MITSUBISHI ELECTRIC

Chillers

A new generation of energy saving
and innovative chiller technology

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A new generation of **chiller technology**

There are a number of challenges facing building owners and managers today.

They must tackle ongoing requirements to reduce energy used in their buildings, but there are also a number of areas of legislation that are placing additional pressure on those responsible for business energy use.

This legislation relates to the reduction of carbon emissions from UK businesses and requires robust solutions to address this, alongside tackling the key market issues.

Chiller systems have been used for decades to deliver controlled cooling to buildings, but with this increasing pressure on energy efficiency and running costs, we now need a low-carbon, cost effective option.

Mitsubishi Electric has manufactured chillers for over 40 years and in 2015 combined this extensive experience with advanced component technology from the commercial air conditioning sector to produce the e-series modular chiller range.

Later the same year Mitsubishi Electric purchased Climaveneta, enhancing our product line up and marking our full scale entry into the chiller market.

Climaveneta is a strong European brand supported by 45 years of customer trust and high quality production, and its range of energy-saving, low-noise and innovative chiller technology further expands the application and customisation capabilities we are now able to offer.

Mitsubishi Electric is the first name for **comfort and efficiency**

Founded in 1921, Mitsubishi Electric is now a global, market leading environmental technologies manufacturer. In the UK, the Living Environment Systems Division provides pioneering solutions that heat, cool, ventilate and control our buildings in some of the most energy efficient ways possible.

Through our technical expertise, long experience and innovative product range, we enable building operators everywhere to significantly improve energy efficiency, reduce running costs and adhere to increasingly tough legislation. We believe that global climate challenges need local solutions.

Our aim is to help individuals and businesses reduce the energy consumption of their buildings and their running costs.

> At Mitsubishi Electric, we have evolved and today we offer advanced technology that really can **make a world of difference**.

Why chillers?
an introduction

Today's building owners and managers face the challenge of providing a comfortable, productive space that is also energy efficient.

As the drive to reduce energy waste continues with further legislation, building services are being scrutinised to find more ways to optimise performance.

Air conditioning is acknowledged as a significant energy user in buildings, therefore chillers can make a significant impact on the energy performance and running cost for many buildings. As manufacturers, we are being tasked with producing more efficient equipment and with enabling specifiers to compare products easily with regard to efficiency and performance.

There are a number of established drivers to ensure high energy efficiency in buildings, **including:**

Minimum Energy Efficiency Standards (MEES)

MEES is linked to the Energy Performance Certificate (EPC) requirement for buildings which is already in place. Since 2008, it has been a legal requirement that an EPC is produced whenever a building is sold or let.

Under MEES from 1 April 2023, landlords must not continue letting a non-domestic property which is already let if that property has an EPC rating of band F or G. It is predicted that MEES will have a gradual, but noticeable effect on the commercial rented property market.

Figures show that around 20% of commercial properties fall into the F or G ratings for EPCs, which amounts to around 200,000 non-domestic buildings.

With that in mind, it is a good time to consider updating building services equipment. In the case of chillers, there are other factors which make new technologies an attractive and cost-effective option.

ErP Directive - Lot 21

The main impact of the ErP (Energy Related Products) Lot 21 will be on the way that chiller efficiency is measured. Ratings will be based on higher requirements for seasonal efficiency, and many older existing chillers will not comply.

The ErP uses different performance parameters for different types of product to set the Minimum Energy Performance Standards (MEPS).

Source	Cooling Capacity	**Minimum Efficiency** Jan 2018	Jan 2021
Air Cooled	<400kW	**149%**	**161%**
Air Cooled	≥400kW	**161%**	**179%**
Water Cooled	<400kW	**196%**	**200%**
Water Cooled	≥400kW / ≤1500kW	**227%**	**252%**
Water Cooled	≥1500kW	**245%**	**272%**

Information from Official Journal of the European Union, EU 2016/2281, Annex II Tables 3 and 4.

The latest chiller technologies help to address the ERP Directive by ensuring that they operate to meet the precise cooling demand of the building, conserving energy usage within the building. The main components of water and air cooled chillers are very similar.

The way we use buildings today is changing, and the energy demands are changing with them. So now is a good time to consider the benefits of upgrading chiller plant.

With legislation pushing buildings towards greater energy efficiency and reducing carbon, and new regulations bringing even more efficient chiller options, such as heat recovery, to the market, specifiers have every reason to take a look at the benefits of a modern chiller for both new construction and retrofit scenarios.

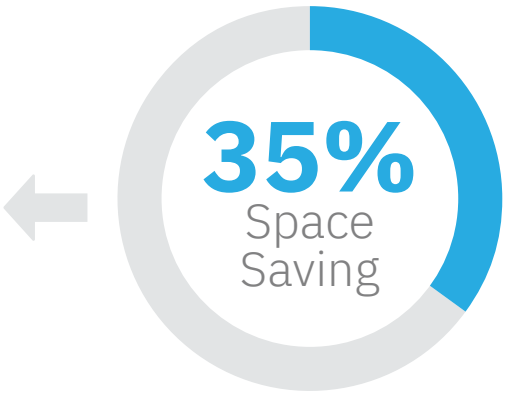
The impact of a chiller on the comfort of occupants should also be considered. With a modern, robust technology in place, building owners can be assured that they are providing a comfortable and healthy environment, as well as saving themselves energy costs in the long-term.

Modular Chillers

Modular Chiller technology provides a more modern approach, and includes benefits which are invaluable on both refurbishment and new-build projects.

What's more, modular equipment is provided to site as a packaged product, requiring minimal installation effort, saving time and costs - as well as reducing possible installation problems.

Instead of a large, single chiller, a number of smaller modules are connected together to provide the end-user with the same level of output as the large, single chiller along with all the benefits of mass produced commodity finished goods.



Space Saving

Typical modular chiller design will see a 35% space saving when compared to a traditional chiller, as they can be positioned in a variety of configurations. For designers looking to optimise ever-tighter roof and plant space, this is an enormous benefit over the large single-block chiller.

Scalability

Scalability is particularly important for today's buildings, where users and requirements of the HVAC plant are constantly changing. Modular chillers can easily be scaled up to meet new requirements.

Built in Redundancy

Another cost saving is that modular chillers do not require the same like-for-like redundancy in chiller plant design that is found in conventional chiller plant. Multiple compressor circuits mean that redundancy is built in.

Quick Turn Around

Modular chillers offer greater stock availability and delivery times. As they are mass produced, modular chillers are part of the manufacturer's 'standard' offering, resulting in a 'just in time' approach to ordering and delivery.

Quick access to the product is very useful for projects with shorter construction durations such as universities, schools and sports arena's where downtime is minimal. Not only is this a time-saver at the point of installation, but it also means that parts for repairs are also easy and quick to obtain.

Pre-packaged

Modular chillers are pre-packaged, pre-piped and pre-wired modules which are tested in the factory before they are shipped to site, where only the water and power connections have to be made. Not only does this make installation errors less likely, it also reduces time on site for installers and costs for end-users.

High Efficiency

The modular approach to chillers allows designers to meet the requirements of a project far more closely than with a traditional chiller. Modular chillers offer significantly better seasonal part-load efficiencies, which mean that they use less energy, and cost less to operate, in the long-term.

Lower Noise Output

As our urban environments become increasingly mixed, with hotels and offices abutting modern urban housing, the noise factor is one that local authorities are keen to control.

Modular chillers are by their nature much quieter than conventional chillers. The variable speed inverter fans which make modular chillers so energy efficient also mean that these products operate with much lower sound levels.

Logistical Ease

Another important consideration is that these small, lightweight modules can be lifted to rooftops far more easily and using less space than traditional chillers, which usually require very large cranes, street closures and increased installation costs as a result.

Modular chillers are part of a growing trend in building services. The modular chiller approach works for designers because they can more closely match the specified equipment to the requirements of a project. By minimising redundancy requirements, equipment is less likely to be over-sized - making it more efficient from the start.

Modular chillers are products which are easy to source, and designed for smooth installation. Quality of manufacture means that warranties are longer, offering peace of mind to those working on site, and for those involved in ongoing maintenance services, spare parts are easily available.

Today's modular chiller is the modern solution for HVAC needs. A quiet, efficient and flexible product that can grow with building requirements.

Our **Modular Chiller** Range

Chiller systems have been used for decades to deliver controlled cooling to buildings, but with increasing pressure on energy efficiency and running costs, we now need a **low-carbon, cost effective option**.

Comprising of Cooling Only and Heat Pump models, and suitable for comfort and process cooling applications, **Mitsubishi Electric's e-series modular chiller range** allows up to six individual units to be connected together to provide a system capacity from 90kW to 1,080kW.

The benefits of Mitsubishi Electric's e-series range:

High efficiency

The e-series modular chiller range uses highly efficient scroll compressor technology from our City Multi VRF units, along with advanced inverters and controls to deliver exceptional efficiency and a wide operating range.

Unique modular approach

Using a modular approach reduces space requirements and simplifies lifting and installation. A modular approach also lends itself to a staged installation or future HVAC demands, as modular chillers can be scaled accordingly.

Reduced plant space

Each module can be positioned in a bank of up to six connected units using the same internal header.

Typically **30% ~ 40% space saving** can be achieved when compared with traditional flatbed type chillers.

Low noise levels

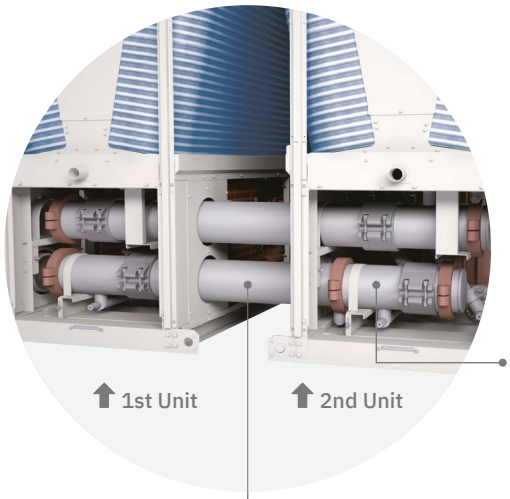
By utilising highly efficient components within a uniquely shaped chiller, the e-series modular chiller range offers market leading low noise levels as standard.

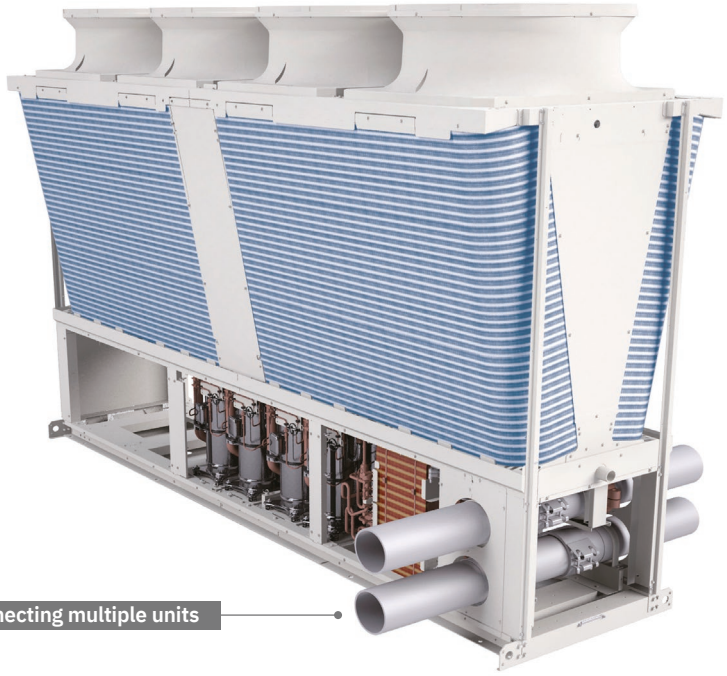
Low noise levels are especially important in today's city centre locations where there is often a mixture of commercial and residential properties in the same area.

