥ 99.995% at 0.3µm	MERV 19	H13	≥ 99.99% at MPPS	
	≥ 99.999% at 0.3µm	MERV 20	H14	≥ 99.999% at MPPS	

- * MERV - Minimum Efficiency Reporting Value
- * AM - Average Arrestance
- * EM - Average Efficiency
- * MPPS - Most Penetrating Particle Size



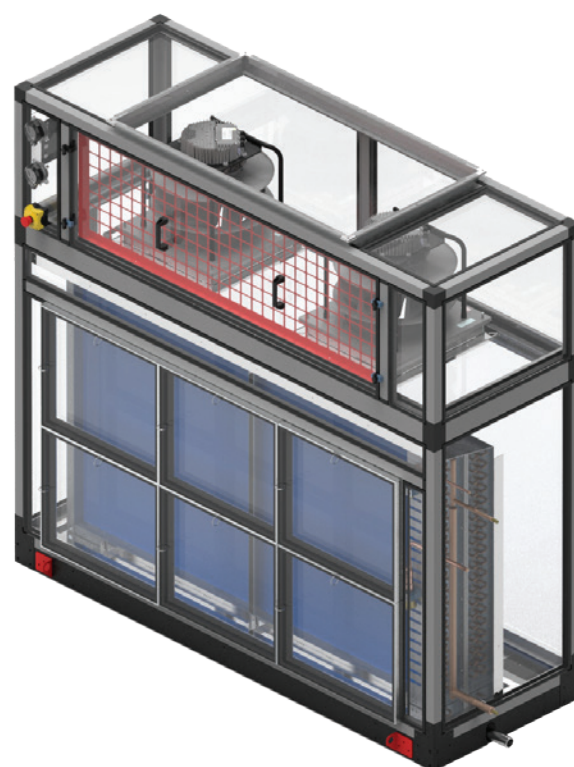


<https://businesstech.co.za/news/business/248593/a-look-at-sandtons-new-r3-billion-golden-tower/>



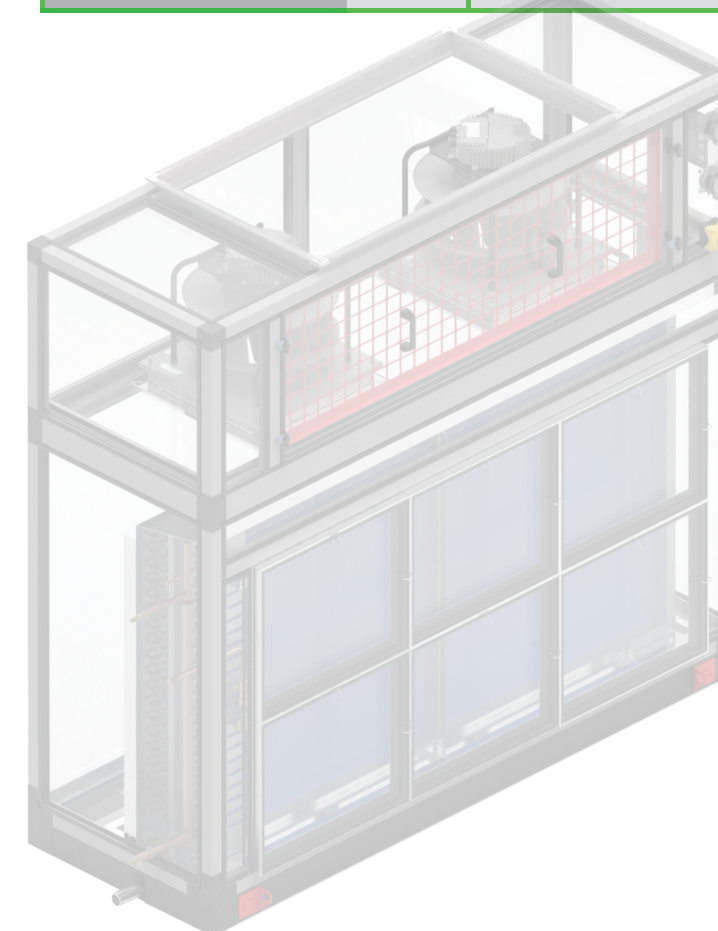
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Vertical Unit Range with EC Plug Fans

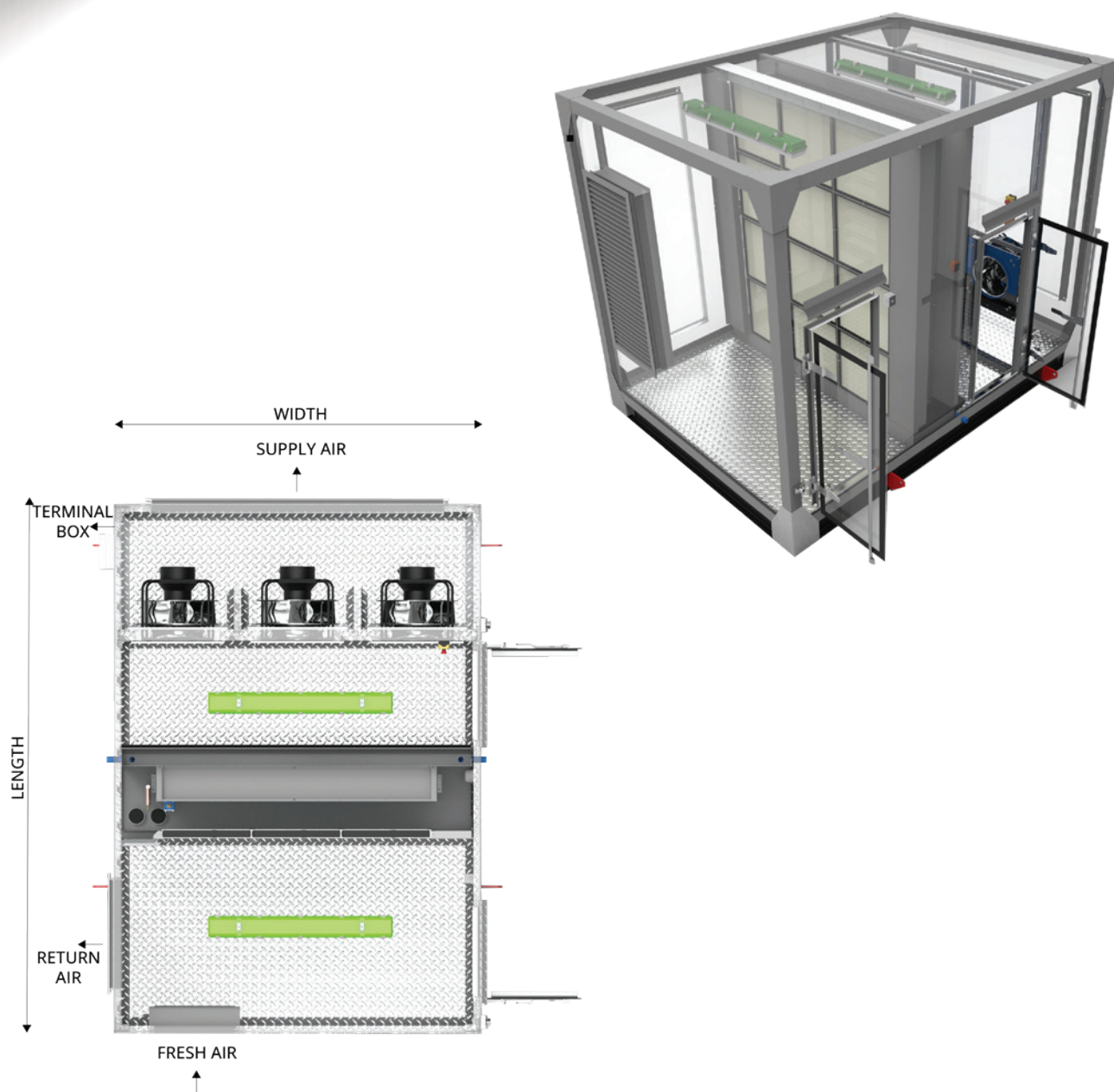


Model N°	Supply Air Quantity (m ³ /s)	Unit	Unit	Unit	Approximate	EC Plug	Return Air Spigot	Drain
		Width (mm)	Depth (mm)	Height (mm)	Rigging Weight (kg)	Motor Size (kW Per Fan)	WxH (mm)	Size (2 off)
HC-AHU-V-1...vv	1	1450	900	1350	310	1 x 2.5	425 x 400	40
HC-AHU-V-2...vv	2	1650	1000	1900	380	1 x 2.5	660 x 500	40
HC-AHU-V-3...vv	3	1650	1000	1900	360	1 x 3.8	715 x 700	40
HC-AHU-V-4...vv	4	2250	1000	1900	490	2 x 3.8	960 x 700	40
HC-AHU-V-5...vv	5	2250	1000	2100	535	2 x 3.8	1185 x 700	40
HC-AHU-V-6...vv	6	2880	1000	2100	570	2 x 3.8	1430 x 700	40
HC-AHU-V-7...vv	7	2880	1000	2100	685	3 x 3.8	1670 x 700	40
HC-AHU-V-8...vv	8	3660	1000	2280	1000	3 x 3.8	1900 x 700	40
HC-AHU-V-9...vv	9	3660	1000	2280	1000	3 x 3.8	2145 x 700	40

(Range 1m³/s - 9m³/s)