Wide operating range

The e-series modular chiller has a wide operating range in both cooling and heating. The low chilled water temperature range of the 90kW module is also ideal for efficient process cooling applications.

Internal header pipe



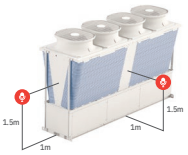


Internal header pipe connecting multiple units

Sound pressure levels

EACV / EAHV	dB(A)		
Model	90kW	150kW	180kW
Front	64	66	68
Right	62	68	71
Back	65	66	67
Left	61	70	70

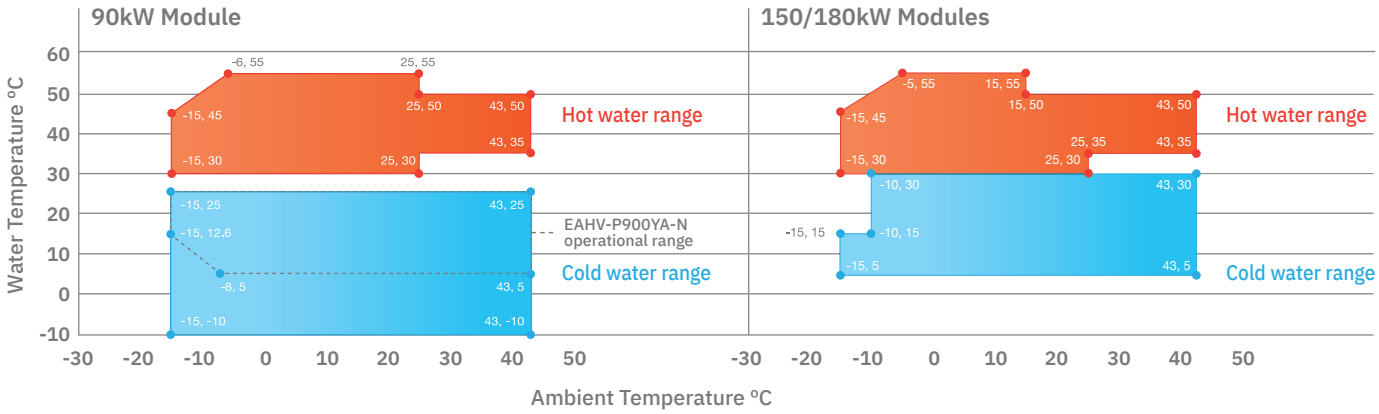
Measuring Point



Sound power levels

EACV / EAHV	dB(A)								
Frequency (Hz)	63	125	250	500	1000	2000	4000	8000	PWL dB(A)
90kW Module	55.8	60.8	66	67.4	70.1	74	65.2	54.1	77.1
150kW Module	59.2	67.4	74.3	79.8	78	75.1	72.3	59.3	84
180kW Module	60.8	73.1	76.3	81.5	80.2	77.5	73.8	62.5	86

Wide operating range



Our **Modular Chiller** Range

System configurations

Maximum Capacity	90kW	150kW	180kW	270kW	300kW	360kW	450kW
Cooling Only	EACV-P900YA-N	EACV-P1500YBL-N	EACV-P900YA-N x2 EACV-P1800YBL-N	EACV-P900YA-N x3	EACV-P1500YBL-N x2	EACV-P900YA-N x4 EACV-P1800YBL-N x2	EACV-P900YA-N x5 EACV-P1500YBL-N x3
Heating / Cooling	EAHV-P900YA-N	EAHV-P1500YBL-N	EAHV-P900YA-N x2 EAHV-P1800YBL-N	EAHV-P900YA-N x3	EAHV-P1500YBL-N x2	EAHV-P900YA-N x4 EAHV-P1800YBL-N x2	EAHV-P900YA-N x5 EAHV-P1500YBL-N x3

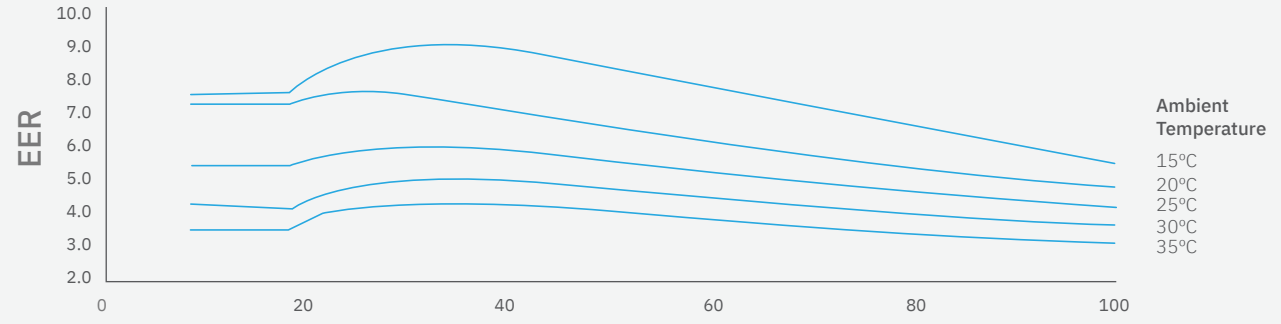
Maximum Capacity	540kW	600kW	720kW	750kW	900kW	1,080kW
Cooling Only	EACV-P900YA-N x6 EACV-P1800YBL-N x3	EACV-P1500YBL-N x4	EACV-P1800YBL-N x4	EACV-P1500YBL-N x5	EACV-P1500YBL-N x6 EACV-P1800YBL-N x5	EACV-P1800YBL-N x6
Heating / Cooling	EAHV-P900YA-N x6 EAHV-P1800YBL-N x3	EAHV-P1500YBL-N x4	EAHV-P1800YBL-N x4	EAHV-P1500YBL-N x5	EAHV-P1500YBL-N x6 EAHV-P1800YBL-N x5	EAHV-P1800YBL-N x6

System efficiency and controllability

The e-series modular chiller has multiple inverter driven compressors that allow the unit to operate between 8% ~ 100% of capacity. By having a broad operating range the chiller has exceptional part load efficiencies which is where most systems will operate.

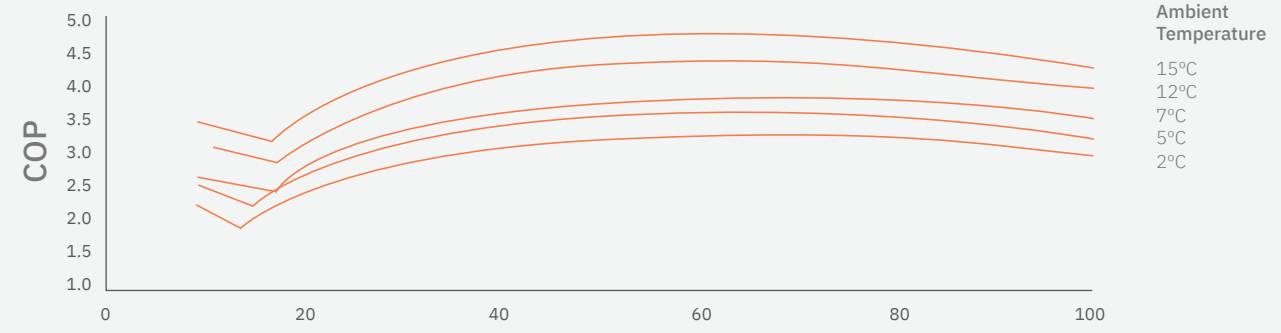
High partial load performance

Cooling



Water outlet 7°C - Water flow volume 15.5m³/h

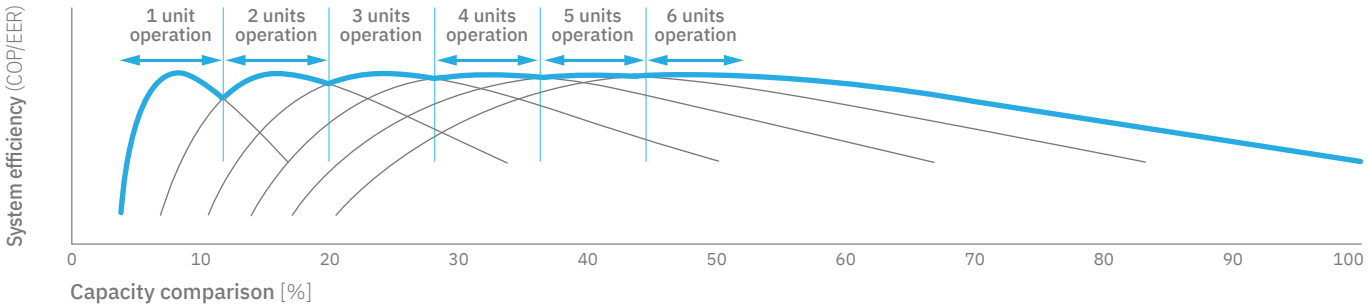
Heating



Water outlet 45°C - Water flow volume 15.5m3/h

Optimum frequency control

When multiple modules are connected, the frequency of each inverter compressor is controlled during operation to increase the efficiency of each module, achieving a high energy saving performance. This control can be implemented by simply using our unique M-NET control, without the need for any other on-site design.

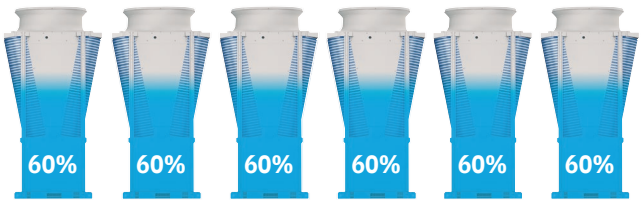


When the overall system load is **60%**

Without optimum frequency control

With non-inverter compressors, it is only possible to turn the unit on or off, and the compressor frequency cannot be adjusted according to the required capacity.

With optimum frequency control



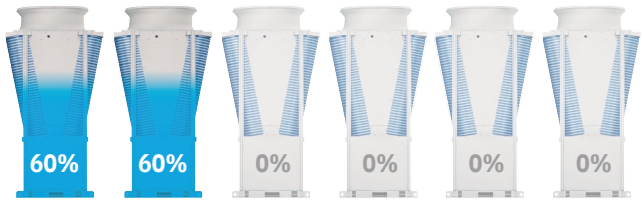
Our modules are equipped with inverter compressors, so the system can be operated in frequency ranges in which the efficiency of each module is at its peak. Optimum frequency control of each unit increases the efficiency of the whole system.

When the overall system load is **20%**

Without optimum frequency control

Since the compressors are running at inefficient frequencies, **the efficiency of the whole system is lower**.

With optimum frequency control



Peak efficiency is between 40 and 60%. In low load conditions, modules can be switched off to **keep remaining modules at optimum efficiency**.

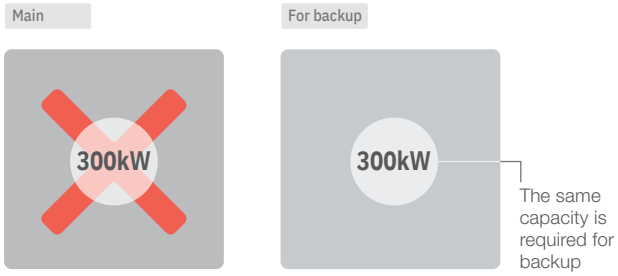
The output of the pumps connected to the remaining group can be decreased, and the efficiency of the whole system is then increased. This control is achieved by connecting to M-NET. There is no need to prepare sensors, and the instrumentation is simple.

Our **Modular Chiller** Range

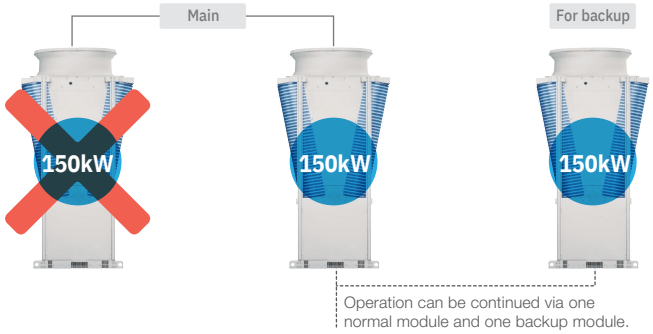
Improved redundancy & resilience

When a non-modular chiller is used as the main 300kW unit, as in this example, the same capacity would also be required as a backup. However, when a Mitsubishi Electric e-series modular chiller is used, two modules can still operate even if one module goes down, continuing normal operation. This reduces the backup capacity requirement.

Non-modular chiller



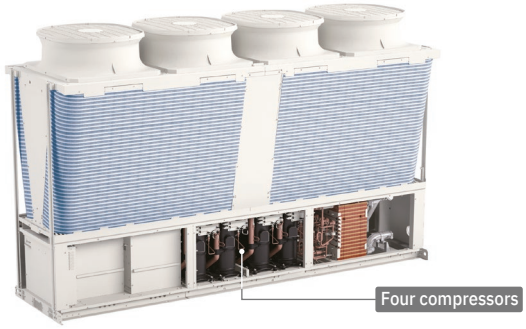
Mitsubishi Electric's e-series modular chiller



Emergency operation mode

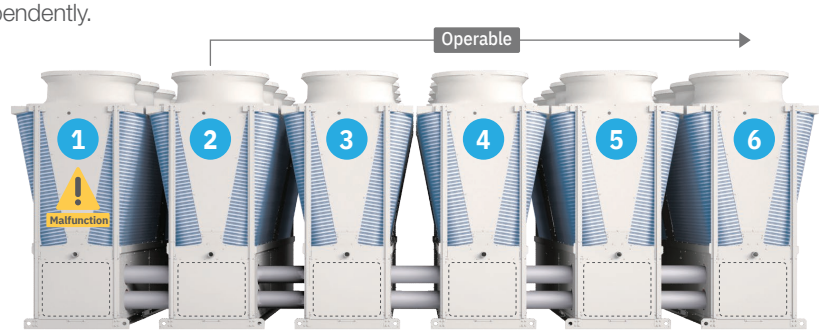
When a single module

The e-series module contains four compressors (two for the 90kW module) developed by Mitsubishi Electric. The **four compressors** operate as two pairs. If something is wrong with one of the two pairs, the other pair can temporarily continue to operate. The 90kW module achieves this by operating its two compressors independently.



When multiple modules

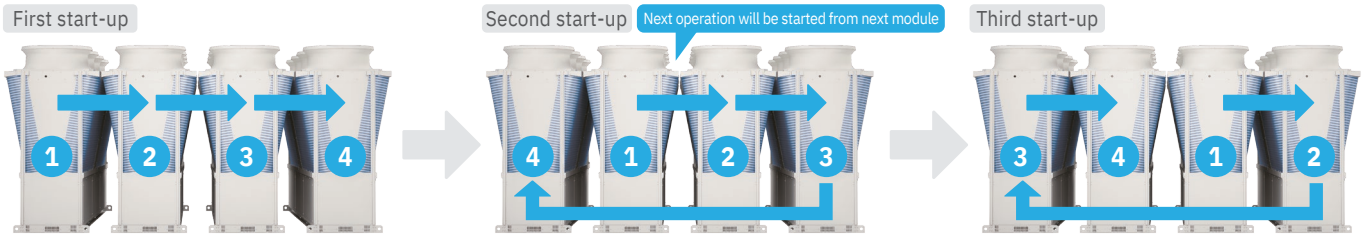
If one of the e-series modules goes down, the remaining modules can continue to operate. Each module can independently control the outlet water temperature. Even if the main module goes down, operation can be continued.



* Units that have been stopped by thermo OFF before the main unit goes down are kept in the thermo OFF mode.

Rotation operation

When multiple modules are installed, the operating time of each module in the same system can be equalized according to the load of the whole system.

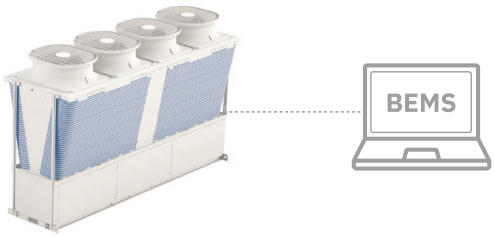


Control options

The e-series modular chiller has **two options** for its control and functional operation:

1. Advanced control

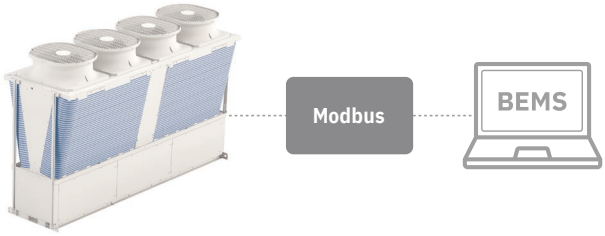
The chiller can be controlled remotely using BEMS systems for volt free input / output control & monitoring via the chiller digital inputs / outputs (terminals K01 - K64) of control areas:



Digital inputs (control points)	**Digital outputs** (read only points)
Operation (on/off)	**Operation** (on/off)
Heat / cool mode (model dependant)	**Malfunction** (normal / malfunction)
Water setpoint	**Mode** (heating / cooling)
Setpoint temperature switching (1st/2nd)	**Defrost operation** (normal / defrost)
Demand operation mode (on/off)	**3rd party external pump operation** (on/off)
Capacity change mode (COP / capacity)	**Drain pan heater** (on/off)
Heating operation mode (normal / ECO mode)	**Auxiliary heater** - external 3rd party heater for frost protection (on/off)
Fan operation for snow (off/on)	

2. Procon Modbus control

This option provides Modbus control over the digital input / outputs (terminals K01 - K64) on the chiller and reports these as Modbus RTU RS485 communication points of Modbus holding registers (control) and Modbus input registers (read only). Modbus registers:



Digital inputs (control points)	**Input registers** (read only points)
Operation (on/off)	**Operation** (on/off)
Heat / cool mode (model dependant)	**Malfunction** (normal / malfunction)
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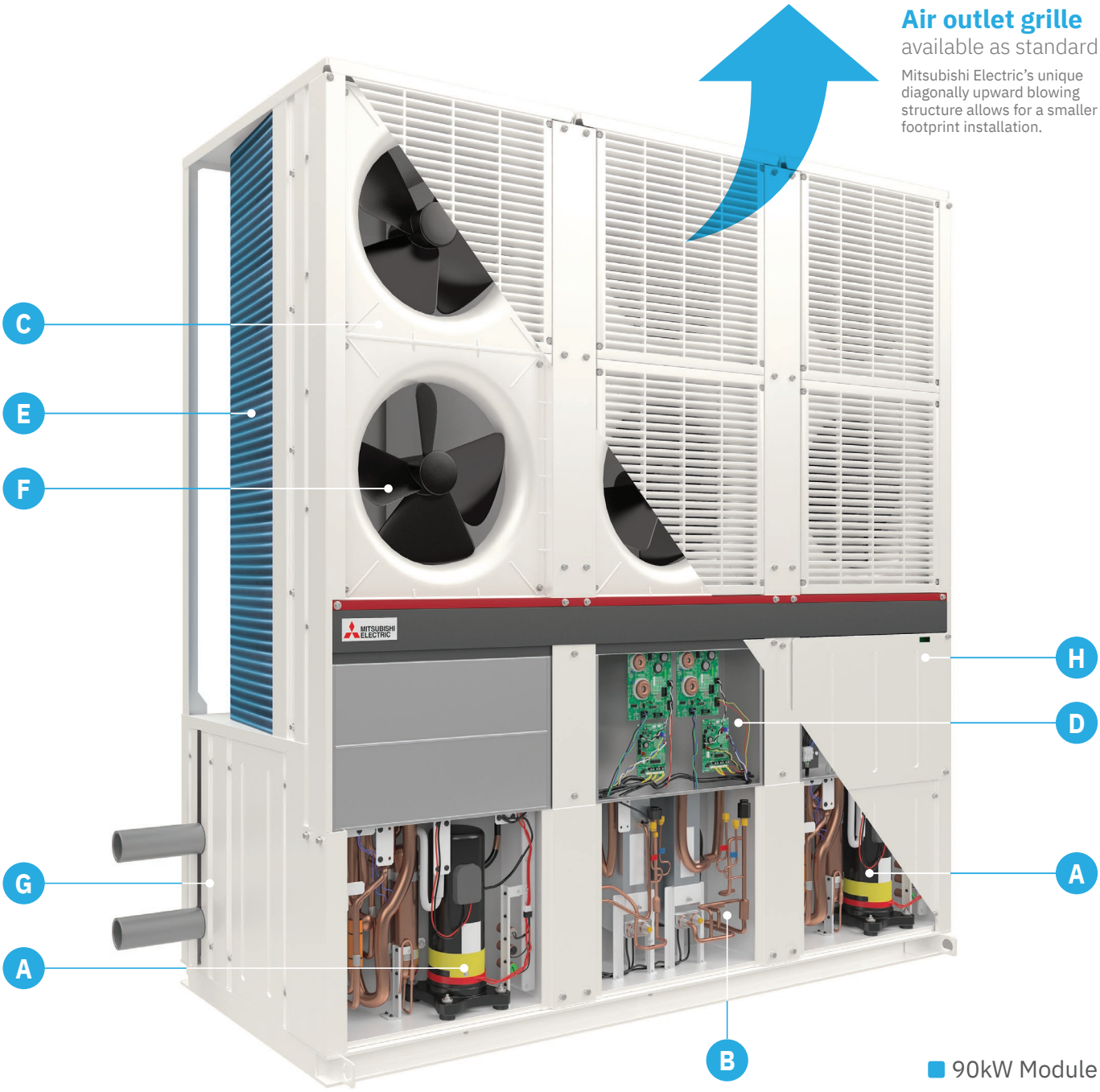
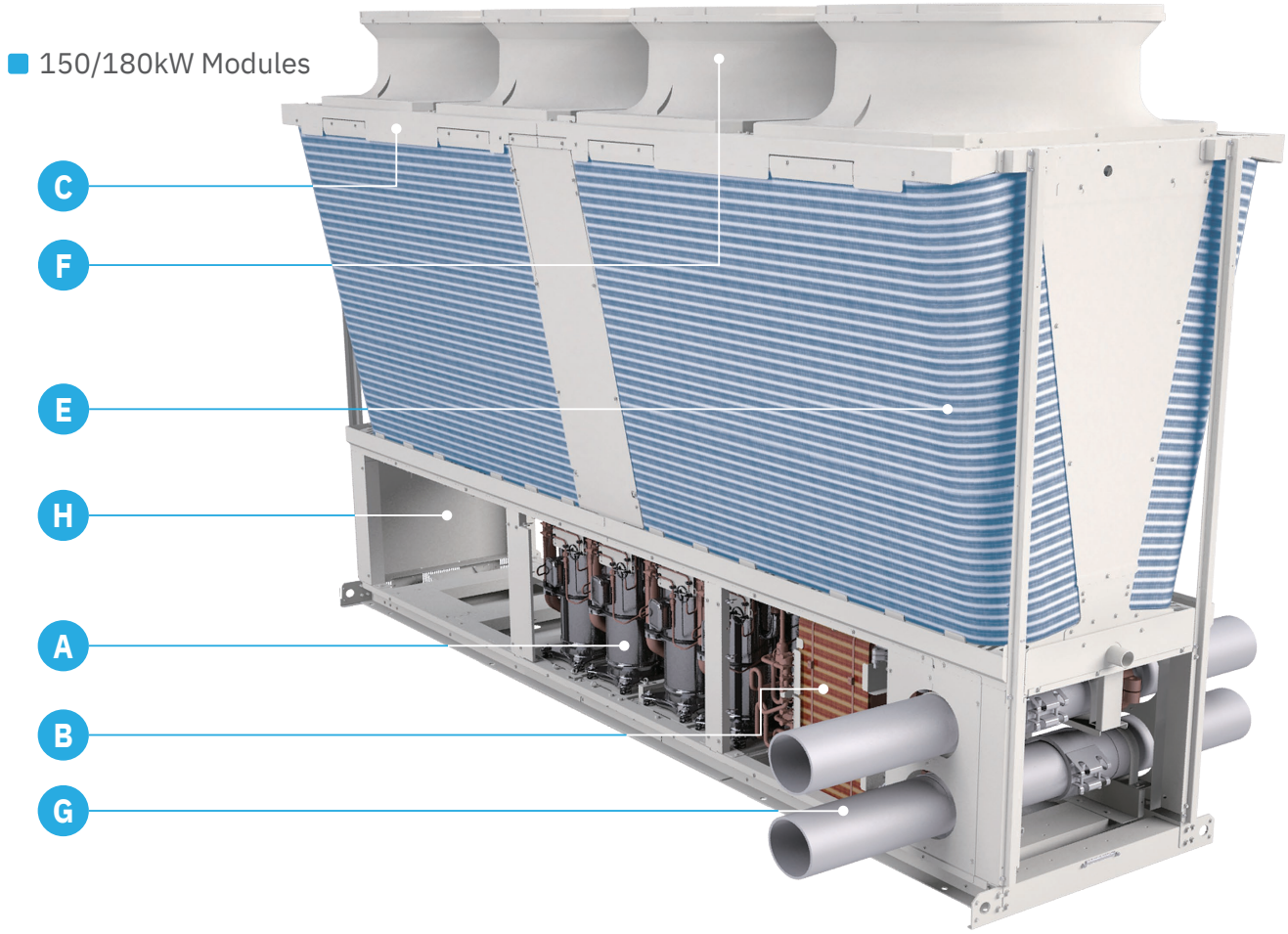
Fan operation for snow (off/on)	