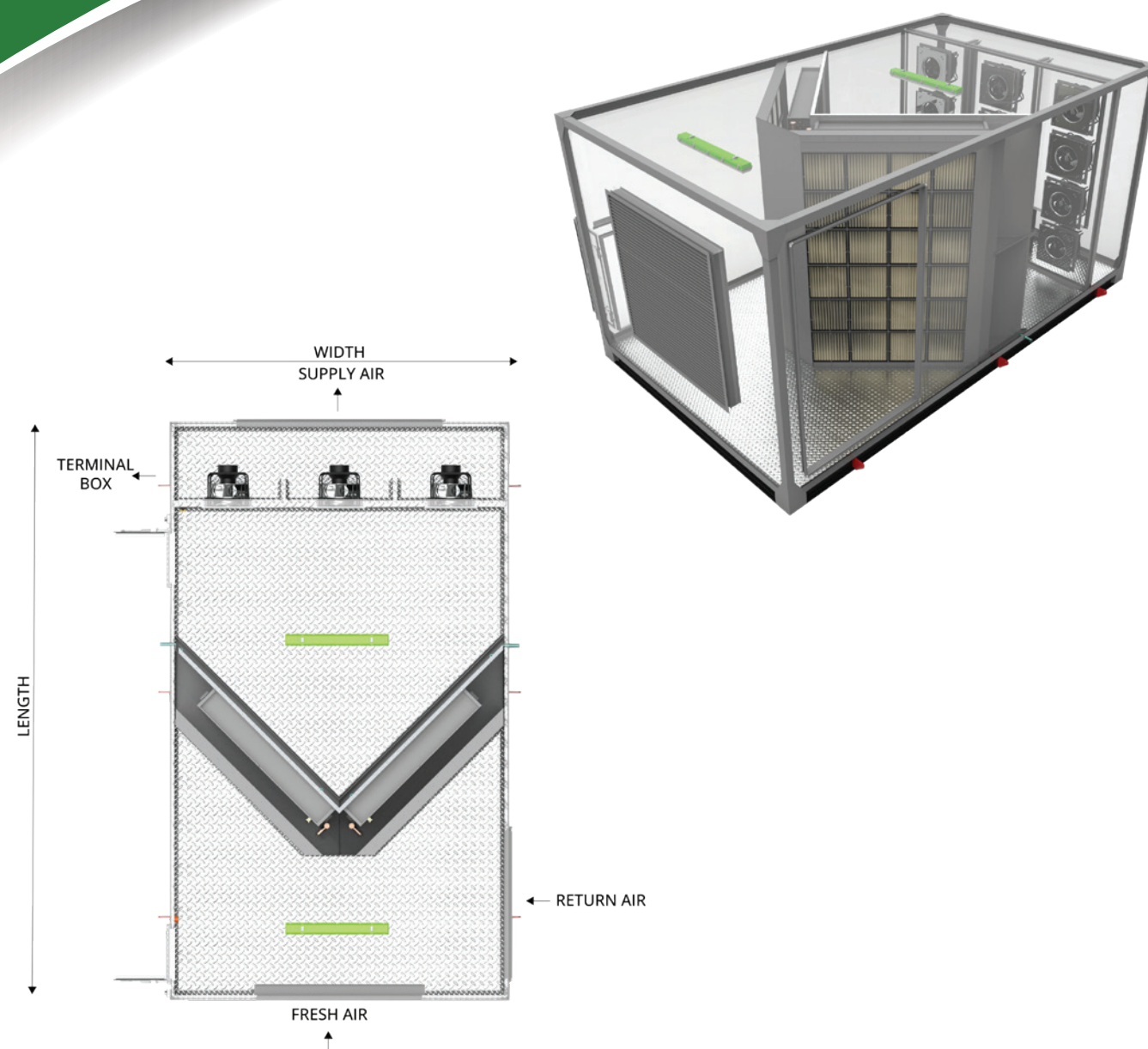
Horizontal Unit with EC Plug Fans



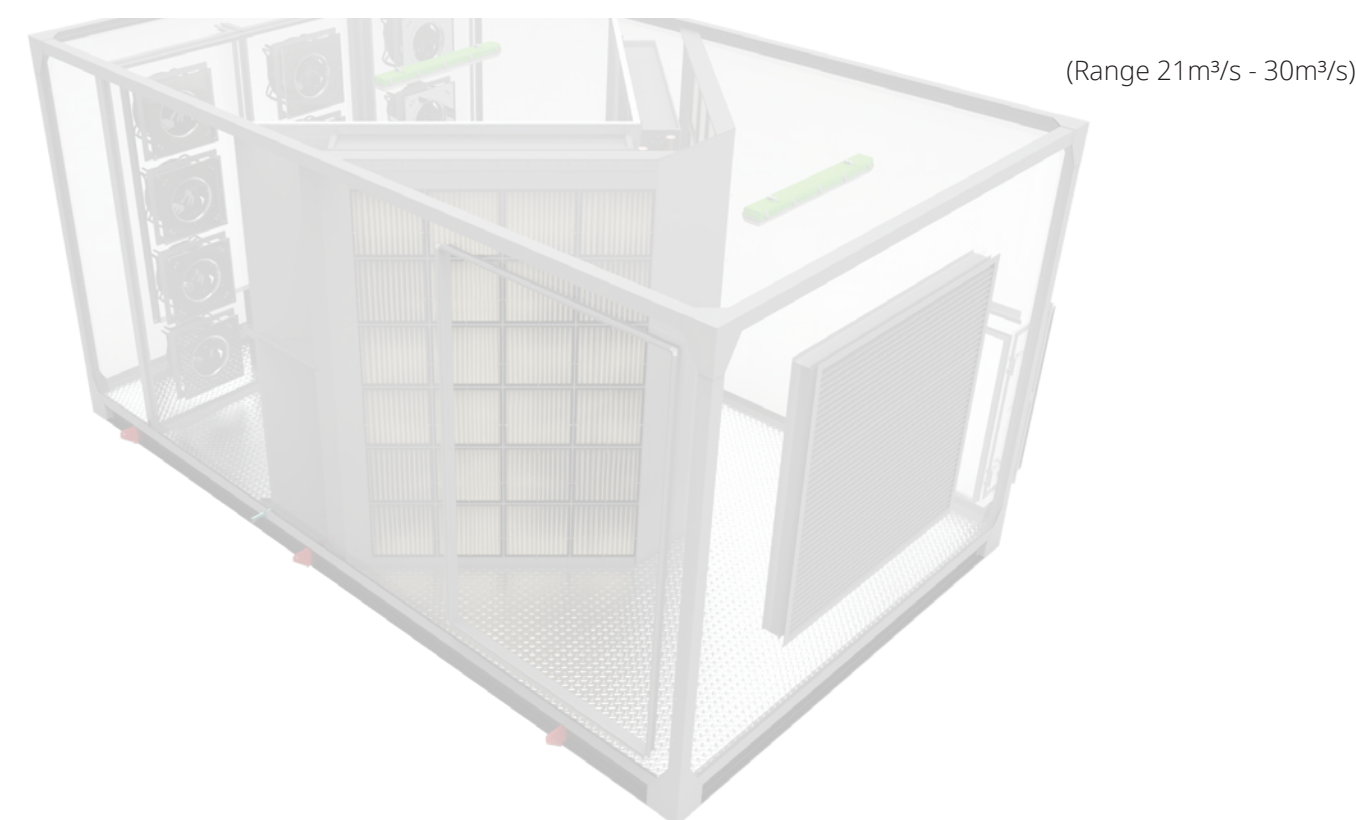
Model N°	Supply Air Quantity (m3/s)	Unit	Unit	Unit	Approximate	EC Plug	Supply Air Spigot	Return Air Spigot	Drain
		Length (mm)	Width (mm)	Height (mm)	Rigging Weight (kg)	Motor Size (kW Per Fan)	WxH (mm)	WxH (mm)	Size (2 off)
HC-AHU-H-1...vv	1	3400	1400	1200	750	1 x 2.5	400 x 450	400 x 450	40
HC-AHU-H-2...vv	2	3400	1600	1600	1000	1 x 2.5	650 x 550	650 x 550	40
HC-AHU-H-3...vv	3	3500	1600	1600	1000	1 x 3.8	745 x 700	745 x 700	40
HC-AHU-H-4...vv	4	3550	1900	1800	1150	1 x 4.4	920 x 750	920 x 750	40
HC-AHU-H-5...vv	5	3550	2200	1800	1250	2 x 2.5	925 x 930	925 x 930	40
HC-AHU-H-6...vv	6	3550	2200	2400	1350	2 x 3.8	1000 x 1015	1035 x 1050	40
HC-AHU-H-7...vv	7	3600	2200	2400	1400	2 x 4.4	1050 x 1150	1050 x 1150	40
HC-AHU-H-8...vv	8	3600	2200	2400	1550	2 x 4.4	1300 x 1075	1300 x 1075	40
HC-AHU-H-9...vv	9	3600	2600	2400	1750	3 x 3.8	1250 x 1250	1250 x 1250	40
HC-AHU-H-10...vv	10	3600	2800	2400	2400	3 x 4.4	1300 x 1350	1300 x 1350	40
HC-AHU-H-11...vv	11	3600	2800	2600	2100	3 x 4.4	1360 x 1400	1360 x 1400	40
HC-AHU-H-12...vv	12	3600	2800	2600	2500	3 x 4.4	1450 x 1440	1450 x 1440	40
HC-AHU-H-13...vv	13	3600	2800	3000	2300	4 x 4.4	1500 x 1455	1500 x 1535	40
HC-AHU-H-14...vv	14	3600	2800	3000	2350	4 x 4.4	1500 x 1600	1500 x 1600	40
HC-AHU-H-15...vv	15	3600	2900	3000	2400	4 x 4.4	1550 x 1630	1653 x 1600	40
HC-AHU-H-16...vv	16	3600	3400	3000	2600	4 x 4.4	1665 x 1660	1665 x 1660	40
HC-AHU-H-17...vv	17	3700	3400	3000	2700	5 x 4.4	1695 x 1700	1725 x 1735	40
HC-AHU-H-18...vv	18	3700	3400	3000	2750	5 x 4.4	1765 x 1760	1765 x 1760	40
HC-AHU-H-19...vv	19	4100	3400	3500	3900	5 x 4.4	1800 x 1800	1800 x 1800	40
HC-AHU-H-20...vv	20	4100	3400	3500	4000	5 x 4.4	1900 x 1800	1900 x 1800	40

(Range 1m³/s - 20m³/s)

Horizontal Unit with 'V' Shape Coils & EC Plug Fans

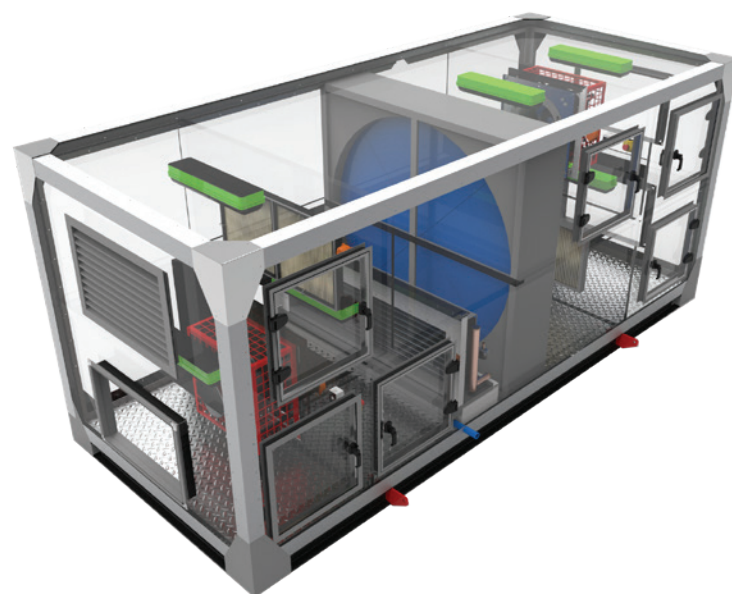


Model N°	Supply Air Quantity (m3/s)	Unit	Unit	Unit	Approximate	EC Plug	Supply Air	Return Air	Drain
		Length (mm)	Width (mm)	Height (mm)	Rigging Weight (kg)	Motor Size (kW Per Fan)	Spigot WxH (mm)	Spigot WxH (mm)	Size (2 off)
HC-AHU-H-21...vv	21	5225	3300	3900	4100	6 x 4.4	950x3350	950x3300	40
HC-AHU-H-22...vv	22	5225	3300	3900	4100	6 x 4.4	1000x3350	1000x3300	40
HC-AHU-H-23...vv	23	5825	3500	3900	4300	7 x 4.4	1000x3350	1000x3300	40
HC-AHU-H-24...vv	24	5825	3500	3900	4400	7 x 4.4	1000x3350	1000x3300	40
HC-AHU-H-25...vv	25	5825	3700	3900	4500	8 x 4.4	1150x3350	1150x3300	40
HC-AHU-H-26...vv	26	5825	3700	3900	4500	8 x 4.4	1200x3350	1200x3300	40
HC-AHU-H-27...vv	27	5825	3900	3900	4600	9 x 4.4	1200x3350	1200x3300	40
HC-AHU-H-28...vv	28	5825	3900	3900	4900	9 x 4.4	1250x3350	1300x3300	40
HC-AHU-H-29...vv	29	6390	4200	4000	5100	10 x 4.4	1250x3450	1300x3400	40
HC-AHU-H-30...vv	30	6390	4200	4100	5100	10 x 4.4	1270x3450	1300x3400	40



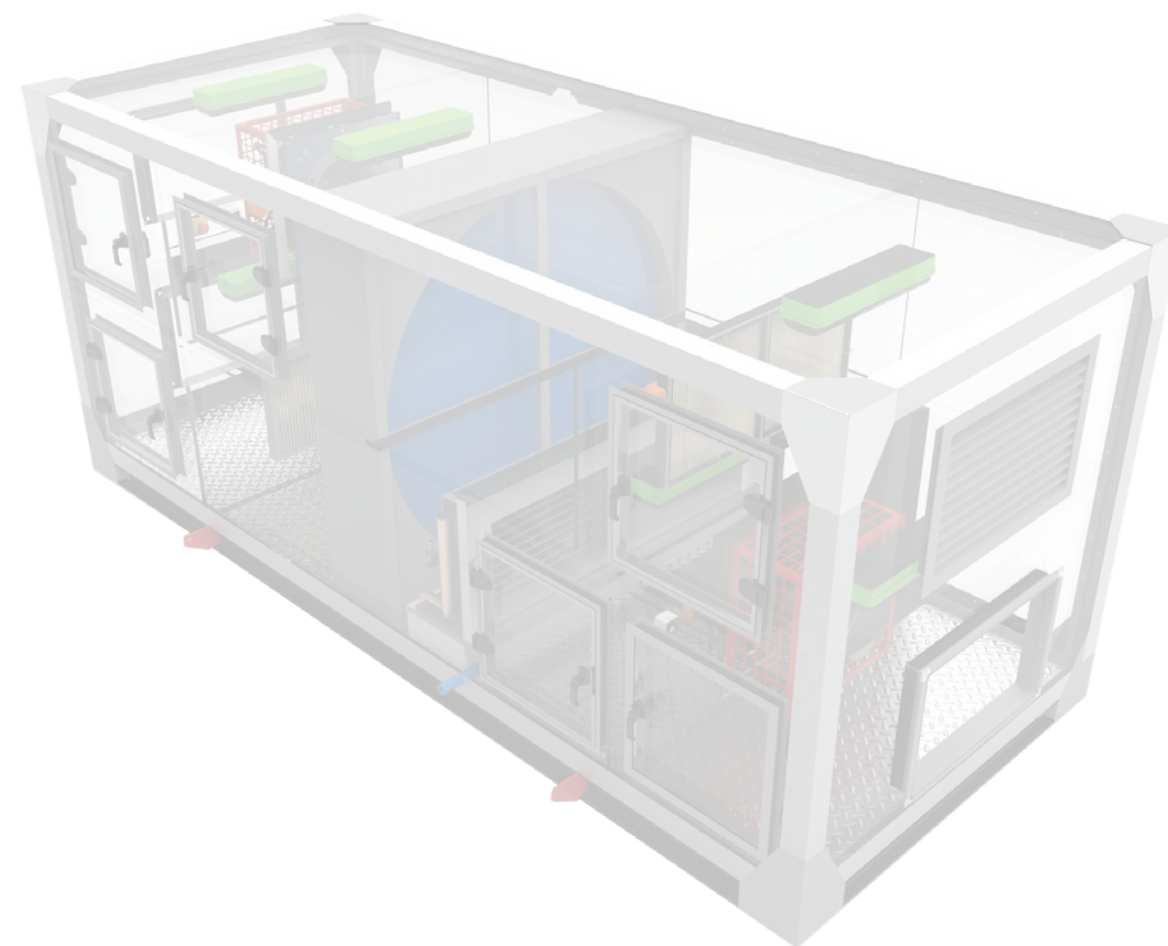
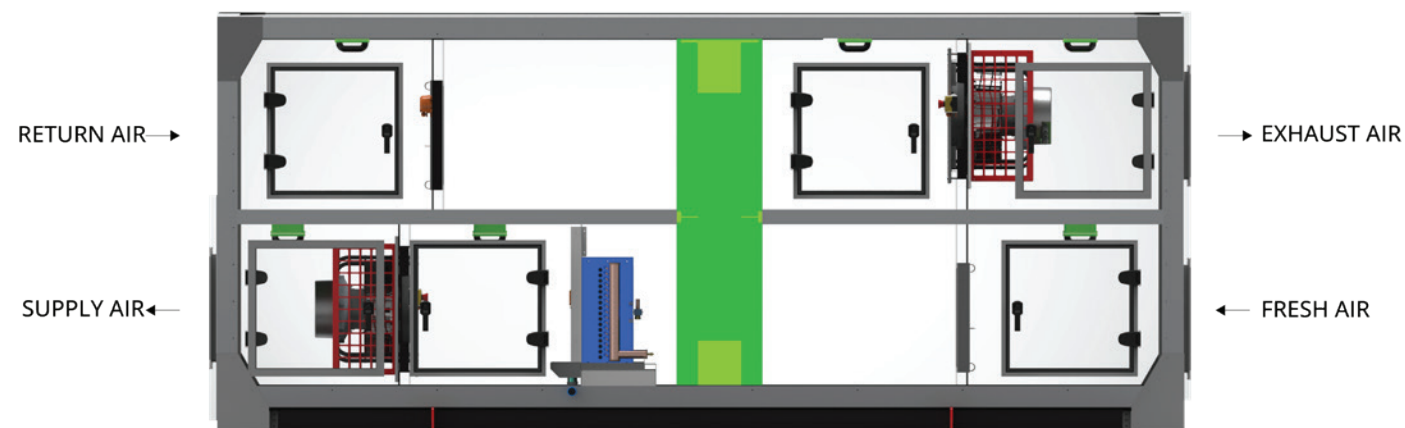
(Range 21m³/s - 30m³/s)