Mandatory safety interlock input signals (for all control modes)
The e-series modular chiller has mandatory connections for external safety devices which MUST BE CONNECTED via hardwired Volt Free connections to the chiller terminals, these signals are:
Water Flow Switch - External 3rd party Volt Free Contact (close on flow) MUST BE CONNECTED to chiller terminals K10 & K11 (90kW), K23 & K24 (150 & 180kW)
Pump Interlock - External 3rd party Volt Free Contact (close on pump run) MUST BE CONNECTED to chiller terminals K04 & K06 (90kW), K01 & K02 (150 & 180kW).

Exceptional features

With the **e-series modular chiller range**, we have examined every single component to find ways of increasing performance, reliability and overall system efficiency.





The new products bring all of this advanced technology and know-how together in a unique package to aid design, specification, installation and on-going operation.

A: High efficiency inverter compressors

Multiple advanced DC inverter-driven scroll compressors are incorporated within each module. This gives a capacity range of 8% to 100% for each module.

B: Two-stage cooling circuit

All compressors serve separate plate heat exchangers located within the module. By modulating the evaporating temperature individually, overall system efficiency can increase by an additional 3.9%, compared to single evaporating refrigeration cycles.

C: Fan inverter control

Each refrigerant circuit has separately controlled, inverter-driven DC fans, allowing for more precise control to save energy and optimise system efficiency.

D: Front service

Access for the control box and other service parts is located at the front of the unit to ease service and maintenance regimes.

E: U and Y-shaped high performance compact air heat exchangers

The use of high performance, compact heat exchangers allows for a greater surface area whilst also keeping the units much narrower than conventional chillers. Blue Fin anti-corrosion coating on the heat exchanger is also provided as standard.

F: Fans

The fan blades have improved ventilation characteristics and a newly designed rear edge that suppresses wind turbulence to increase efficiency and reduce noise levels.

G: Internal header pipe

The in-built internal header pipes simplify design, installation and maintenance and makes the e-series range modular and suitable for almost any situation.

H: Digital indicator

A dedicated digital indicator inside the PCB displays high pressure, low pressure, water inlet temperature, water outlet temperature, error codes etc., thereby aiding service and maintenance.

Keeping the M&S Bank Arena & ACC Liverpool cool with Mitsubishi Electric e-series chillers

Mitsubishi Electric's cooling only **e-series** chillers have been selected for the M&S Bank Arena Liverpool to deliver energy efficient cooling to the venue.

The Arena provides live music, theatre, sporting events and comedy performances to audiences of up to 11,000. In December 2017, a huge fire devastated the car park adjacent to the arena, where the arena's chiller system was housed, causing irreparable damage to the structure of the car park and damaging the chillers. As a result, a new location for a chiller system was required.

When deciding on a solution, the owners of The ACC Liverpool Group, operators of the Arena, Convention Centre and their sister venue Exhibition Centre Liverpool, were faced with the challenge of limited space both on and around the arena for any new chillers to be located. The Arena's existing air handling units are housed in four small rooftop plant areas, but the narrow walkways around the AHUs did not offer sufficient space for a traditional chiller system to be installed.

The solution came in the form of 46 cooling only 90kW e-series modular chillers, which are now providing energy efficient comfort cooling to the Arena & Convention Centre.

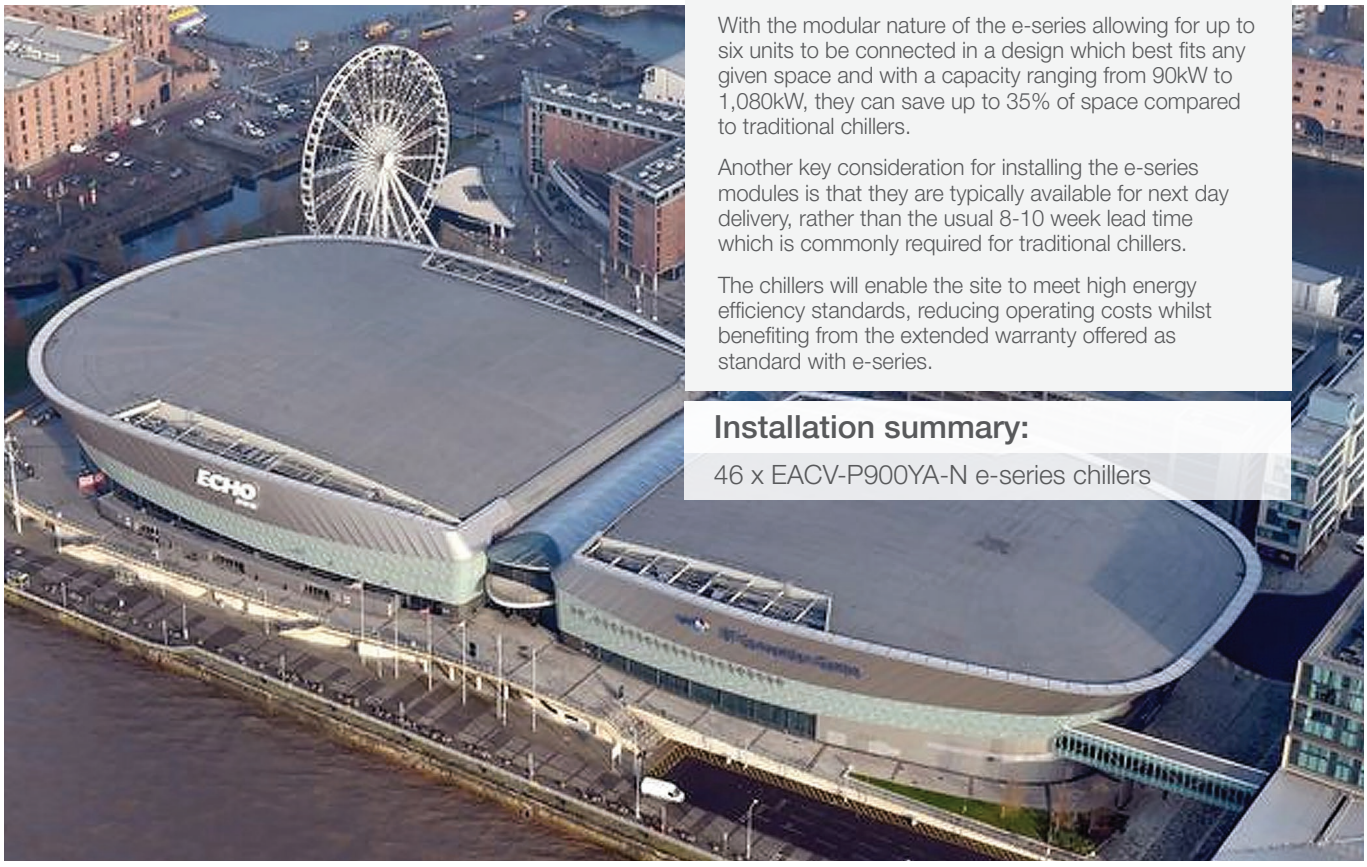
After engaging with Mitsubishi Electric, ENGIE's Senior Project Manager Adam Williams, saw the benefit of the e-series chillers. He said, "After the fire, I was not only managing the installation of temporary chillers to cool the facility through the summer months, but was also trying to provide The ACC Liverpool Group with a rapid, permanent cooling solution."

"The general consensus was that the solution we required just wasn't feasible, but we were confident that a solution could be engineered. As a result of my existing relationship with Mitsubishi Electric, I was familiar with their e-series product as an off-the-shelf, modular and highly efficient product which could be delivered quickly and meet with our restricted space requirements. Being modular, the chillers can literally be connected together in multiples of 90kW and are provided with pipe jointing kits to link the modules together."

With the modular nature of the e-series allowing for up to six units to be connected in a design which best fits any given space and with a capacity ranging from 90kW to 1,080kW, they can save up to 35% of space compared to traditional chillers.

Another key consideration for installing the e-series modules is that they are typically available for next day delivery, rather than the usual 8-10 week lead time which is commonly required for traditional chillers.

The chillers will enable the site to meet high energy efficiency standards, reducing operating costs whilst benefiting from the extended warranty offered as standard with e-series.



Installation summary:

46 x EACV-P900YA-N e-series chillers

e-series modular chiller installation provides efficient cooling for ASDA head office

ASDA House in Leeds is benefiting from energy-efficient cooling with the installation of ten Mitsubishi Electric **e-series** modular chillers, replacing its existing outdated system.

The site, ASDA's three-story head-office, operates as the central hub for the company and houses several functions, including office and meeting spaces, cafeterias, and customer support teams. The building needed a new, reliable, energy efficient chiller system to replace the old chiller units that were housed in one wing of the building.

ASDA House needed a chiller system which was able to meet the significant cooling demands of the building as efficiently as possible. As the company's head office, ASDA House also needed its cooling system to be extremely reliable to deliver a comfortable working environment in the offices. With a site located in the heart of Leeds city centre next to the river Aire, the site faces access restrictions, making ease and speed of installation a crucial factor.

Following a consultation with Mitsubishi Electric, the team were keen to use Mitsubishi Electric's e-series chillers, based on the range's efficiency and flexibility. ASDA worked with DDA Ltd consulting engineers and Yorkshire Building Services (YBS) installers to deliver ten e-Series EACV-P900YA-N chillers, providing 900kW of cooling to the wing of the building.

"For ASDA, it was important that it invested in a system which would operate flexibly at a variety of load conditions, but was also available in modular form," said Tim Anderson of YBS. "The installation restrictions were quite challenging, given ASDA House's location in the city centre, but thanks to the Mitsubishi Electric e-series chillers modular design, we were able to quickly get these up and running. It's also possible to relocate the chillers if needed, which is a significant bonus."

With a common internal header pipe, helping to simplify the design, installation, maintenance and reducing space requirements, the e-series is the perfect solution in restricted environments.

An important reason for the selection of the e-series was the product's resilience. This is delivered through the modular design of the system; with over twenty compressors, if a single compressor fails, 95% of the peak load can still be provided without interruption.

The decision to adopt a more reliable, modular solution presents ASDA with a great opportunity to evaluate the e-series chillers, before rolling it out more widely across its estate.

Installation summary:

10 x EACV-P900YA-N e-series chillers

e-series Modular Chiller (90-1,080kW)

Cooling Only

			EACV-P900YA-N	EACV-P1500YBL-N	EACV-P1800YBL-N
POWER SOURCE			3-phase 4-wire 380-400-415v, 50/60Hz	3-phase 4-wire 380-400-415v, 50/60Hz	3-phase 4-wire 380-400-415v, 50/60Hz
COOLING CAPACITY *1		kW	90.0	150.0	180.0
WATER		kcal/h	77,400	129,000	154,800
		BTU/h	307,080	511,800	614,160
	Power Input	kW	27.27	45.1	59.01
	EER (Pump input is not included)		3.30	3.33	3.05
	IPLV*3		6.34	6.55	6.33
	Water Flow Rate	m^3/h	15.5	25.8	31
COOLING CAPACITY		kW	90	148.6	177.8
(EN14511) *2		kcal/h	77,400	127,779	152,874
WATER		BTU/h	307,080	506,955	606,517
	Power Input	kW	29.2	46.52	61.25
	EER		3.08	3.19	2.90
	Eurovent Efficiency Class		B	A	B
	ESEER*4		4.71	4.74	4.45
	SEER (ηsc) (BS EN14825)		4.88 (192%)	4.62 (181%)	4.58 (180%)
	Water Flow Rate	m^3/h	15.5	25.8	31.0
	Minimum Water Circuit Volume	L	420	800	800
COOLING CAPACITY		kW	56.73	N/A	N/A
BRINE		kcal/h	48,788	N/A	N/A
(ethylene glycol 35WT%) *5 *6		BTU/h	193,563	N/A	N/A
	Power Input	kW	25.98	N/A	N/A
	Current Input 380 - 400 - 415V	A	43.9 - 41.7 - 40.2	N/A	N/A
	EER (Pump input is not included)		2.18	N/A	N/A
	EER (Includes pump input based on EN14511)		2.10	N/A	N/A
	SEPR (ηsc) (BS EN14825)		6.11 (241%)	N/A	N/A
	Brine (ethylenegylcol 35WT%) Flow Rate	m^3/h	11.5	N/A	N/A
CURRENT INPUT	Cooling Current 380 - 400 - 415V *1	A	46.0 - 43.7 - 42.2	77 - 73 - 70	77 - 73 - 70
	Maximum Current Input	A	61	111	111
WATER PRESSURE DROP *1	Water	kPa	135	114	164
	Brine (ethylene glycol 35WT%)*5	kPa	106	N/A	N/A
TEMP RANGE	Cooling Water	°C	Outlet water 5 ~ 25	Outlet water 5 ~ 30	Outlet water 5 ~ 30
	Cooling Brine (ethylene glycol 35WT%)*5	°C	Outlet brine -10 ~ 25	N/A	N/A
	Heating	°C	N/A	N/A	N/A
	Outdoor	°C	-15 ~ 43*6	-15 ~ 43	-15 ~ 43
CIRCULATING WATER VOLUME		m^3/h	15.5	25.8	31
SOUND PRESSURE LEVEL (measured in anechoic room) at 1m*1		dB(A)	65	66	68
SOUND POWER LEVEL (measured in anechoic room)*1		dB(A)	77	84	86
DIAMETER OF WATER PIPE	Inlet	mm	100A housing type joint	150A housing joint type	150A housing joint type
(Standard piping)	Outlet	mm	100A housing type joint	150A housing joint type	150A housing joint type
EXTERNAL FINISH			Polyester powder coated steel plate	Polyester powder coated steel plate	Polyester powder coated steel plate
EXTERNAL DIMENSION	Width x Depth x Height	mm	2250 x 900 x 2450	3400 x 1080 x 2350	3400 x 1080 x 2350
WEIGHT	Inside Header Piping "-N" Model	kg	1022	1256	1256
DESIGN PRESSURE	R410A	MPa	4.15	4.15	4.15
	Water	MPa	1	1	1
HEAT EXCHANGER	Water Side		Stainless steel plate and copper brazing	Stainless steel plate and copper brazing	Stainless steel plate and copper brazing
	Air Side		Plate fin and copper tube	Plate fin and copper tube	Plate fin and copper tube
COMPRESSOR	Type		Inverter scroll hermetic compressor	Inverter scroll hermetic compressor	Inverter scroll hermetic compressor
	Maker		Mitsubishi Electric Corporation	Mitsubishi Electric Corporation	Mitsubishi Electric Corporation
	Starting Method		Inverter	Inverter	Inverter
	Quantity		2	4	4
	Motor Output	kW	11.7 x 2	11.7 x 4	11.7 x 4
	Case Heater	kW	0.045 x 2	N/A	N/A
	Lubricant		MEL32	MEL32	MEL32
	Starting Current	A	8.5	19.1	19.1
	Max Running Current	A	61	111	111
FAN	Air Flow Rate	m^3/min	77 x 6	265 x 4	265 x 4
		L/s	1,283 x 6	4,417 x 4	4,417 x 4
		cfm	2,719 x 6	9,357 x 4	9,357 x 4
	Type, Quantity		Propeller fan x 6	Propeller fan x 4	Propeller fan x 4
	Starting Method		Inverter	Inverter	Inverter
	Motor Output	kW	0.19 x 6	0.94 x 4	0.94 x 4
PROTECTION	High Pressure Protection		High pres. sensor & High pres. switch at 4.15MPa (601psi)	High pres. sensor & High pres. switch at 4.15MPa (601psi)	High pres. sensor & High pres. switch at 4.15MPa (601psi)
	Inverter Circuit		Over-heat protection, Over-current protection	Over-heat protection, Over-current protection	Over-heat protection, Over-current protection
	Compressor		Over-heat protection	Over-heat protection	Over-heat protection
REFRIGERANT	Charge (kg)		19 x 2	15 x 4	15 x 4
	CO_2 Equivalent (t)		79.3	125.3	125.3
	Control		LEV	LEV	LEV

*1 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB outlet water temp 7°C inlet water temp 12°C. Outlet brine temp -5°C inlet brine temp 0°C. Pump input not included.
*2 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB outlet water temp 7°C inlet water temp 12°C. Pump input is included based on EN14511.
*3 IPLV IS is calculated in accordance with AHRI 550 - 590.
*4 ESEER is calculated in accordance with EUROVENT conditions.
*5 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB outlet brine temp -5°C inlet water temp 0°C.
*6 Only EACV-P900YA-N capable of water flow temps to -10°C.

■ Please always make water circulate, or take the circulation water out completely when not in use for long periods. ■ The water circuit must be closed circuit.
■ Due to continuous improvement, the above specifications may be subject to change without notice.

90kW Module

150/180kW Modules

e-series Modular Chiller (90-1,080kW)

Heat Pump

				EAHV-P900YA-N	EAHV-P1500YBL-N	EAHV-P1800YBL-N
POWER SOURCE				3-phase 4-wire 380-400-415v, 50/60Hz	3-phase 4-wire 380-400-415v, 50/60Hz	3-phase 4-wire 380-400-415v, 50/60Hz
COOLING CAPACITY *1			kW	90.0	150.0	180.0
WATER			kcal/h	77,400	129,000	154,800
			BTU/h	307,080	511,800	614,160
	Power Input		kW	30.6	45.1	59.01
	EER (Pump input is not included)			3.30	3.33	3.05
	IPLV *3			6.34	6.55	6.33
	Water Flow Rate		m^3/h	15.5	25.8	31
COOLING CAPACITY (EN14511) *2			kW	90	148.6	177.8
			kcal/h	77,400	127,779	152,874
WATER			BTU/h	307,080	506,955	606,517
	Power Input		kW	29.2	46.52	61.25
	EER			2.94	3.19	2.90
	Eurovent Efficiency Class			B	A	B
	ESEER*6			4.71	4.74	4.45
	SEER (ηsc) (BS EN14825)			4.88 (192%)	4.62 (181%)	4.58 (180%)
	Water Flow Rate		m^3/h	15.5	25.8	31.0
	Minimum Water Circuit Volume		L	780	1450	1450
HEATING CAPACITY*3			kW	90.0	150	180
			kcal/h	77,400	129,000	154,800
			BTU/h	307,080	511,800	614,160
	Power Input *3		kW	25.71	44.59	55.68
	COP			3.50	3.36	3.23
	Water Flow Rate		m^3/h	15.5	25.8	31.0
HEATING CAPACITY (EN14511) *4			kW	90.0	151.42	182.24
			kcal/h	77,400	130,221	156,726
			BTU/h	307,080	516,645	621,803
	Power Input *3		kW	27.6	46.01	57.92
	COP			3.25	3.29	3.15
	Eurovent Efficiency Class			A+	A	B
	SCOP Low/Medium			3.66 (143%) / 2.89 (113%)	3.24 (127%) / 2.85 (112%)	3.24 (127%) / 2.85 (112%)
	Water Flow Rate		m^3/h	15.5	25.8	31.0
CURRENT INPUT	Cooling Current 380 - 400 - 415V *1		A	46.0 - 43.7 - 42.3	77 - 73 - 70	77 - 73 - 70
	Heating Current 380 - 400 - 415V *3		A	43.4 - 41.2 - 39.7	76 - 72 - 69	76 - 72 - 69
	Maximum Current Input		A	61	111	111
WATER PRESSURE DROP *1	Water		kPa	135	114	164
TEMP RANGE	Cooling Water		°C	Outlet water 5 ~ 25	Outlet water 5 ~ 30	Outlet water 5 ~ 30
	Heating		°C	Outlet water 30 ~ 55	Outlet water 30 ~ 55	Outlet water 30 ~ 55
	Outdoor		°C	-15 ~ 43	-15 ~ 43	-15 ~ 43
CIRCULATING WATER VOLUME			m^3/h	15.5	25.8	31
SOUND PRESSURE LEVEL (measured in anechoic room) at 1m*1			dB(A)	65	66	68
SOUND POWER LEVEL (measured in anechoic room)*1			dB(A)	77	84	86
DIAMETER OF WATER PIPE (Standard piping)	Inlet		mm	100A housing type joint	150A housing joint type	150A housing joint type
	Outlet		mm	100A housing type joint	150A housing joint type	150A housing joint type
EXTERNAL FINISH				Polyester powder coated steel plate	Polyester powder coated steel plate	Polyester powder coated steel plate
EXTERNAL DIMENSION	Width x Depth x Height		mm	2250 x 900 x 2450	3400 x 1080 x 2350	3400 x 1080 x 2350
WEIGHT	Inside Header Piping "-N" Model		kg	1022	1326	1326
DESIGN PRESSURE	R410A		MPa	4.15	4.15	4.15
	Water		MPa	1	1	1
HEAT EXCHANGER	Water Side			Stainless steel plate and copper brazing	Stainless steel plate and copper brazing	Stainless steel plate and copper brazing
	Air Side			Plate fin and copper tube	Plate fin and copper tube	Plate fin and copper tube
COMPRESSOR	Type			Inverter scroll hermetic compressor	Inverter scroll hermetic compressor	Inverter scroll hermetic compressor
	Maker			Mitsubishi Electric Corporation	Mitsubishi Electric Corporation	Mitsubishi Electric Corporation
	Starting Method			Inverter	Inverter	Inverter
	Quantity			2	4	4
	Motor Output		kW	11.7 x 2	11.7 x 4	11.7 x 4
	Case Heater		kW	0.045 x 2	N/A	N/A
	Lubricant			MEL32	MEL32	MEL32
	Starting Current		A	8.5	19.1	19.1
	Max Running Current		A	61	111	111
FAN	Air Flow Rate		m^3/min	77 x 6	265 x 4	265 x 4
			L/s	1,283 x 6	4,417 x 4	4,417 x 4
			cfm	2,719 x 6	9,357 x 4	9,357 x 4
	Type, Quantity			Propeller fan x 6	Propeller fan x 4	Propeller fan x 4
	Starting Method			Inverter	Inverter	Inverter
	Motor Output		kW	0.19 x 6	0.94 x 4	0.94 x 4
PROTECTION	High Pressure Protection			High pres. sensor & High pres. switch at 4.15MPa (601psi)	High pres. sensor & High pres. switch at 4.15MPa (601psi)	High pres. sensor & High pres. switch at 4.15MPa (601psi)
	Inverter Circuit			Over-heat protection, Over-current protection	Over-heat protection, Over-current protection	Over-heat protection, Over-current protection
	Compressor			Over-heat protection	Over-heat protection	Over-heat protection
REFRIGERANT	Charge (kg)	R410A (GWP 2088)		19 x 2	15 x 4	15 x 4
	CO_2 Equivalent (t)			79.3	125.3	125.3
	Control			LEV	LEV	LEV