Heat Recovery Wheel with EC Plug Fans

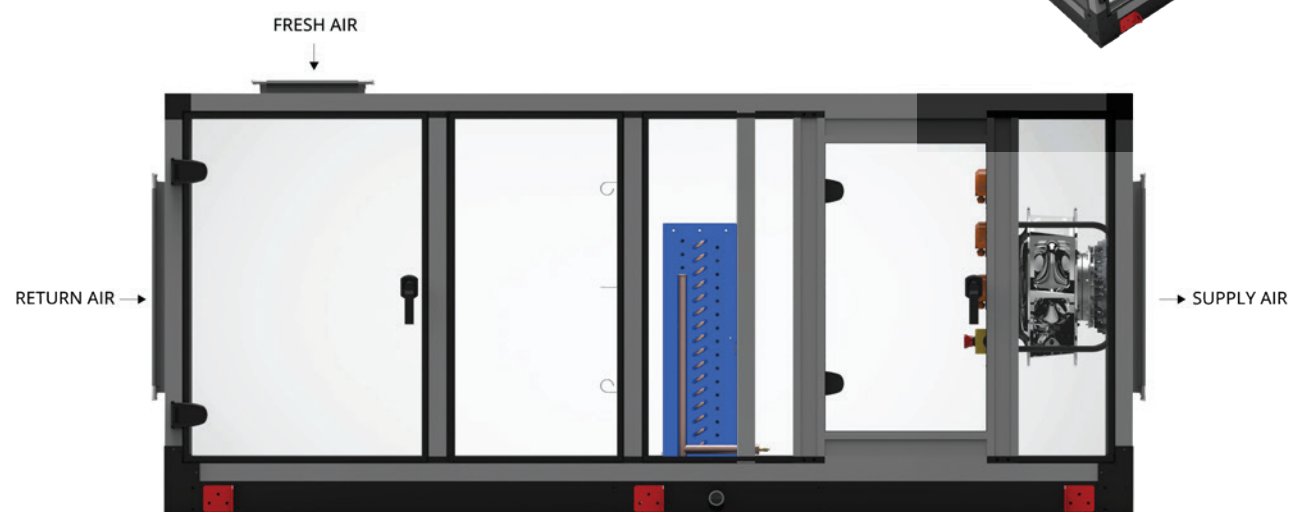


Model N°	Supply Air Quantity (m3/s)	Unit	Unit	Unit	Approximate	EC Plug	Supply Air Spigot	Return Air Spigot	Drain
		Length (mm)	Width (mm)	Height (mm)	Rigging Weight (kg)	Motor Size (kW Per Fan)	WxH (mm)	WxH (mm)	Size (2 off)
HC-AHU-HRW-1...vv	1	3495	1800	2000	1200	1 x 2.5	800x300	400x400	25
HC-AHU-HRW-2...vv	2	3495	2000	2700	1600	1 x 2.5	800x550	600x550	25
HC-AHU-HRW-3...vv	3	3495	2400	2700	2000	1 x 3.8	900x750	900x550	32
HC-AHU-HRW-4...vv	4	4060	2500	2700	2200	1 x 4.4	1600x600	1300x500	32
HC-AHU-HRW-5...vv	5	4060	2900	3100	2650	2 x 2.5	1600x700	1500x550	32
HC-AHU-HRW-6...vv	6	4660	3100	3700	3200	2 x 3.8	1650x800	2000x500	32
HC-AHU-HRW-7...vv	7	4660	3200	3700	3750	2 x 4.4	1650x950	2100x550	32

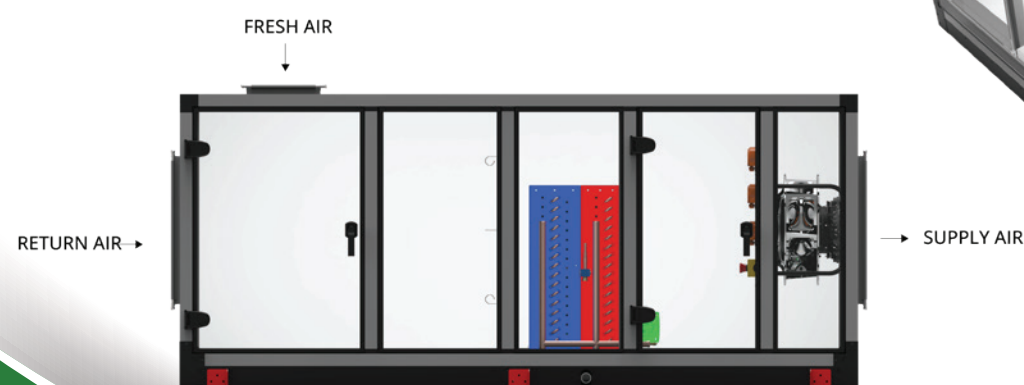
(Range 1m³/s - 7m³/s)



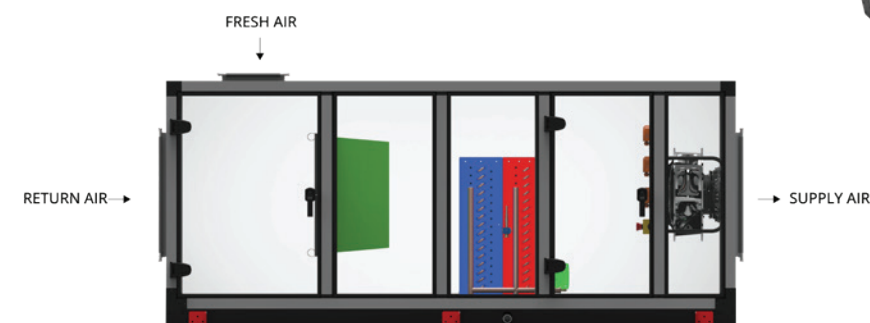
Other Air Handling Unit Designs



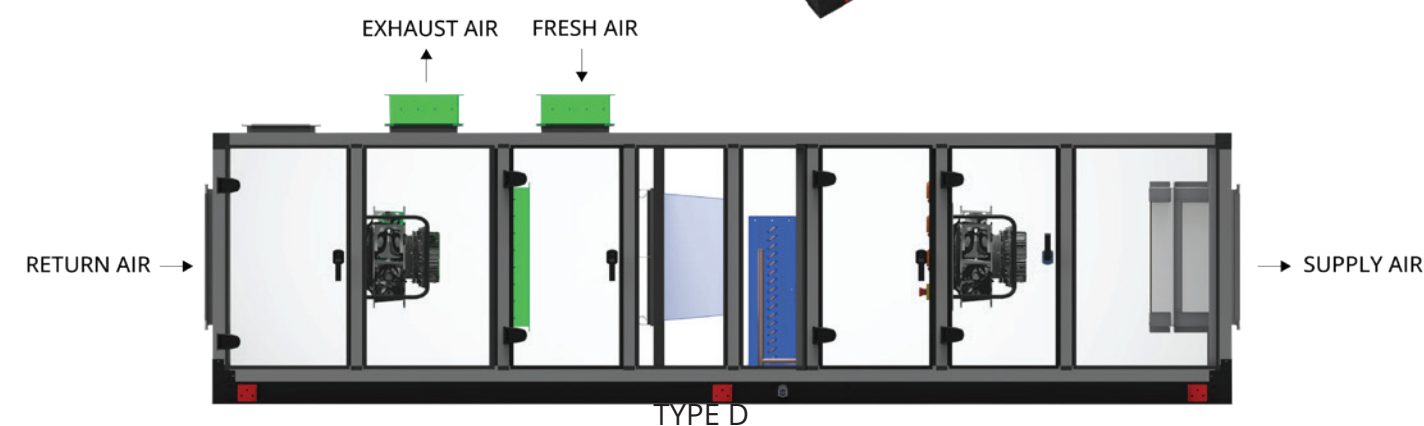
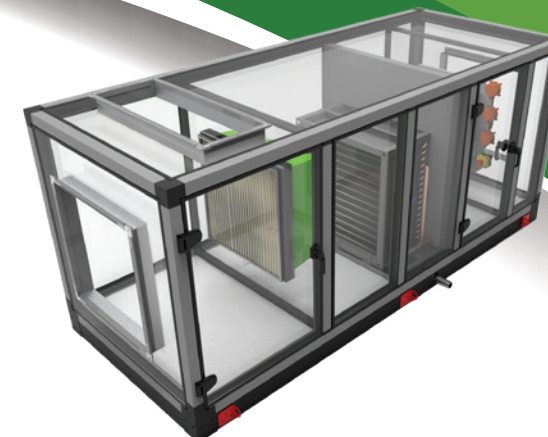
TYPE A



TYPE B

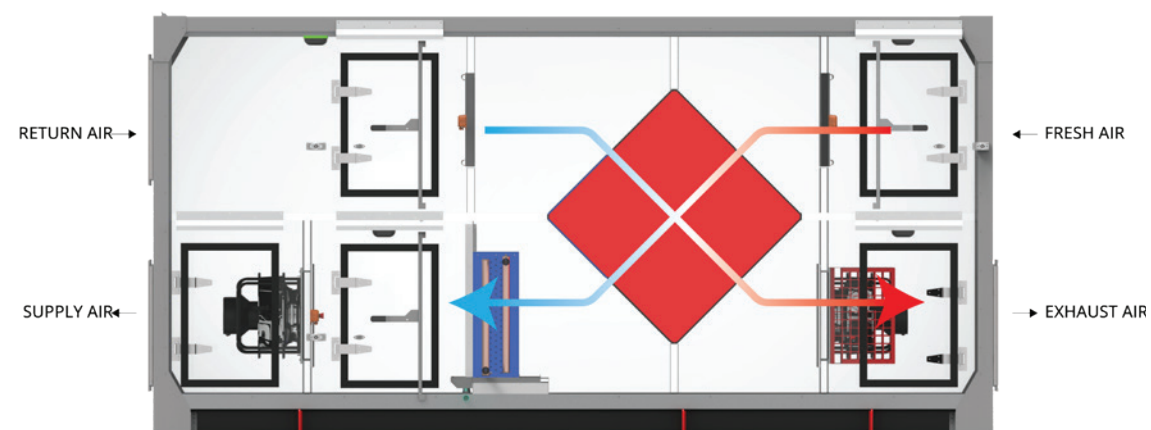
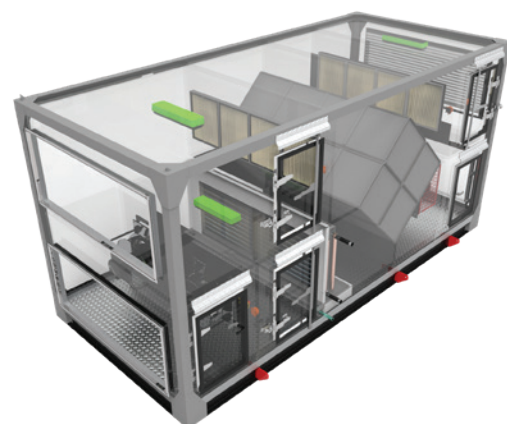


TYPE C

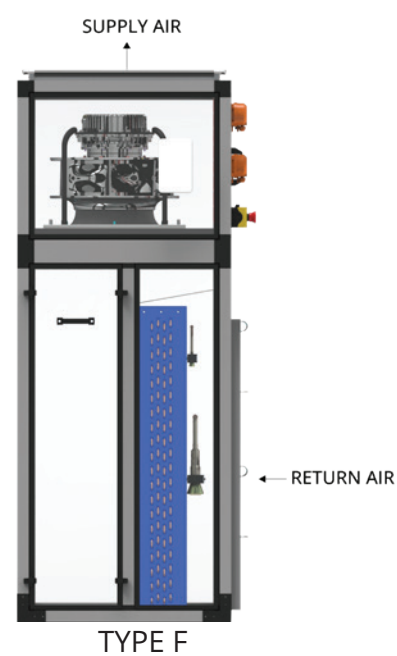


TYPE D

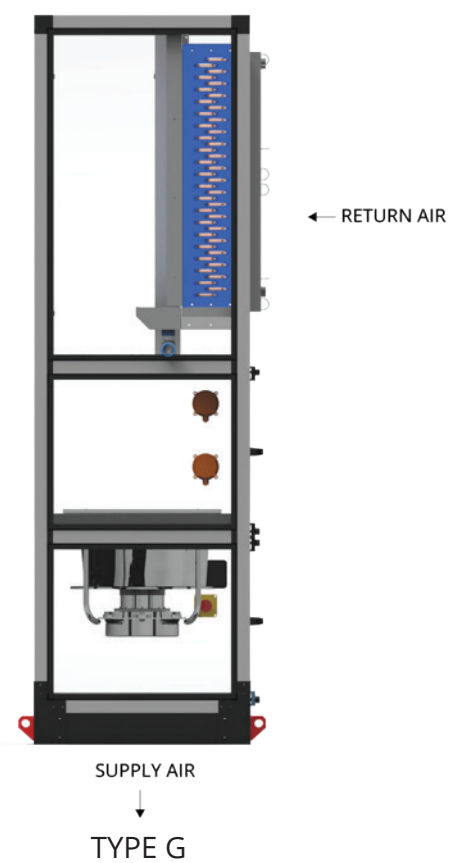




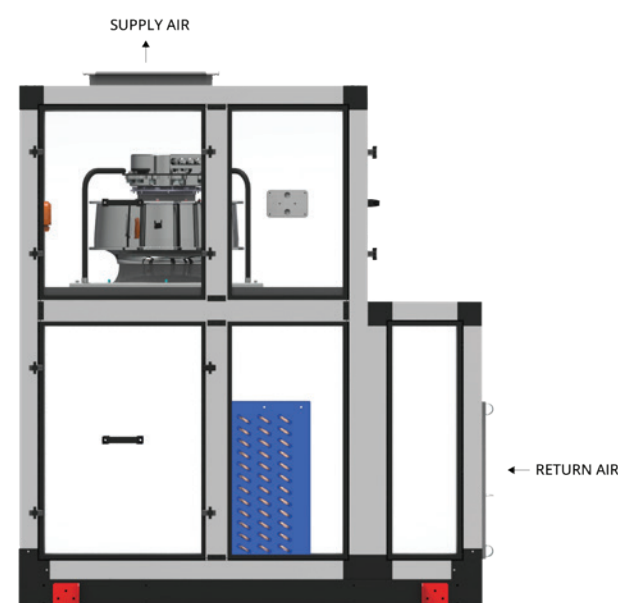
TYPE E



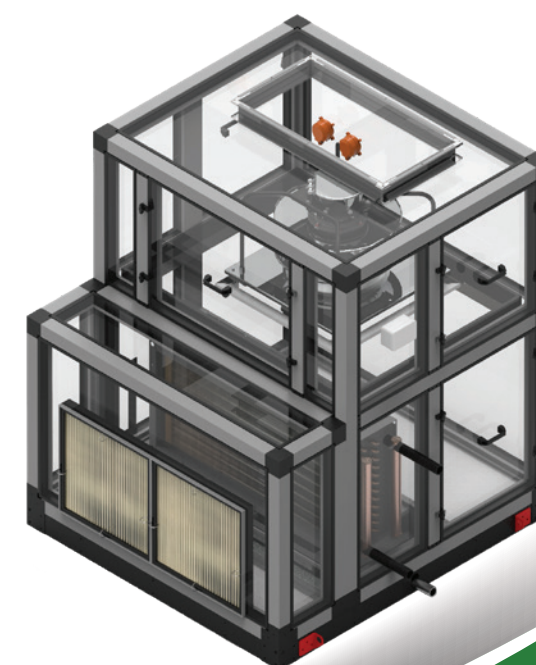
TYPE F



TYPE G

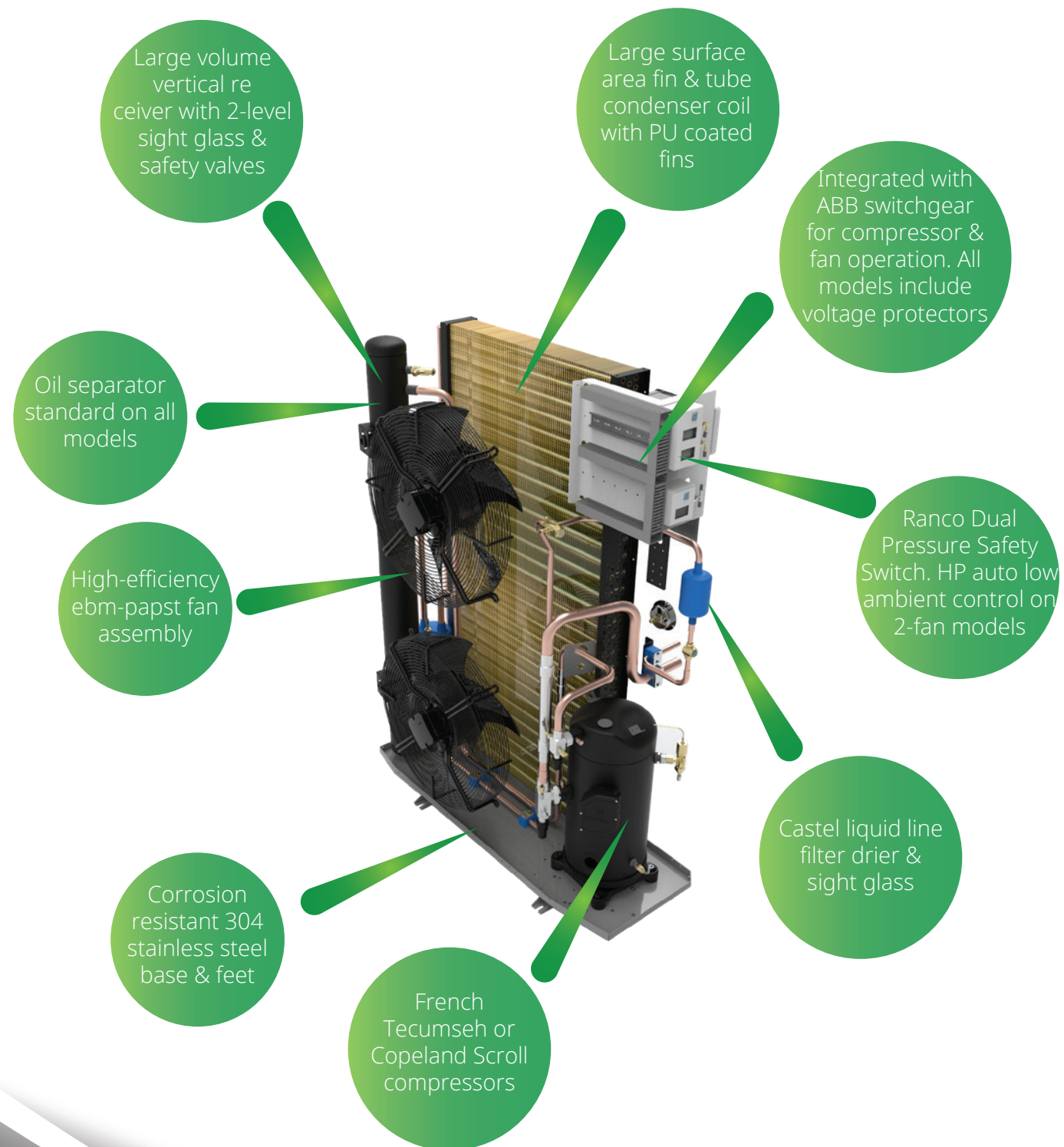


TYPE H



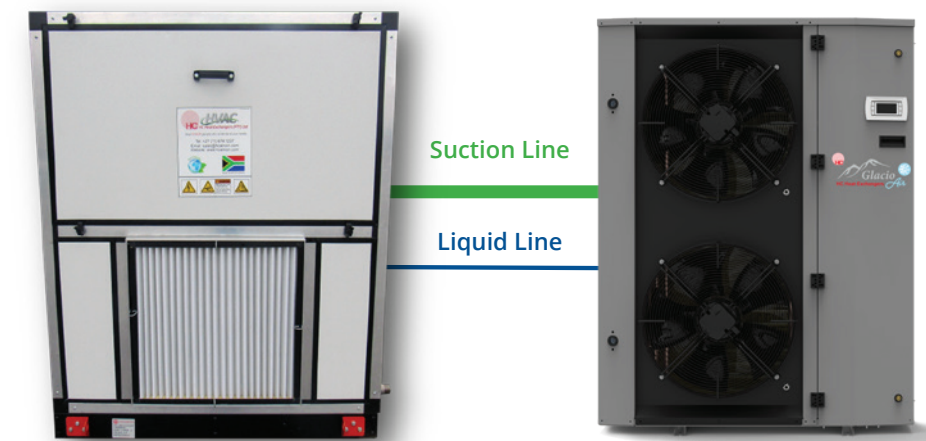


Cooling Only - Local Solution Simple & Robust



Special Features

- Increased liquid receiver volumes
- SANS347 compliant liquid receivers with pressure relief valves
- Externally visible twin liquid level sight glasses (for Monitoring & Charging)
- Adjustable Ranco dual pressure switches
- Integrated oil separator
- Suction & liquid service valves
- 100% lead TGIC & CR free, environmentally friendly light grey powder coating
- No PC boards or electronics on standard models
- Standard ebm-papst axial fan motors
- ABB electrical switch gear
- French Tecumseh and Copeland Scroll Compressors
- Liquid stop valve before the filter drier and moisture indicator for ease of service
- Aesthetic and robust galvanised sheet metal casing with light grey epoxy powder coated finish
- 304 stainless steel base plate & mounting



We offer you Variable Refrigerant flow Rooftop Packaged Units with high efficiency EC Plug Fan technology all on a common base. With no need for inter-connecting site piping or wiring, we save the contractor and the project valuable site time.

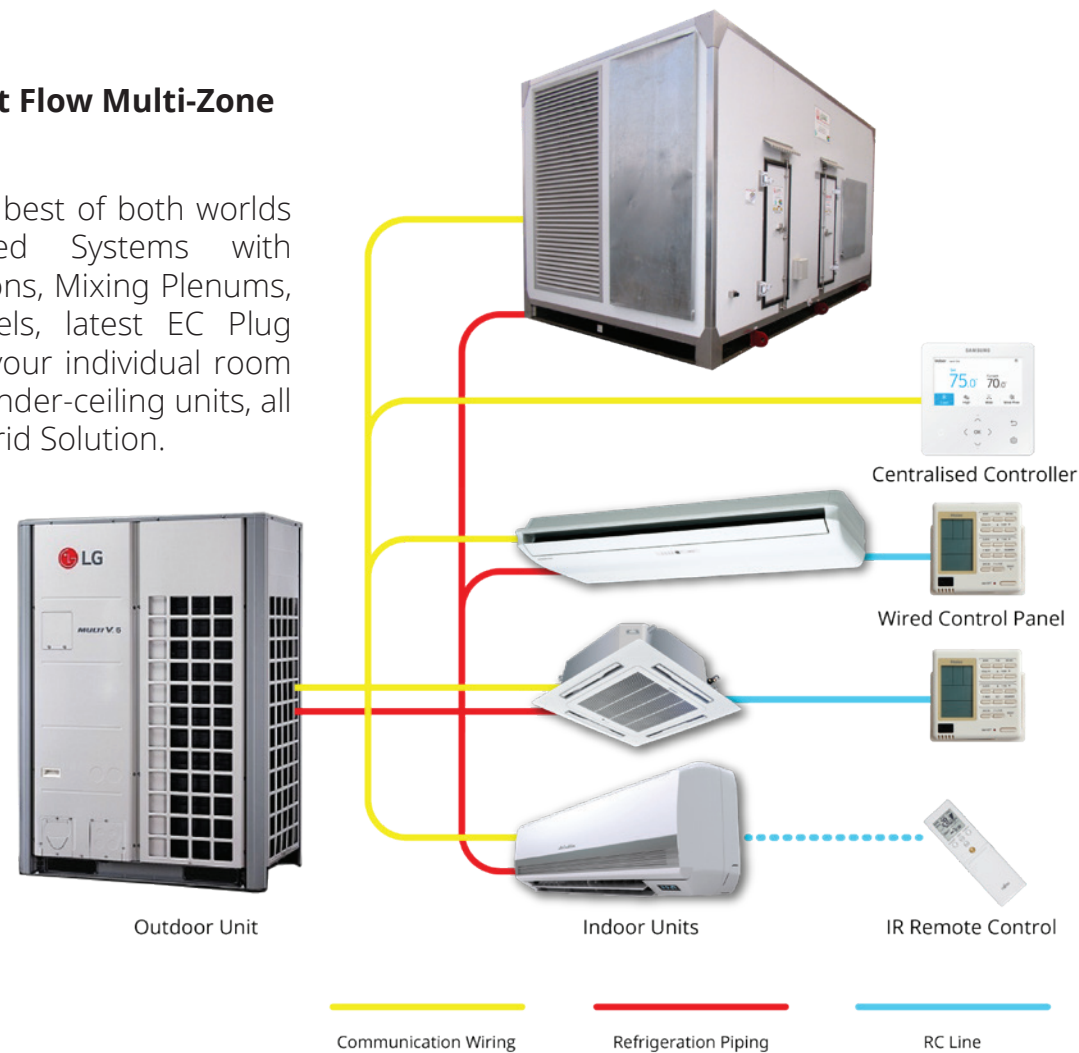
All workmanship is carried out in a controlled factory environment. Here you can be assured of better quality workmanship where critical processes such as brazing with nitrogen are continuously adhered to.