*1 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB outlet water temp 7°C inlet water temp 12°C. Pump input not included.
*2 Under normal cooling conditions at outdoor temp 35°CDB/24°CWB outlet water temp 7°C inlet water temp 12°C. Pump input is included based on EN14511.
*3 Under normal heating conditions at outdoor temp 7°CDB/6°CWB outlet water temp 45°C inlet 40°C. Pump input not included.
*4 Under normal heating conditions at outdoor temp 7°CDB/6°CWB outlet water temp 45°C inlet 40°C. Pump input power is included, based on EN14511.
*5 IPLV IS is calculated in accordance with AHRI 550 - 590.
*6 ESEER is calculated in accordance with EUROVENT conditions.

■ Please always make water circulate, or take the circulation water out completely when not in use for long periods. ■ The water circuit must be closed circuit.
■ Due to continuous improvement, the above specifications may be subject to change without notice.

F-Gas phase down

The European Union is committed to reducing the environmental impact of refrigerants and to lower the consumption and use of HFCs within with a number of industry sectors for which air conditioners and other HVAC applications form a part of.

The ultimate objective is to cut the availability of HFCs by **79%** between 2015 and 2030.

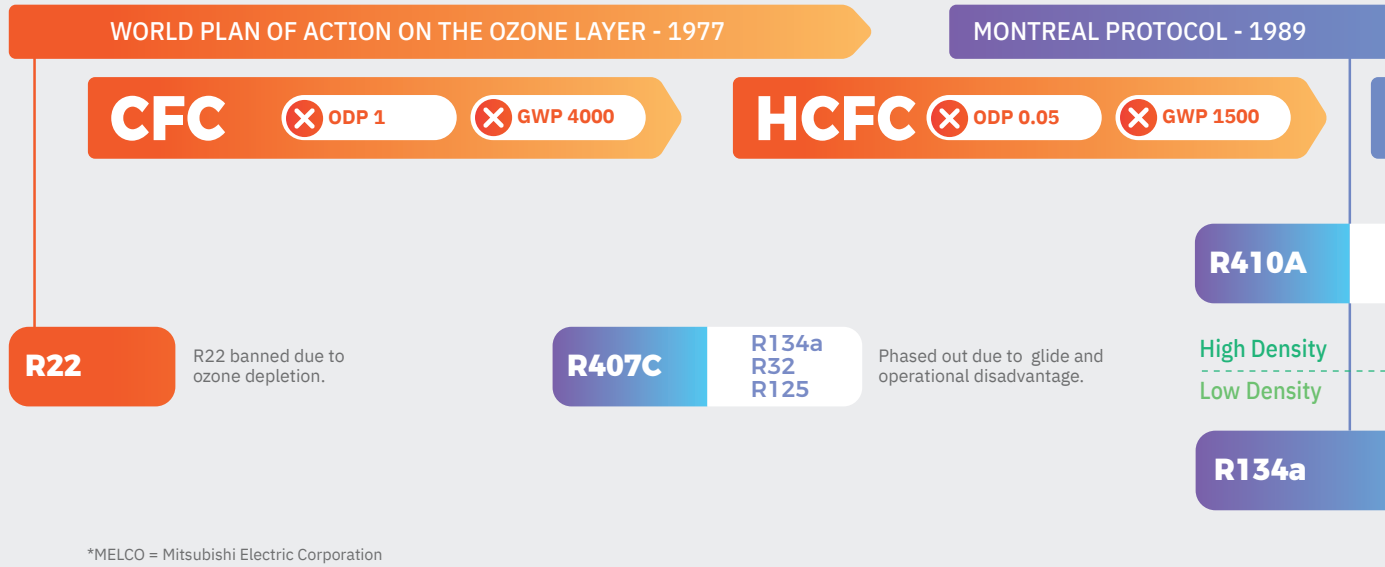
From 1st January 2015, the phase down of hydrofluorocarbons (HFCs), and bans on use of the refrigerants in certain sectors of new equipment, began.

The European Union (EU) is restricting the availability of HFCs through a quota system policed by the Environment Agency in the UK. The environmental impact of HFC refrigerants are expressed as global warming potential [GWP] which can be used to calculate a CO_2 equivalent (CO_2-eq) for any given volume of refrigerant, as seen below in the example.

The CO_2 equivalent is calculated using the following formula:

- **Equivalent Tonnes of CO_2 =**
  Weight of refrigerant x GWP divided by 1000
- ***Example;*** for a system with 10kg of R410A:
  Equivalent Tonnes of CO_2 =
  10 x 2088 divided by 1000 = **20.88 tonnes**

The future of refrigerants

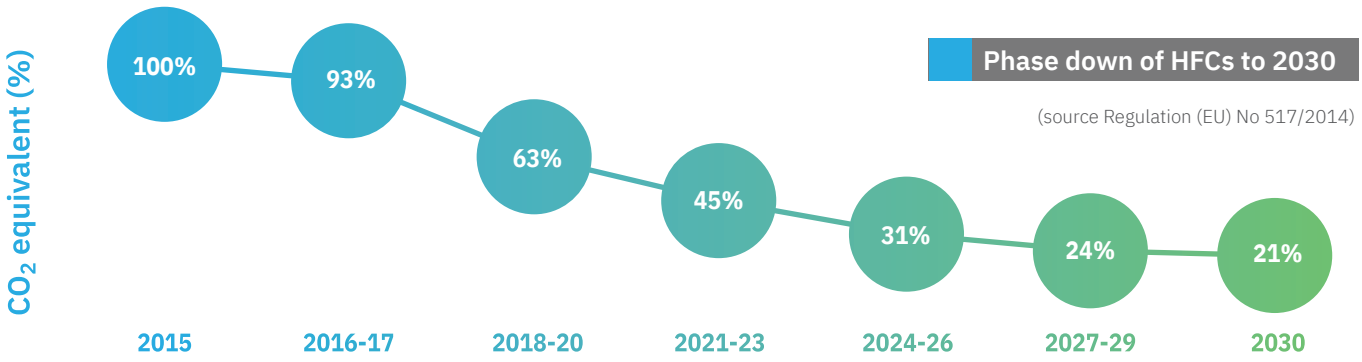


*MELCO = Mitsubishi Electric Corporation

High density refrigerants - Scroll compressors

R32 - Good for <50kW inverter driven applications
- Increase in efficiency
- Capacity increase
- Technology only available for small inverter driven compressors
- Cost neutral
- A2L
- Chosen Due to availability of small DX compressors using inverters to manage higher discharge temperatures

R454B - Good for >100kW fixed speed application
- Increase in efficiency
- Same capacity
- Technology only available for larger fixed speed compressors
- Cost neutral
- Can be used as a 'drop in' for R410A chillers
- Chosen due to availability of components in Europe



The illustration above gives a good overview of what percentage of the baseline 183 million tonnes CO_2-eq will be available to the EU market up to 2030. It should be noted that the quotas are issued EU-wide, rather than set for each country. Although the illustration shows dates to 2030, there are plans to go beyond that year with further phase downs. The next major drop is in 2021, where the F-Gas quota will be reduced to 55% of 2015 baseline figures.

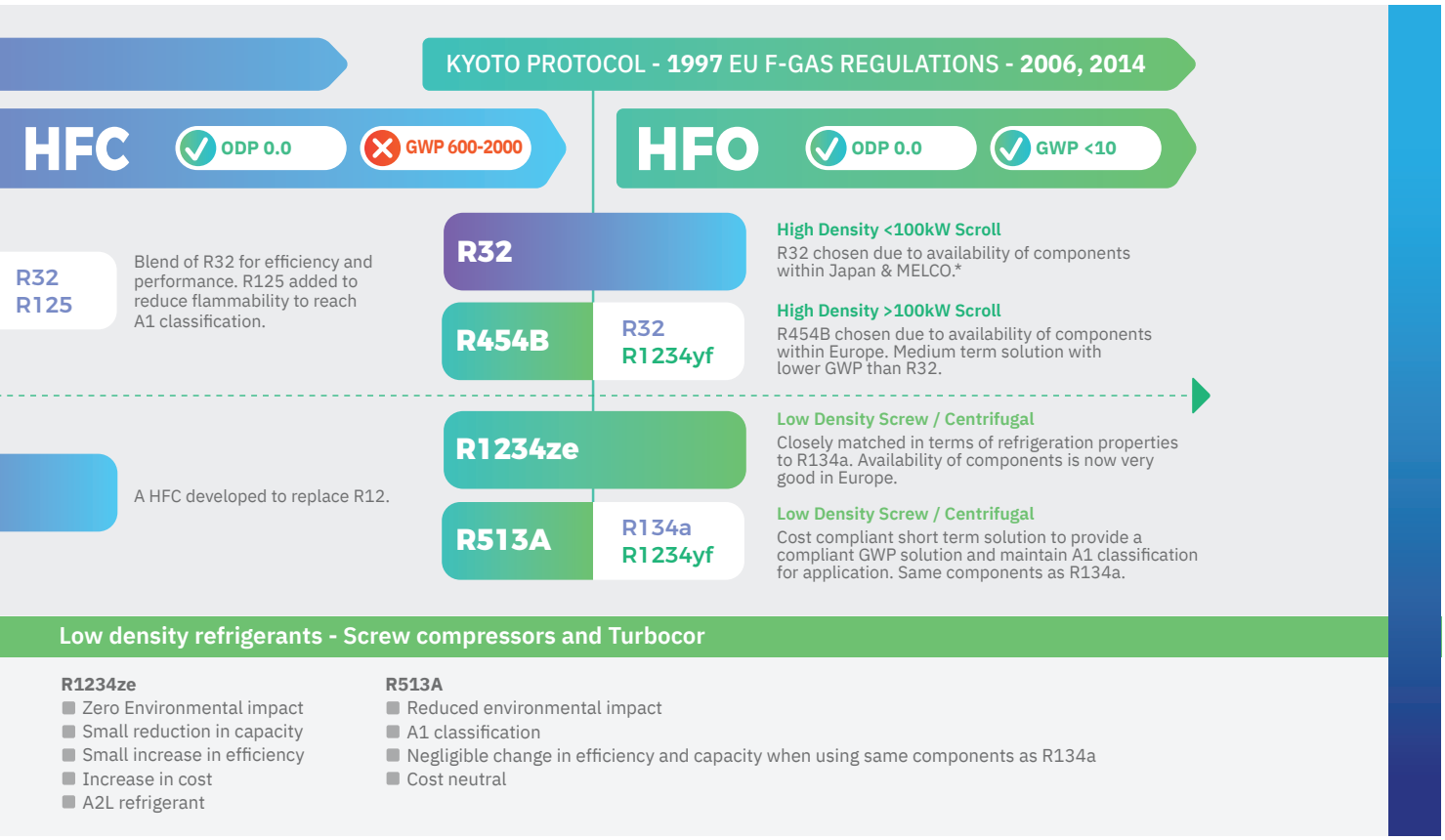
The impact on pricing and the HFC market