Innovation through Collaboration

Variable Refrigerant Flow Multi-Zone Hybrid Solution

These units offer the best of both worlds including, Centralised Systems with various filtration options, Mixing Plenums, Heat Recovery Wheels, latest EC Plug Fan technology and your individual room cassette, midwall or under-ceiling units, all on one HC-HVAC Hybrid Solution.



We are proud to offer you innovative solutions with all leading brands of VRV/F system providers



Rooftop Units



Rooftop Packaged Units (RTPU)

HC-HVAC offers the industry a wide range of energy efficient Rooftop Packaged Units with innovative technologies, designed for the use in commercial and industrial applications.

The units range from 10kW to 700kW of cooling, with varying supply air volumes (m³/s). All units have programmable controllers with all the safeties and control sequences forming an integral part of the Rooftop Unit control logic.

Our design team has a wealth of industry knowledge, which allows our designs to take into consideration the value propositions of all key stakeholders such as contractors, consultants, architects and the end users.

All our Rooftop Units are factory tested and quality checked before installation. Only final duct connections, power supply, sensor wiring and drain connections are required on site. This drastically reduces any installation costs and saves critical site programming time. Our Rooftop Units are designed for quick and easy installation by qualified artisans.

We pride ourselves in offering solutions to the industry challenges and hence our unit designs can incorporate various bespoke options.

We support a greener future and we are therefore mindful of the environmental and climate impact that our unit designs have in terms of refrigerant choices. We are constantly looking at the Ozone Depleting Potential (ODP) and the Global Warming Potential (GWP) of the refrigerants we use.

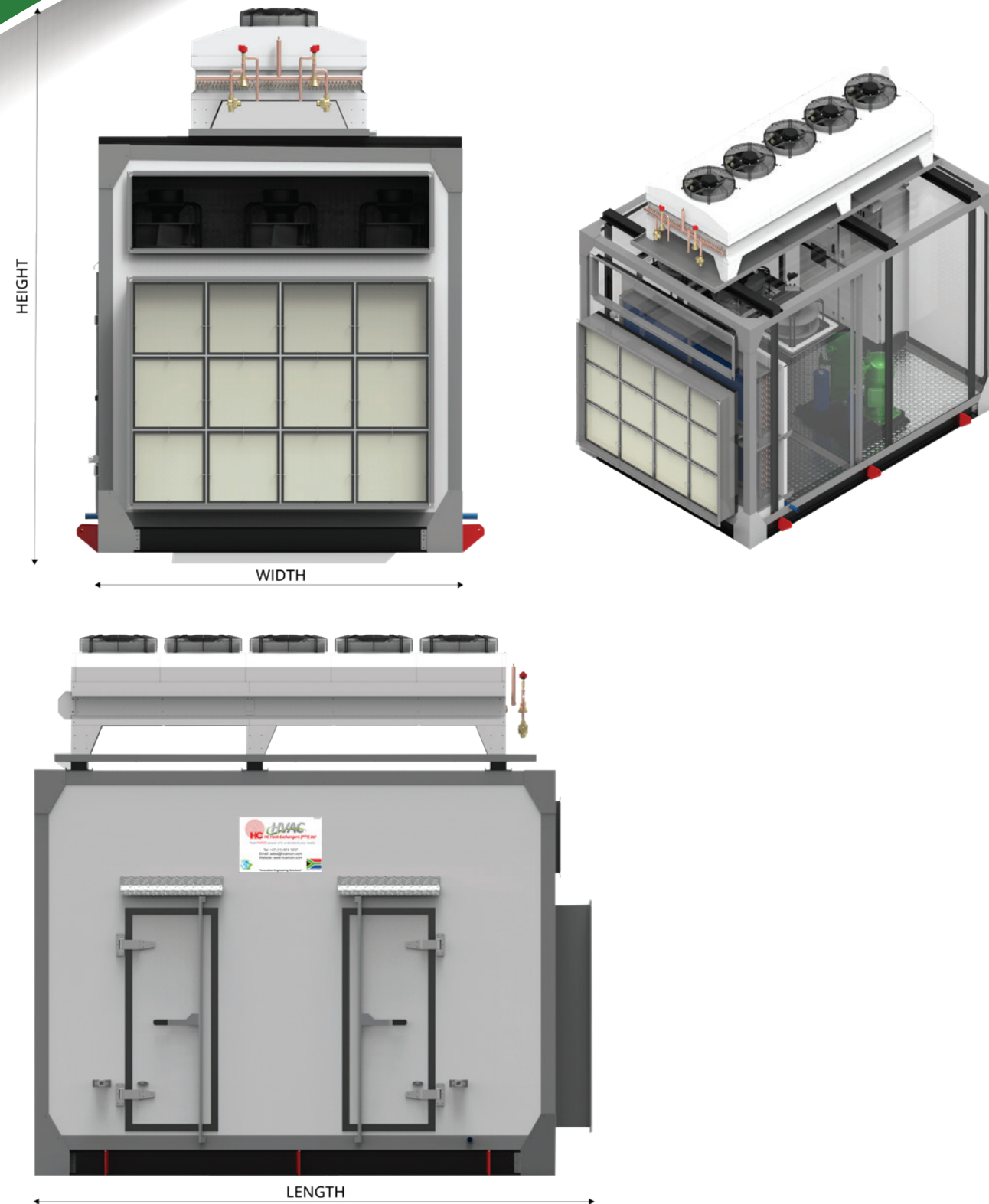
We will continue to use refrigerants with a lower environmental impact and we fully support the Montreal Protocol amended in Kigali, Rwanda in 2016.

The following are some of the options available:

- Cooling Only Units
- Heatpump – Reverse Cycle Heating With Automatic Defrost
- Compact Designs
- Mixing Plenums
- Walk-In Plenums
- High Efficiency Filtration Systems – Primary, Secondary and HEPA Filtration
- Economy Cycle – Free Cooling Systems
- Fresh Air Control With CO₂ Sensors
- High Efficiency EC Plug Fans – Supply Air Stream
- High Efficiency EC Plug Fans - Return And Exhaust Stream.
- Averaging Air Sensor Control
- Return Air Sensor Control
- Supply Air Sensor Control
- Hermetic Scroll Compressors
- Semi-Hermetic Reciprocating Compressors
- Screw Compressors
- UVC - Germicide Lights
- Inverter Driven Compressors
- R407C, R410A, R744 (CO₂) Etc.
- Variable Flow Function for VAV Systems
- Heat Recovery Wheels - Energy Recovery Systems
- Air-To-Air Heat Exchangers - Energy Recovery Systems
- Humidifiers
- Sound Attenuators



Compact Rooftop Units



Model N°	Supply Air Quantity (m3/s)	Total Cooling Capacity	Unit	Unit	Unit	Supply Air Spigot	Return Air Spigot
		(kW)	Length (mm)	Width (mm)	Height (mm)	WxH (mm)	WxH (mm)
HC-RTPU-C 2-30	2	29.8	2900	1700	1210	1000 x 500	1000 x 1000
HC-RTPU-C 2-33	2	33.4	2900	2300	1210	1000 x 500	1000 x 1000
HC-RTPU-C 2-38	2	37.5	2900	2300	1210	1000 x 500	1000 x 1000
HC-RTPU-C 3-40	3	44.2	3000	2300	1210	1300 x 500	1000 x 1000
HC-RTPU-C 3-60	3	57.0	3000	1700	1820	1800 x 500	1500 x 1200
HC-RTPU-C 4-60	4	72.4	3000	2300	1820	1800 x 500	1500 x 1200
HC-RTPU-C 4-70	6	95.3	3400	2900	1820	1800 x 500	1500 x 1200
HC-RTPU-C 5-80	6	101.9	3400	2900	1820	2100 x 500	1800 x 1500
HC-RTPU-C 6-100	7	116.1	3400	2900	1820	2100 x 500	1800 x 1500
HC-RTPU-C 6-110	6	106.4	3400	2300	3685	2100 x 500	1800 x 1500
HC-RTPU-C 7-120	7	116.8	3400	2300	3985	2100 x 500	1800 x 1800
HC-RTPU-C 8-130	8	129.6	4000	2300	3985	2100 x 500	1800 x 1800

(Range 30 - 130kW)

Large Rooftop Units



Model N°	Supply Air Quantity (m3/s)	Total Cooling Capacity	Unit	Unit	Unit	Supply Air Spigot	Return Air Spigot
		(kW)	Length (mm)	Width (mm)	Height (mm)	WxH (mm)	WxH (mm)
HC-RTPU-L- 9-150-HP	9	145.6	4900	2900	3285	1800 x 1100	1400 x 1000
HC-RTPU-L-10-160-HP	10	162.0	4900	2900	3285	1800 x 1200	1400 x 1100
HC-RTPU-L-12-190-HP	12	191.8	4900	2900	3485	1850 x 1350	1450 x 1250
HC-RTPU-L- 13-210-HP	13	212.8	4900	3000	3485	2000 x 1350	1600 x 1250
HC-RTPU-L- 14-230-HP	14	233.6	4900	3500	3485	2200 x 1300	1800 x 1200
HC-RTPU-L- 16-260-HP	16	259.2	4900	3500	3585	2300 x 1400	1900 x 1300
HC-RTPU-L- 17-290-HP	17	288.0	5500	3700	3600	2500 x 1500	2100 x 1400
HC-RTPU-L- 19-320-HP	19	319.0	5500	3700	3600	2500 x 1500	2100 x 1400
HC-RTPU-L- 21-350-HP	21	350.0	5500	3700	3600	2600 x 1600	2200 x 1500
HC-RTPU-L- 23-390-HP	23	389.0	5500	3700	3600	2700 x 1700	2300 x 1600

(Range 145 - 390kW)

Hybrid Rooftop Units

We are proud to offer our clients, consultants, contractors and facility management companies the latest and most innovative solutions for their Air Handling and Rooftop Unit requirements. The Rooftop Packaged Units have evolved considerably over the last few years with the introduction of the new Hybrid VRV/F technologies.

With the increasing cost of electricity and overall input costs, responsible clients are always looking for the most efficient products. Therefore the Energy Efficiency Ratio (EER) and now the Seasonal Energy Efficiency Ratio (SEER) have become critical factors in the decision making process. This allows for the latest VRV/F technologies to be included into the units.

The VRV/F products are equipped with the latest Scroll compressor technology, with some brands offering all the compressors operating on full inverter technology. This enables variable refrigerant flow and low start-up current, with stepless capacity control.

On larger unit capacities there are multiple compressors allowing for the regulation of each condensing units operating times. This leads to all the compressors working at similar operating hours.

The part load efficiency of the VRV/F systems offers the end-user excellent energy efficiency. This is ideal considering that in the majority of Rooftop Unit applications the unit operates at part load conditions due to the varying load profile of the building coupled with varying occupancy.

These VRV/F condensing units are designed and manufactured in world class production facilities. The product designs are continuously improved by large Research and Development teams with excellent testing and laboratory facilities.

The high commissioning and testing standards of the units allow them to be charged and test run on modern software with detailed reports being generated.

The VRV/F condensing unit designs are continuously improved by large Research and Development teams with excellent testing and laboratory facilities.



Energy efficiency is a core design feature of VRV/F equipment and this is evident in the compressor and heat exchange technologies utilised in these products. The low start-up power requirements due to the inverter compressors enable continuous savings over the units life cycle. The majority of Air Conditioning applications have varying building load profiles, occupancy rates as well as ambient conditions which is ideal for VRV/F equipment that provides excellent energy efficiency at part load conditions.

VRV/F units can be used in a wide variety of residential and commercial applications. The units are especially popular when simultaneous heating and cooling is required and heat recovery is optimised.

Globally Innovative Solutions, whilst creating and sustaining local employment.

This is the power of Innovation through Collaboration.



Compact Hybrid Rooftop Units



Hybrid Compact Eco Package - With EC Plug Fans									
Model No Reference	Supply Air Quantity (m ³ /s)	Total Cooling Capacity (kW)	Unit Length (mm)	Unit Width (mm)	Unit Height (mm)	Approximate Rigging Weight (kg)	Motor Size (kW per Fan)	Unit MFA (Amps)	Drain 2off (mm)
HC-HCEP-B-1-20-HP	1.2	22.4	3400	1500	2100	750	2.5	23.8	40
HC-HCEP-B-2-30-HP	2	33.5	3400	1500	2300	1000	2.5	35.8	40
HC-HCEP-B-3-50-HP	3	50.4	3400	1700	2500	1550	3.8	55.2	40
HC-HCEP-B-4-70-HP	4	67.4	3700	2300	2500	2400	4.3	69.5	40
HC-HCEP-B-5-80-HP	5	83.9	3700	2300	2500	2700	3.8	90.4	40
HC-HCEP-B-6-100-HP	6	101	3700	2600	2800	3300	3.8	90.4	40
HC-HCEP-B-7-120-HP	7	118	4500	3000	2800	3800	4.3	113	40
HC-HCEP-B-8-140-HP	8	135	4500	3000	3100	4400	2.5	136.4	40
HC-HCEP-B-9-150-HP	9	151.2	4500	3000	3100	4500	3.8	140.6	40

Power Supply - 380-415V - 50Hz

MFA - Maximum Fuse Amps

The above Nominal Cooling Capacities are based on indoor conditions: 27°C DB, 19°C WB and outdoor temperature: 35°C DB @ sea level

(Range 22 - 150kW)

Large Hybrid Rooftop Units



Hybrid Large Eco Package - With EC Plug Fans											
Model No Reference	Supply Air Quantity (m³/s)	Total Cooling Capacity (kW)	Unit Length (mm)	Unit Width (mm)	Unit Height (mm)	Supply Air Spigot WxH (mm)	Return Air Spigot WxH (mm)	Approximate Rigging Weight (kg)	EC Plug Fan Motor Size (kW per Fan)	Unit MFA (Amps)	Drain 2 off (mm)
HC-HECP-B-10-170-HP	10	168	6750	2800	2400	930 x 1800	945 x 1800	4900	3.8	165.6	40
HC-HECP-B-11-190-HP	11	191	6750	2800	2600	920 x 2000	935 x 2000	5500	4.3	165.5	40
HC-HECP-B-12-200-HP	12	202	6750	2800	2600	1000 x 2000	1020 x 2000	5700	4.3	183.5	40
HC-HECP-B-13-220-HP	13	224	6750	2800	3000	905 x 2400	925 x 2400	6200	4.3	219.5	40
HC-HECP-B-14-240-HP	14	236	8000	2800	3000	975 x 2400	995 x 2400	6700	3.8	202	40
HC-HECP-B-15-260-HP	15	258	8000	3400	3000	1045 x 2400	1065 x 2400	6700	4.3	240	40
HC-HECP-B-16-270-HP	16	274.4	8000	3400	3000	1115 x 2400	1135 x 2400	7000	4.3	276	40
HC-HECP-B-17-280-HP	17	280	8000	3400	3000	1180 x 2400	1205 x 2400	7100	4.3	276	40
HC-HECP-B-18-300-HP	18	302.4	8000	3400	3000	1250 x 2400	1275 x 2400	7900	3.8	330	40

Power Supply - 380-415V - 50Hz

MFA - Maximum Fuse Amps

The above Nominal Cooling Capacities are based on indoor conditions: 27°C DB, 19°C WB and outdoor temperature: 35°C DB @ sea level

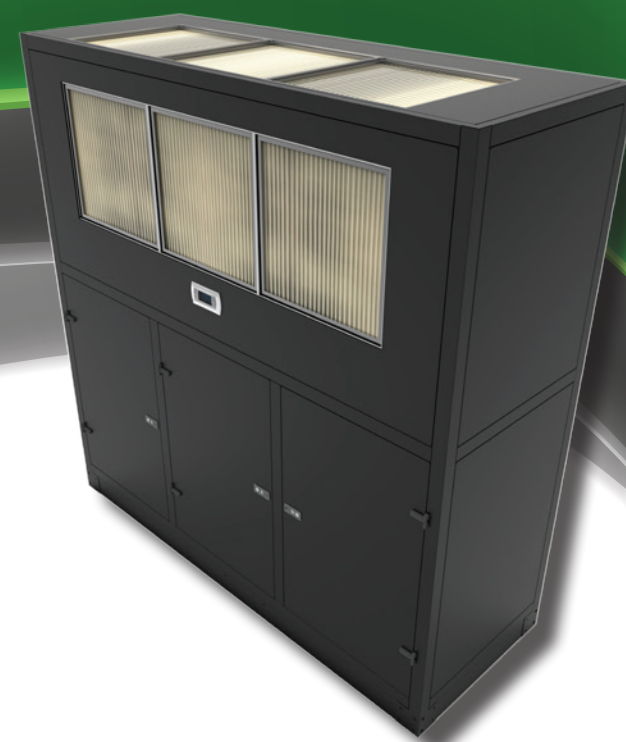
(Range 170 - 300kW)



<https://www.engineeringnews.co.za/article/or-tamoo-west-rp-project-construction-to-start-10-10-2019-02-12>

Commercial Rooftop Range

Oslo Series



Athens Series

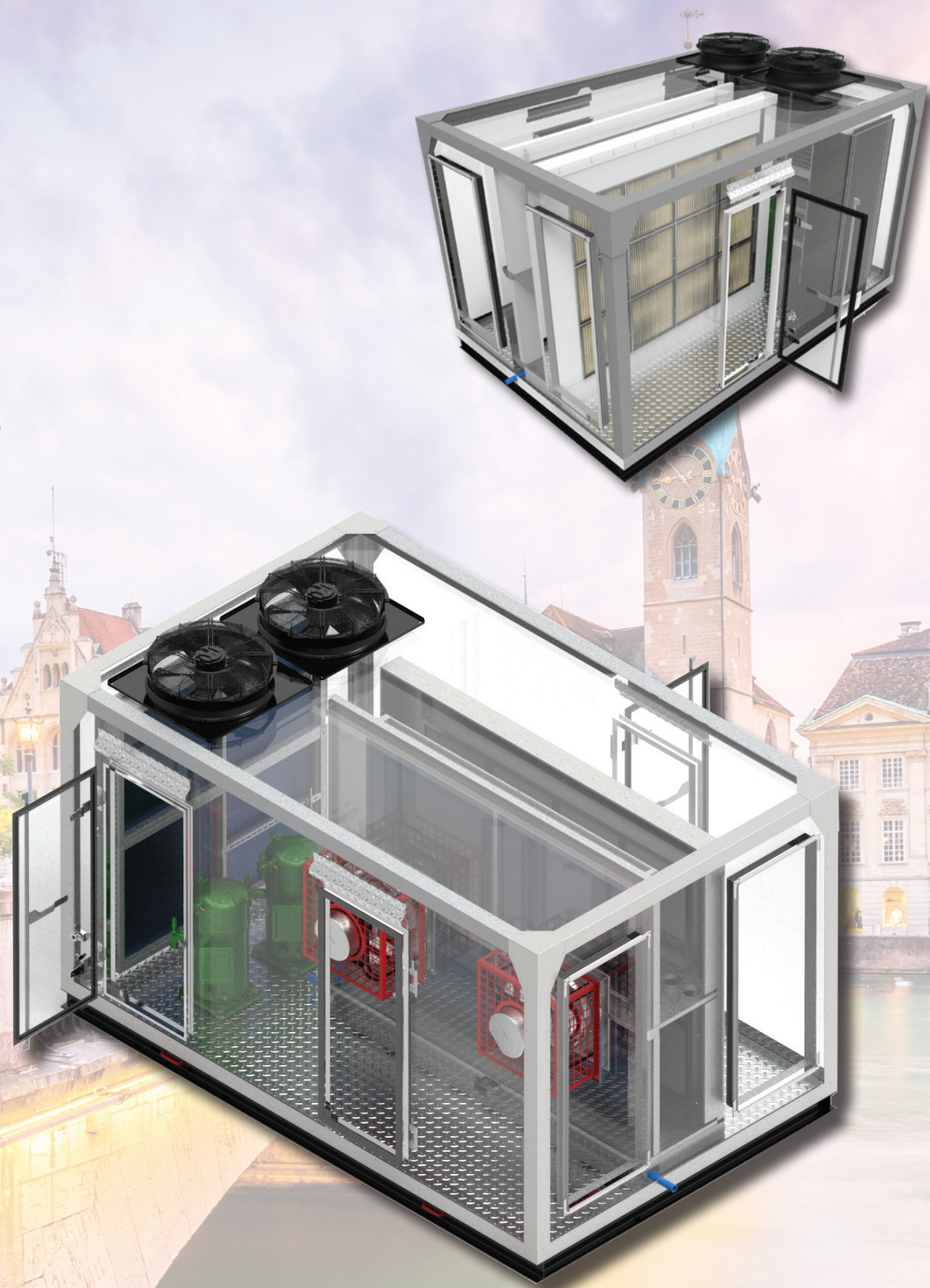
Designed to meet the highest performance and energy efficiency standards