The HFC phase down process was intended to bring about market change, and it certainly seems to have achieved that. The price of refrigerants has risen, in the case of some types of refrigerant very significantly, affecting the air conditioning market as well as retail where the gases are used for food cooling.

The Commission regards the price rises as an indication that the phase down process is working. It also recommends a number of different actions that can be taken to avoid the price rises. The Commission also points to a 'number of new blends' which are available as alternatives to the higher GWP refrigerants.

The alternatives

As the Commission pointed out, a number of lower GWP refrigerants are now on the market and offer a long-term solution for future proofing air conditioning in buildings. In the chiller arena, there are a number of refrigerants available as shown in the illustration below. The most common new alternatives are HFOs - hydrofluoro olefins. These include R1234ze and R1234yf, for example.



Heat Recovery

Heat is required in buildings across the year. Whether it is used for space heating or domestic hot water services, **heat is vital for occupant comfort and health**.

However, production of heat in buildings not only represents a cost in terms of energy, but is also increasingly under pressure from legislation due to the carbon and other emissions associated with heating systems.

The drive to cut carbon produced when heating buildings is now well and truly on, and optimising efficient production and use of heat is rapidly rising up the agenda.

Electrification of heat

The UK has been very successful in decarbonising its electricity production. **As a result, electricity is regarded as a 'cleaner' energy source than gas.**

The government's emission factors reflect this shift away from fossil-fuels, and they are intended to encourage businesses to move to electricity as the source of heating.

Heat recovery from Mitsubishi Electric

Heat recovery offers a number of benefits which are proving very useful for today's built environment. While low-carbon heating options for buildings are certainly available, they generally occupy a larger footprint than traditional systems. Inner city applications are using much more compact HVAC solutions.

Heat recovery systems can be included in the HVAC plan with little to no impact on space requirements and can have a dramatic impact, reducing energy consumption and carbon emissions.

For mixed use projects or large offices, where heat profiles are diverse, heat recovery works particularly well. Heat can be captured from the cooling process and used to reduce the heating requirements in other areas of the building.

Partial Heat Recovery (desuperheater)

This method is great for smaller applications and is an excellent solution for providing domestic hot water (DHW) in a building. Each refrigerant circuit is fitted with a desuperheater in series with the condenser coils.

This harnesses the 'waste' energy in the form of heat and is ideal for providing hot water at around 60ºC.

Simultaneous heating and cooling chillers

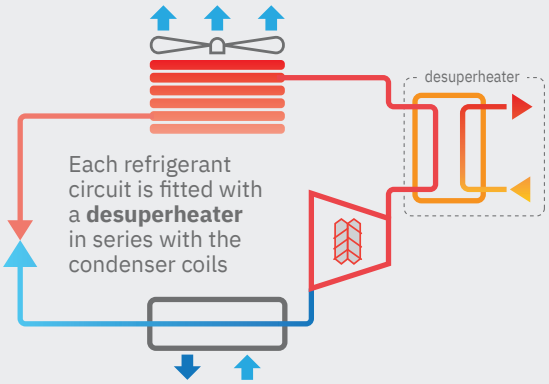
This is an approach that works very well in mixed-use applications, large office buildings and data centres where there are coincidental heating and cooling loads.

Simultaneous heating and cooling equipment, sometimes referred to as 4 pipe chillers, has the usual compressor, condenser and evaporator components. However, it also contains additional auxiliary exchangers, enabling the chiller to take the 'waste' heating or cooling energy and to transfer it where it's needed in the building.

i-FX-Q2-G05
R513A / Up to 1,600kW

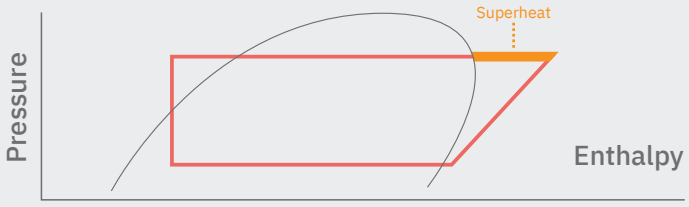
INTEGRA

Partial heat recovery (desuperheater)

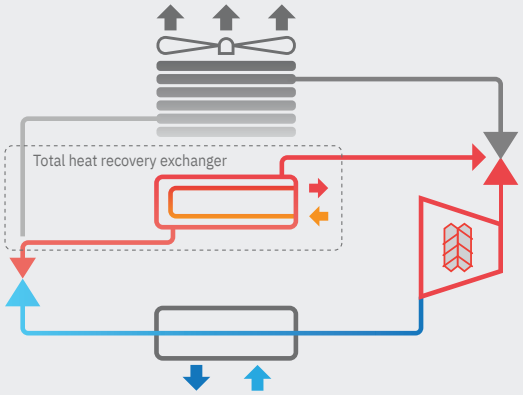


Approximately **20%** of the chiller's capacity

Up to **60°C** of outlet water temperature



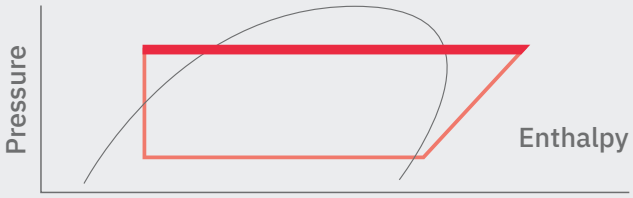
Simultaneous heating and cooling chillers



Each refrigerant circuit is fitted with a **total heat recovery exchanger** in parallel with the condenser coils

Always **100%** of the chiller's capacity

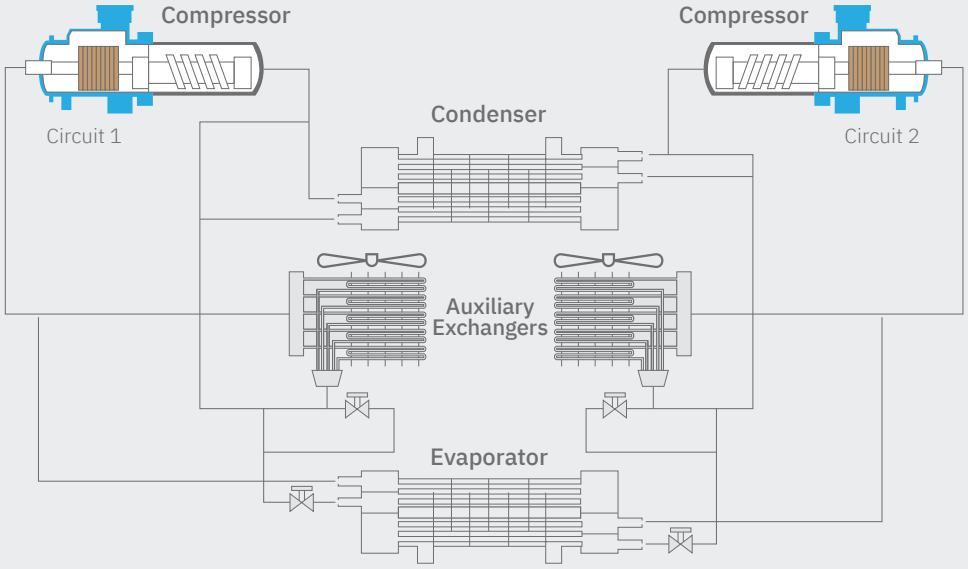
Up to **60°C** of outlet water temperature



Climaveneta 4-Pipe Integra chiller operation

Simultaneous and Independent

Heating and Cooling



Our **Traditional Chiller** Range

Consisting of a wide range of models, the Climaveneta range of chillers are a **new generation of water chiller** designed for comfort and process cooling applications.

Modern multi-function buildings, shopping centres, large business centres and process cooling are just some of the examples where increased comfort and precision control are required.

The Climaveneta range of chillers can deliver all of this and more through their ability to be easily integrated into ever increasingly complex building systems.

In order to maximise performance, reliability and overall system efficiency, the Climaveneta range of products bring advanced technology and know-how together in customisable packages to aid design, specification, installation and on-going operation.

- Advanced technology
- Air source and water cooled versions
- Scalable and fully customisable
- Plate or Shell & Tube heat exchanger options

Flexible Application Options

Comfort Cooling

By using hydronic terminals, a simple application of a chiller can include cooling a space or environment to a set temperature.

By using water as the medium of energy, high sensible cooling and stable room temperatures can be achieved.