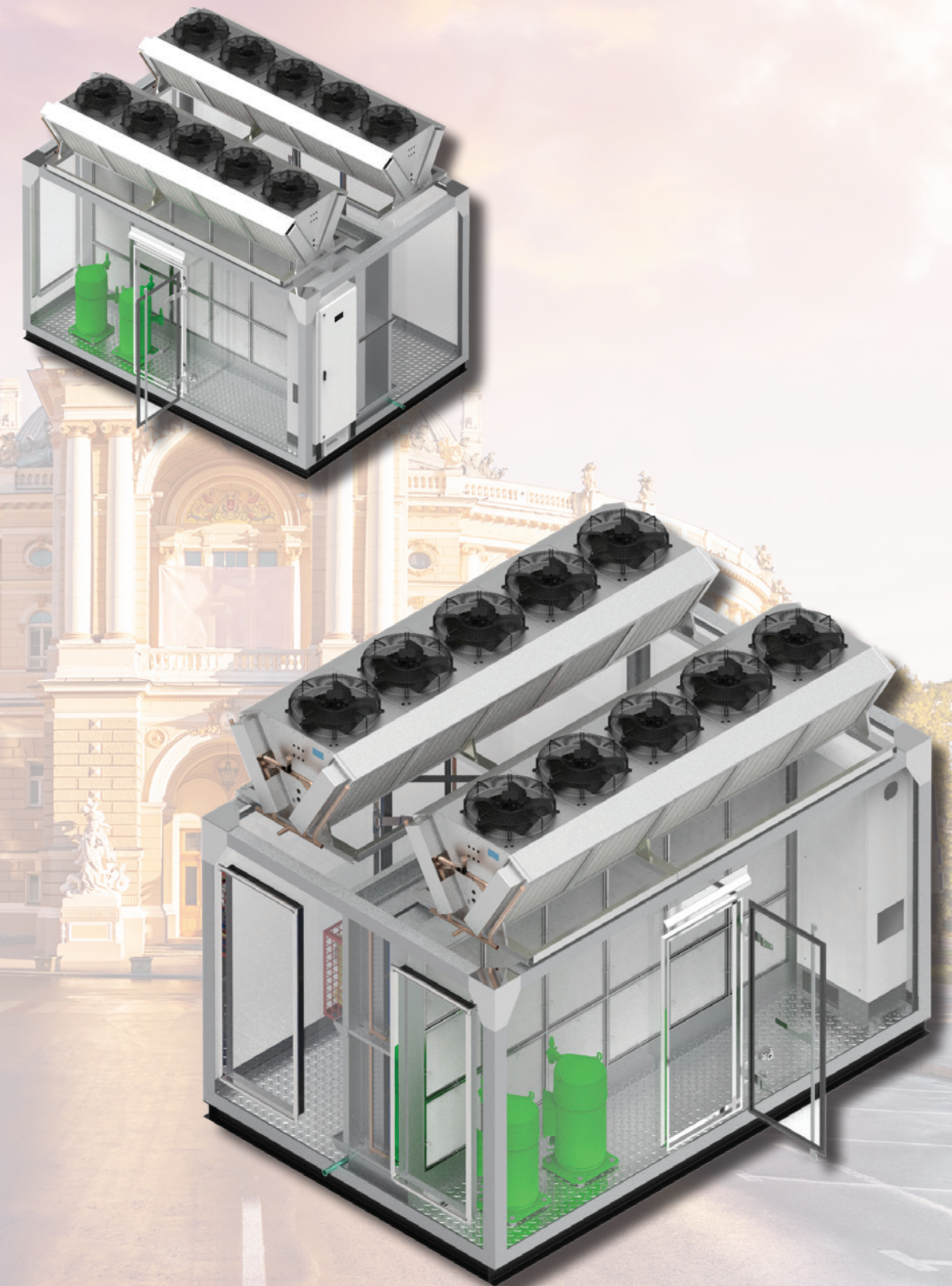
Berlin Series



Zürich Series



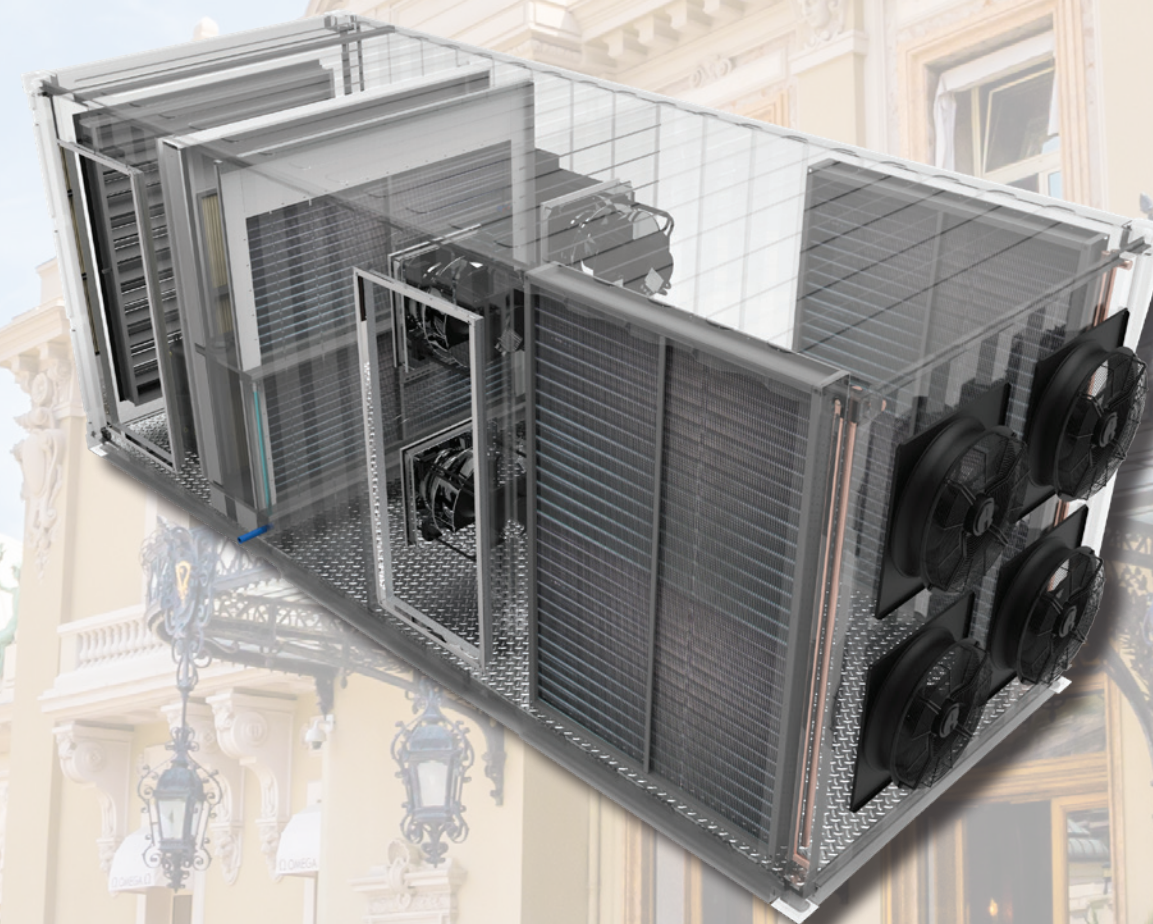
Odessa Series



Madrid Series



Monaco Series



Rome Series

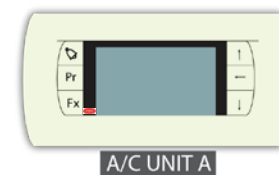


<https://www.imperial.co.za/copy-of-south-african-national-libr>



Remote Panels

TYPE A



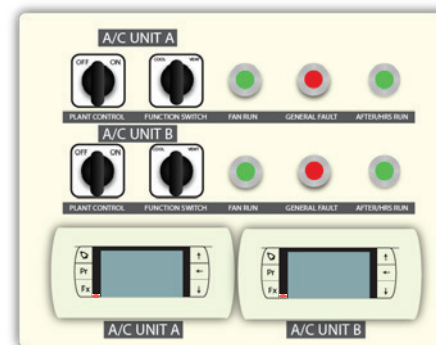
Carel pGD LCD Display

TYPE B



Indoor Surface Mount Panel
Plant control OFF/ON
Plant mode Cool/Vent
Fan Run Indication - Green Light
General Fault Alarm - Red Light
After Hours Switch - 2 Hours
300 x 220 x 120mm - PVC enclosure

TYPE C



Indoor Dual Unit Surface Mount Panel
Plant control OFF/ON
Plant mode Cool/Vent
Fan Run Indication - Green Light
General Faulty Alarm - Red Light
After Hours Switch - 2 Hours
450 x 370 x 130mm - PVC enclosure

Guideline ACH (Air Changes per Hour)

Category	Building	From	To	Variables to Consider
Homes	All spaces in general	4		
	Attic spaces for cooling	12	15	Influenced by heat and moisture
Agriculture	Cows			
	Pig Houses	6	10	Outside Temperatures, Concentration of Cows, Pigs, Chicken per Square Metre are Important Considerations
	Poultry Houses			
Commercial	Banks	4	10	The Greater the People per Square Metre, the Greater the ACH Requirement
	Office	4	10	
	Hairdresser	6	10	Fumes, Heat and People per Square Metre Decide this
	Kitchen	15	60	Heat and Moisture Decide the People per Square Meter
	Conference Room	12		
	Toilet	10		
Health	Hospital Rooms	4	6	The Greater the People per Square Metre, the Greater the ACH Requirement
	Medical Centers	8	12	
Hospital	Clinic	6	12	The Greater the People per Square Metre, the Greater the ACH Requirement
	Waiting Room	10	15	
	Ward	6	10	
Public Building	Classroom	6	12	The Greater the People per Square Metre, the Greater the ACH Requirement
	Library	4	10	
	Assembly Halls	4	6	
	Auditoriums	8	15	
	Cafeterias	12	15	
	Churches	8	15	
	Classrooms	6	12	
	School Classrooms	4	12	
	Lunchrooms	12	15	Influenced by Heat, Moisture and Density of People
	Cooking Room	15	20	Heat, Moisture, Fumes, Concentration of people are Important Considerations
	Public Toilet	20		
Industrial	Bakeries	20	30	Moisture and Heat
	Boiler Rooms	15	20	
	Factory Buildings (Fumes and Moisture)	10	15	Fumes and Moisture
	Factory Buildings (Ordinary)	2	4	Low Density of People
	Galvanizing Plants	20	30	Fumes, Heat and Moisture
	Mills, Textile Dye	15	20	
	Paint Shop	15	20	Fumes
	Precision Manufacturing	10	50	Heat, Moisture, Fumes, Concentration of People are Important Considerations
Leisure	Bars	20	30	People per Square Metre Decide this
	Club Houses	20	30	The Greater the People per Square Metre, the Greater the ACH Requirement
	Cocktails Lounges	20	30	
	Conference Hall	8	10	
	Dining Hall	8	10	
	Restaurant	8	12	Heat, Moisture, Fumes, Concentration of People are Important Considerations
	Hotel Kitchen	15	20	
	Hotel Laundry	15	20	
	Hotel Toilet	10	12	
	Nightclubs	20	30	Fumes and Volume of People
Restaurant	Restaurants	6	10	A Busy Restaurant will Require More Changes per Hour
	Restaurant Kitchen	20	30	Heat, moisture and Density of People can Influence this

Cooling Load - Rules of Thumb

Area Served	Rate W/m ²			Rate BTU/HR / m ²		
Banks, Court Houses and Municipal buildings	151	-	189	515	-	645
Bars, Taverns, Clubhouses and Nightclubs	189	-	252	645	-	860
Dedicated Outside Air Systems ie. Hospitals	126	-	378	430	-	1290
Dining Halls, Lunch Rooms and Cafeterias	151	-	378	515	-	1290
Hospital Patient Rooms	126	-	151	430	-	515
Kitchens	107	-	252	365	-	860
Libraries and Museums	107	-	151	365	-	515
Malls and Shopping Centers	107	-	252	365	-	860
Medical Centers, Clinics and Offices	126	-	151	430	-	515
Pharmacy, Jewellery and Beauty Stores	167	-	217	570	-	741
Police Station, Fire Stations and Post Offices	107	-	151	365	-	515
Restaurants	151	-	378	515	-	1290
Retail and Department Stores	126	-	189	430	-	645
School Classrooms	135	-	167	461	-	570
Supermarkets	107	-	151	365	-	515

<http://arco-hvac.ir/wp-content/uploads/2015/05/HVAC-Equations-Data-and-Rules-of->

South African Average Altitude and Ambient Temperatures

Location	Altitude Meters	Design Temperature	Location	Altitude Meters	Design Temperature
Alexander Bay	0	32°C	Kroonstad	1348	32°C
Aliwal North	1337	35°C	Krugersdorp	1699	31°C
Barberton	852	35°C	Ladysmith	1000	32°C
Bathurst	259	34°C	Lindley	1540	33°C
Beaufort West	863	35°C	Louis Trichard	961	35°C
Berlin	1341	30°C	Lydenburg	1470	33°C
Bethlehem	1615	32°C	Mafikeng	1272	35°C
Bloemfontein	1371	34°C	Maseru	1571	33°C
Bremersdorp	626	32°C	Mbabane	1163	32°C
Cape Town	0	32°C	Middleburg	1447	31°C
Carletonville	1341	32°C	Mantagu	223	34°C
Carolina	1690	33°C	Musina	548	35°C
Ceres	457	36°C	Midrand	1510	33°C
Clanwilliam	76	43°C	Mbombela	731	34°C
Cradock	873	35°C	New Castle	1185	32°C
De Aar	1243	35°C	Oudtshoorn	334	37°C
Dundee	1250	32°C	Phalaborwa	405	36°C
Durban	0	32°C	Pietermaritzburg	792	32°C
East London	0	32°C	Polokwane	1301	34°C
Ermelo	1675	32°C	Piet Retief	1271	33°C
Estcourt	1181	34°C	Port Shepstone	0	30°C
Eshowe	502	33°C	Potchefstroom	1352	33°C
Fauresmith	932	35°C	Mokopane	1176	34°C
Fort Beaufort	457	39°C	Tshwane	1376	34°C
Francistown	1004	37°C	Queenstown	1077	37°C
Fraserburg	1280	35°C	Roberston	172	35°C
Gaberone	1007	38°C	Roodeplaat	1066	35°C
George	0	31°C	Rustenburg	1234	35°C
Germiston	1665	31°C	Thabazimbi	1028	37°C
Graaf-Reinett	750	40°C	Thohoyandou	724	35°C
Grahamstown	539	36°C	Uitenhage	110	37°C
Grootfontein	1263	35°C	Umtata	701	34°C
Gqeberha	0	32°C	Uppington	804	38°C
Hanover	1337	34°C	Ventersdorp	1484	32°C
Harrismith	1628	31°C	Vereeniging	1417	33°C
Hope Town	1219	35°C	Victoria West	1269	35°C
Howick	1052	35°C	Vryburg	1186	36°C
Johannesburg	1752	32°C	Bela Bela	1115	35°C
Keetmanshoop	1004	39°C	Welkom	1375	34°C
Kimberley	1196	35°C	Wepner	1439	32°C
Kingwilliams Town	375	37°C	Windhoek	1728	34°C
Klerksdorp	1324	34°C	Worcester	201	37°C
Knysna	0	31°C			

According to CIBSE Guide B - HVAC & Refrigeration 2005 / Section 3.10 Ductwork / Table 3.2, the maximum recommended duct velocities for low pressure ductwork systems, depending on acoustic criteria and project type.

Maximum Duct Velocities

Maximum Duct Velocities for Low Pressure Systems in Relation to Noise Levels				
Typical applications	Typical Noise Rating (NR)	Velocity (m/s)		
		Main Ducts	Branch	Runouts
Auditorium, Lecture Halls, Cinemas	25-30	4	3.5	<2.0
Bedrooms (non-domestic buildings)	20-30	5	4.5	2.5
Department Stores, Supermarkets, Shops, Cafeterias	40-45	9	7	4.5
Domestic Buildings (bedrooms)	25	3	2.5	<2.0
General Offices, Restaurants, Banks	35-40	7.5	6	3.5
Industrial Buildings	45-55	10	8	5
Private Offices, Libraries	30-35	6	5.5	3
Theaters, Concert Halls	20-25	4	2.5	<2.0

Useful Equations

1. Density = $\frac{\text{mass}}{\text{volume}} \therefore \rho \frac{m}{v} \text{ kg/m}^3$

also $\rho = \frac{1}{v} \text{ kg/m}^3$ $v = (\text{specific volume})$

2. Specific Volume (v) = $\frac{1}{\text{density}} = \frac{1}{\rho} \text{ m}^3/\text{kg}$

3. Greek Symbols: η = Efficiency (neta)
 ρ = Density (rho)

4. Mass flow rate (\dot{m})

$$\dot{m} = \dot{V} \times \rho \text{ kg/s}$$

OR $\dot{m} = \dot{V} \times \frac{1}{v} \therefore \dot{m} = \frac{\dot{V}}{v} \text{ kg/s}$

5. Quantity of heat (Q)

(for a change in temperature)

$$Q = \dot{m} \cdot C_p \Delta T \text{ kJ/s or kW}$$

(For a change of phase)

$$Q = \dot{m} \cdot h_{fg} \text{ kJ/s or kW}$$

(h_{fg} = latent heat required)

6. Require flow rate

$$l/s = \frac{Q_s}{4.187 \times \Delta T}$$

Specific Heat Capacities

Air	- 1.012 kJ/kg. k
Water Vapour	- 1.996 kJ/kg. k
Ice	- 2.108 kJ/kg. k
Water	- 4.187 kJ/kg. k

7. Specific Enthalpy (h)
To calculate the total energy transfer

$$\dot{Q} = \dot{m} \Delta h \text{ kJ/s or kW}$$

8. $t_M = t_A + f_R (t_B - t_A)$

t_M = DB temperature of mixture

t_A = DB temperature of coldest airstream

t_B = DB temperature of hottest airstream

f_R = quantity (or mass) of hottest airstream expressed as a fraction of the total air quantity (mass).

$$f_R = \frac{m_B}{m_A + m_B}$$

$$= \frac{\frac{m_B}{v_B}}{\frac{m_A}{v_A} + \frac{m_B}{v_B}}$$

$$= \frac{V_B}{V_A + V_B}$$

9. CFM = 2119 x l/s

10. BTU/HR = 3.413 x Watts

11. ACRH – Air Change Rate Per Hour

$$\text{m}^3 / \text{s} = \frac{\text{m}^3 \times \text{ACRH}}{3600}$$



Honeywell Refrigerant Application Guide



COMMERCIAL REFRIGERATION						
ASHRAE #	GWP ^a	Trade Name	Replaces	Blend Composition / ASHRAE Classification ^b	Typical Lubricant ^c	Comments
	AR5		ASHRAE #			
R-1234yf	1	Solstice yf	134a	HFO (single component fluid)	Alkylbenzene, Synthetic (POE, PAG)	Ultra-low GWP and higher capacity solution for vending machines, plug in cabinets, and water chillers. New equipment only
				ASHRAE A2L		
R-1234ze	1	Solstice ze	134a	HFO (single component fluid)	Alkylbenzene, Synthetic (POE, PVE, PAG)	Ultra-low GWP and high efficiency solution for vending machines, plug in cabinets, and water chillers. New equipment only
				ASHRAE A2L		
R-455A	146	Solstice L40X	R-404A R-507	R-32/R-1234yf/CO2	Synthetic (POE)	Low GWP blend for low, medium, and high temperature systems Excellent option for self-contained units Close performance match to R-404A New equipment only
				ASHRAE A2L		
R-450A	547	Solstice N13	R-134a R-401A R-401B R-409A	R-134a/R-1234ze	Synthetic (POE)	GWP is 58% lower than R-134a >90% capacity with similar efficiency (101-103% vs R-134a) New equipment and retrofits
				ASHRAE A1		
R-448A	1273	Solstice® N40	R-404A R-402A R-408A R-22 R-507 R-502	R-32/R-125/ R-134a/R-1234ze/ R-1234yf	Synthetic (POE)	Global warming potential (GWP) is 68% lower than R-404A 5% - 16% lower energy consumption vs R-404A Best capacity and efficiency alternative to R-22 and R-404A New equipment and retrofits
				ASHRAE A1		
R-134a	1300	Genetron® 134a	R-12	R-134a	Synthetic (POE, PVE)	Similar energy efficiency and good capacity match compared to R-12 Performs well in small hermetic systems
				ASHRAE A1		
R-407F	1674	Genetron Performax® LT	R-22 R-404A R-402A R-408A R-507	R-32/R-125/ R-134a	Synthetic (POE, PVE)	Good capacity match to R-22 Lower discharge temperature vs R-22 Cost-effective alternative New equipment and retrofits
				ASHRAE A1		
R-452A	1945	Solstice 452A	R-404A R-507	R-1234yf/R-32/R-125	Synthetic (POE)	Low and medium temperature alternative for R-404A Discharge temperature similar to R-404A Transport, condensing units, self-contained units New equipment and retrofits
				ASHRAE A1		
Service Gas Refrigerants						
R-404A	3943	Genetron 404A		R-125/R-143a/ R-134a	Synthetic (POE, PVE)	R-404A and R-507 are HFC blends with high GWP. These refrigerants are subject to future regulations on usage.
				ASHRAE A1		
R-507	3985	Genetron AZ-50®		R-125/R-143a	Synthetic (POE, PVE)	Honeywell recommends utilizing HFO blends such as Solstice N40 for new equipment and as a replacement for R-404A and R-507 in existing equipment
				ASHRAE A1		
R-22	1760	Genetron 22		R-22	Mineral oil	Phaseout Schedule: January 1, 2020: No new R-22 refrigerant can be manufactured or imported into the U.S. or Canada. Any servicing must use stockpiled or reclaimed material ¹ . 100% reduction in HCFC consumption required by Montreal Protocol
				ASHRAE A1		
COMMERCIAL AIR CONDITIONING / CHILLERS						
ASHRAE #	GWP ^a	Trade Name	Replaces	Blend Composition / ASHRAE Classification ^b	Typical Lubricant ^c	Comments
	AR5		ASHRAE #			
R-1234ze	1	Solstice ze	R-134a	HFO (Single component fluid)	Alkylbenzene Synthetic (POE, PVE, PAG)	Ultra-low GWP solution, best performance match to R-134a New equipment (chillers, small systems)
				ASHRAE A2L		
R-1233zd	1	Solstice zd	R-123	HFO (Single component fluid)	Alkylbenzene Mineral oil Synthetic (POE, PVE)	Ultra-low GWP solution for low pressure chillers New equipment only
				ASHRAE A1		

	R-450A	547	Solstice N13	R-134a R-409A R-401A R-401B	R-134a/R-1234ze	Synthetic (POE)	GWP is 58% lower than R-134a >90% capacity with similar efficiency (101-103% vs R-134a) New equipment and retrofits
					ASHRAE A1		
	R-466A (provisional)	733	Solstice N41	R-410A	R-32 / R-125 / R-131I	Synthetic (POE)	Nonflammable GWP is 60% lower than R-410A New Equipment Only
					ASHRAE A1 (preliminary)		
	R-245fa	858	Genetron 245fa	R-11 R-123	HFC (Single component fluid)	Synthetic (POE, PVE)	Equipment redesign, Organic Rankine Cycle heat transfer fluid New equipment only
					ASHRAE B1		
	R-134a	1300	Genetron 134a	R-12	HFC (Single component fluid)	Synthetic (POE, PVE)	Similar energy efficiency and good capacity match to R-12 New equipment and retrofits
				R-500	ASHRAE A1		
	R-407C	1624	Genetron 407C	R-22	R-32/R-125/R-134a	Synthetic (POE)	Best retrofit alternative to R-22. Close performance match with slightly higher operating pressures New equipment and retrofits
				R-500	ASHRAE A1		
	R-410A	1923	Genetron AZ-20®	R-22	R-32/R-125	Synthetic (POE)	High pressure, high efficiency New equipment only
					ASHRAE A1		
Service Gas							
	R-123	79	Genetron 123	R-11 (HCFC)	HFC (Single component fluid)	Alkylbenzene Mineral oil Synthetic (POE, PVE)	Due for phase out in 2020 Limited availability in the U.S. as of January 2018
					ASHRAE B1		
RESIDENTIAL/LIGHT COMMERCIAL AIR CONDITIONING/HEAT PUMP							
	ASHRAE #	GWP ^a	Trade Name	Replaces	Blend Composition / ASHRAE Classification ^b	Typical Lubricant ^c	Comments
		AR5		ASHRAE #			
	R-466A (provisional)	733	Solstice N41	R-410A	R-32 / R-125 / R-131I	Synthetic (POE)	Nonflammable GWP is 60% lower than R-410A New Equipment Only
					ASHRAE A1 (preliminary)		
	R-134a	1300	Genetron 134a	R-12	HFC (Single component fluid)	Synthetic (POE) Alkylbenzene	Similar energy efficiency and good capacity match compared to R-12 New equipment and retrofits
				R-500	ASHRAE A1		
	R-407C	1624	Genetron 407C	R-22	R-32/R-125/R-134a	Synthetic (POE)	Best retrofit alternative to R-22. Close performance match with slightly higher operating pressures New equipment and retrofits
				R-500	ASHRAE A1		
	R-410A	1923	Genetron AZ-20	R-22	R-32/R-125	Synthetic (POE)	High pressure, high efficiency New equipment only
					ASHRAE A1		
	R-422D	2477	Genetron 422D	R-22	R-125/R-134a/R-600a	Mineral Oil Synthetic (POE)	Use of Synthetic (POE) will enhance oil return, if required Retrofits
					ASHRAE A1		
MOBILE AIR CONDITIONING / AUTOMOTIVE							
	ASHRAE #	GWP ^a	Trade Name	Replaces	Blend Composition/ ASHRAE Classification ^b	Typical Lubricant ^c	Comments
		AR5		ASHRAE #			
	R-1234yf	1	Solstice yf	R-134a	HFO (Single component fluid)	Synthetic (POE, PAG)	Ultra-low GWP solution New equipment only (small systems)
					ASHRAE A2L		
	R-134a	1300	Genetron 134a	R-12	HFC (Single component fluid)	Synthetic (POE, PVE)	Similar energy efficiency and good capacity match to R-12
					ASHRAE A1		

¹R22 Phaseout Schedule for Air Conditioning and Refrigeration
January 1, 2004: 35% reduction in HCFC consumption required by Montreal Protocol.
January 1, 2010: No new R-22 can be manufactured for new equipment manufactured or imported in US or Canada. 65% reduction in HCFC consumption required by Montreal Protocol.
January 1, 2015: 90% reduction in HCFC consumption required by Montreal Protocol
January 1, 2020: No new R-22 refrigerant can be manufactured or imported into the US or Canada. Any servicing must be done using stockpiled or reclaimed material. 100% reduction in HCFC consumption required by Montreal Protocol.

²ASHRAE Classification Guide:
ASHRAE A1: Nonflammable, low toxicity ASHRAE A2L: Mildly flammable, low toxicity ASHRAE B1: low flammability, higher toxicity

³Notes
³Listing of GWP Values as per Report IPCC WG1 AR5 (100-yr time horizon)
(a) CFC=Chlorofluorocarbon; HCFC=Hydrochlorofluorocarbon; HFC=Hydrofluorocarbon; H=Hydrocarbon; FC=Fluorocarbon; HFO = Hydrofluoro-olefin
⁴Check with the compressor manufacturer for their recommended lubricant



CO₂ Refrigeration and Air Handling Units

HC-HVAC is proud to offer a range of Air Handling Units that would be incorporated into a total CO₂ refrigeration and air conditioning solution.

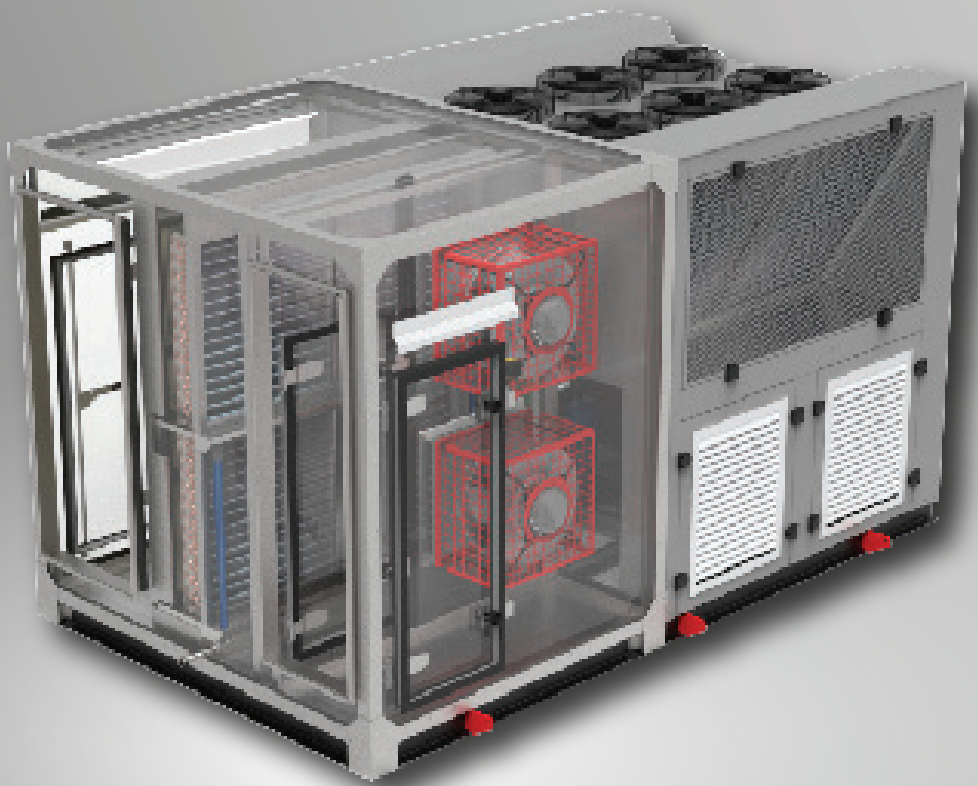
Systems combining low temp, medium temp and air conditioning loads coupled with Heat Recovery and/or Heatpump solutions are becoming very popular with this natural refrigerant offering.



The popularity of R744 can be attributed to the following advantages:

- Excellent thermodynamic properties and low energy requirements
- Low toxicity
- Low Global Warming Potential (GWP=1)
- Lower cost than HFC Refrigerants
- Non-flammability
- No risk of forced refrigerant phase out
- Zero Ozone Depletion Potential (ODP)





HC Group Head Quarters

8 Amber Road, Elandsfontein
Johannesburg, South Africa

Tel: +27-11 674 1237 | info@hcggroup.com



www.hcggroup.com