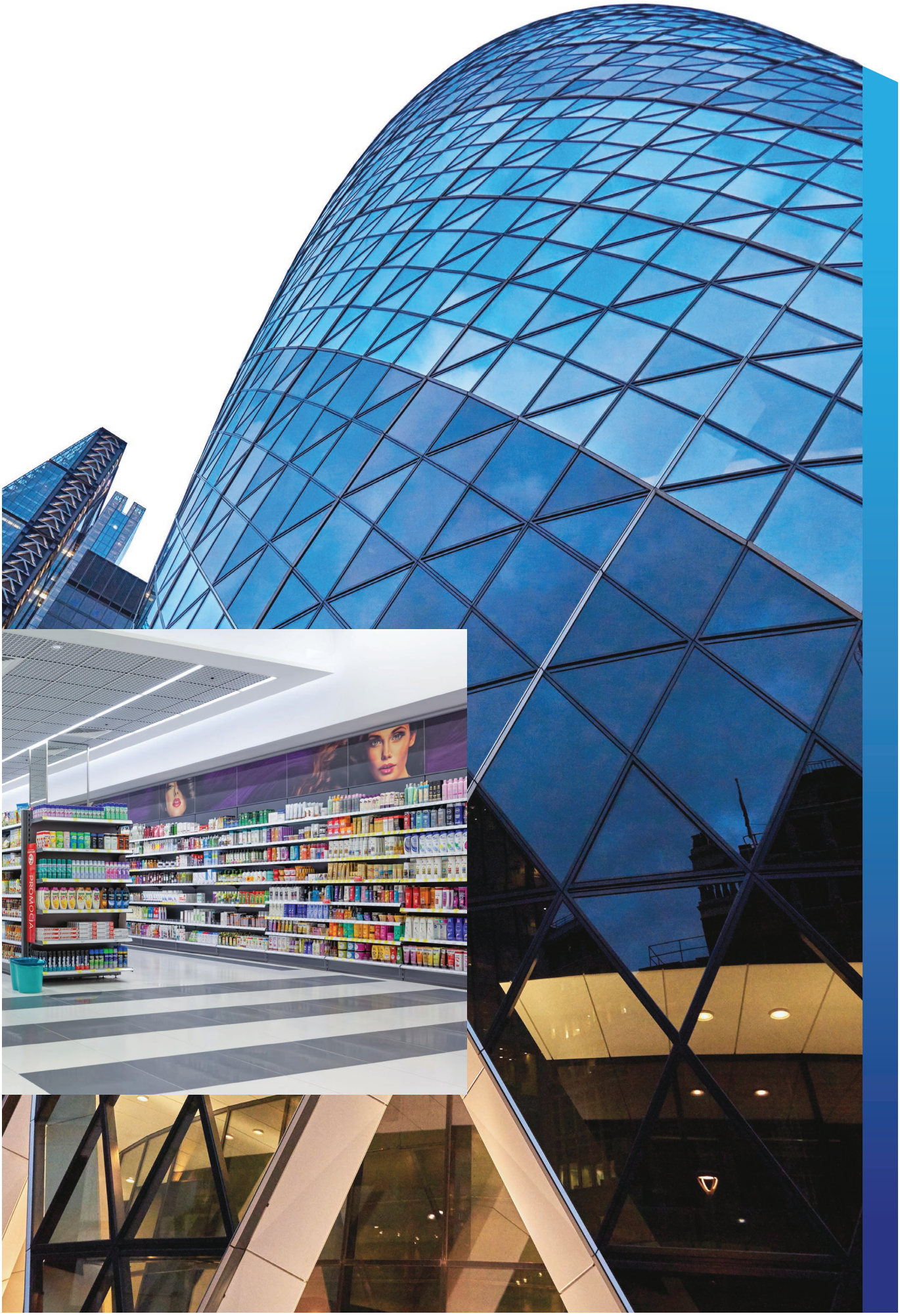
- **Retail stores / Shopping centres**
- **Airports**
- **Offices**
- **Cinemas / Theatres**
- **Schools / Universities**
- **Museums**
- **Hotels and Resorts**
- **Hospitals / Healthcare**

Process Cooling

During manufacturing processes, many substances become hot and if overheated can negatively effect the productivity and efficiency of the process.

By correctly applying a chiller it is possible to ensure optimum temperatures and conditions are maintained at a steady state.

- **Manufacturing processes**
- **Automotive and Electronic processes**
- **Energy and Power generation**
- **Industrial technology**



Chillers for **Cooling Only** Applications

A wide range of advanced, customisable models for use in efficiently cooling a space or an environment to a set temperature.

Key Features

- Energy efficient, customisable chillers
- Low noise levels
- Low GWP, HFO and R513A refrigerant options
- Free cooling available

Air Cooled Chillers

i-BX	Inverter driven scroll compressors			INVERTER	AXIAL	PLATES	4 – 35
i-NX	Inverter driven scroll compressors			INVERTER	AXIAL	PLATES	43 – 129
NX	Scroll compressors			R 454B	AXIAL	PLATES	39 – 327
NX	Scroll compressors				AXIAL	SHELL&T.	159 – 352
NECS	Scroll compressors				AXIAL	SHELL&T.	334 – 885
FX	Screw compressors	R HFO1234ze	R 513A	PLATES	AXIAL	SHELL&T.	140 – 1710
i-FX (1+i)	Inverter driven screw compressors	R HFO1234ze	R 513A	INVERTER	AXIAL	SHELL&T.	447 – 1697
TECS2	Inverter driven oil-free centrifugal compressors	R 513A		INVERTER	AXIAL	EC FAN	FLOODED	220 – 1324
TECS2 HFO	Inverter driven oil-free centrifugal compressors		INVERTER	R HFO1234ze	EC FAN	FLOODED	339 – 1017

Capacity Range: 500 | 1000 | 1500kW

Water Cooled Chillers

NX-W	Scroll compressors					PLATES	38 – 398
FX-W	Screw compressors	R 513A		R HFO1234ze		SHELL&T.	124 – 401
FOCS2-W	Screw compressors			R 513A		SHELL&T.	306 – 2416
FOCS3-W	Screw compressors			R 513A		FLOODED	188 – 1693
i-FX-W (1+i)	Screw compressors	R 513A		INVERTER		FLOODED	532 – 1784
TECS2-W HFO	Inverter driven oil-free centrifugal compressors	R HFO1234ze		INVERTER		FLOODED	340 – 1364
TX-W	Inverter driven oil-free centrifugal compressors	R 513A		INVERTER		FLOODED	246 – 4191

Capacity Range: SET | 1000 | 2000 | 3000 | 4000kW

Condenserless Chillers

NECS-ME	Scroll compressors	PLATES	39 – 432
FOCS-ME	Screw compressors	SHELL&T.	79 – 2240

Capacity Range: 500 | 1000 | 1500 | 2000kW

Air Cooled with Free-Cooling Technology

TECS-FC	Inverter driven oil-free centrifugal compressors	R 513A	INVERTER	EC FAN	SHELL&T.	302 – 1693

Capacity Range: 500 | 1000 | 1500kW

Air Cooled Chillers with Evaporative Free-Cooling Technology

TECS-EFC	Inverter driven oil-free centrifugal compressors	INVERTER	AXIAL	FLOODED	300 – 1693

Capacity Range: 500 | 1000 | 1500kW

Chillers for **Heat Pump** Applications

A wide range of advanced, customisable models for use in efficiently cooling or heating a space or an environment to a set temperature.

Key Features

- Energy efficient, customisable chillers
- Low noise levels
- Low GWP, HFO and R513A refrigerant options
- Free cooling available
- Hot water production up to 78°C

Air to Water Reversible Heat Pumps

			Capacity Range
NX-N	Scroll compressors	R 454B · SCROLL · AXIAL · P PLATES	38 – 319
i-NX-N	Inverter driven scroll compressors	INVERTER · SCROLL · AXIAL · P PLATES	41 – 128
FOCS-N	Screw compressors	SCREW · AXIAL · T SHELL&T.	441 – 1162

500 1000kW

Water to Water Heat Pumps Reversible on Hydraulic Side

			Capacity Range
NX-W/H	Scroll compressors	SCROLL · P PLATES	24 – 398
i-FX-W/H	Inverter screw compressors	R 513A · INVERTER · SCREW · FL FLOODED	532 – 1784
FOCS2-W/H	Scroll compressors	SCREW · T SHELL&T.	306 – 2416

1000 2000kW

Water to Water Reversible Heat Pumps

			Capacity Range
NX-W/H	Scroll compressors	SCROLL · P PLATES	37 – 398

200 400 600 800kW

Heating Only Heat Pumps

			Capacity Range
AW-HT	Air source with scroll compressors	SCROLL · AXIAL · P PLATES	38 – 205
EW-HT	Water source with scroll compressors	SCROLL · P PLATES	70 – 279

100 200 300kW

Key

Green HFO Refrigerants - Climaveneta uses green HFO refrigerants such as HFO1234ze and HFO1234yf in many ranges.

Magnetic Levitation - Magnetic levitation centrifugal compressors range from 200kW to 4MW in both air source and water source, free cooling and evaporative free cooling versions, to deliver the highest efficiency in every application.

Inverter Driven Compressor - The capacity is modulated resulting in increased efficiency as well as in the possibility to effectively implement smart management solutions such as active redundancy.

VPF - The VPF (Variable Primary Flow) dynamically optimises the unit's thermoregulation for variable flow operation, thus ensuring both the highest pump energy savings and stable chiller operation.

Leading Heat Recovery Technology - Heat recovery solutions are employed, such as thermodynamic, plate and rotary heat recovery as well as refrigerant booster.

Configurable Efficiency Set - 3 energy efficiency standard configurations available with most hydronic units.

High Water Temperature - A complete range of solutions designed to deliver high water temperature for any heating requirement.

INTEGRA Simultaneous Heating & Cooling 4-pipe Chiller System

Air and Water sourced units for 4-pipe systems, using either scroll, screw or inverter screw compressors. Available from 45 to 1,125kW, these systems provide simultaneous heating and cooling in a highly efficient manner.

Key Features

- TER (Total efficiency Ratio) of up to 8
- Minimal footprint requiring less plant space
- Reduction of onsite operations as INTEGRA negates the need to connect to the gas network

Air to Water Units

Capacity Range (200 / 400 / 600 / 800kW)

Model	Compressors	Features	Capacity Range (kW)
i-NX-Q	Inverter scroll compressors	INVERTER, SCROLL, AXIAL, PLATES	45 – 165
NECS-Q	Scroll compressors	SCROLL, AXIAL, SHELL&T.	150 – 928
ERACS2-Q	Screw compressors	R 513A, SCREW, AXIAL, SHELL&T.	200 – 826
i-FX-Q2	Inverter screw compressors	R 513A, INVERTER, SCREW, EC FAN, SHELL&T.	334 – 1125

Water to Water Units

Capacity Range (200 / 400 / 600 / 800kW)

Model	Compressors	Features	Capacity Range (kW)
NECS-WQ	Scroll compressors	SCROLL, PLATES	48 – 442
ERACS-WQ	Screw compressors	R 513A, SCREW, SHELL&T.	189 – 393

Key

Inverter Driven Compressor - The capacity is modulated resulting in increased efficiency as well as in the possibility to effectively implement smart management solutions such as active redundancy.

VPF - The VPF (Variable Primary Flow) dynamically optimises the unit's thermoregulation for variable flow operation, thus ensuring both the highest pump energy savings and stable chiller operation.

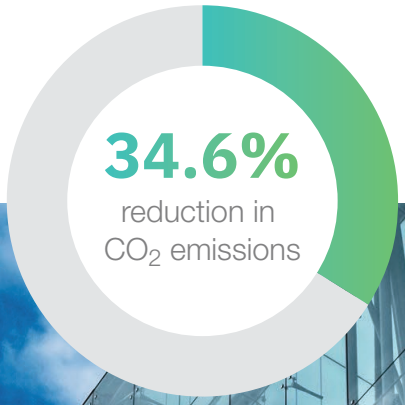
Configurable Efficiency Set - 3 energy efficiency standard configurations available with most hydronic units.

High Water Temperature - A complete range of solutions designed to deliver high water temperature for any heating requirement.

Smart Thermal Energy Management - An innovative heat recovery system that allows the smart use of rejected heat from the industrial process for comfort heating and other neighbouring applications.

Reducing CO_2 emissions and increasing energy efficiency at 350 Euston Road

Owned by British Land and managed by Broadgate Estates, this property has achieved significant energy reduction targets and has been heralded as a best-practice example for energy savings by several independent institutions, including CIBSE.



At 350 Euston Road, Regent's Place, owner British Land and management team Broadgate Estates Ltd have reduced energy use for common areas and shared services by 65% in six years. Alongside no-cost and low-cost efficiency initiatives, a new air source heat pump is now delivering additional cost savings for occupiers and CO_2 reductions, whilst maintaining thermal comfort levels in the building.

British Land is one of the UK's leading property firms. The company's award winning energy reduction programme at Euston Road generates cost savings for occupiers and protects asset value for investors. 350 Euston Road is a seven-storey building, offering over 130,000 sq ft of office space and is occupied by a multitude of large firms.

When the traditional boiler and chiller system at 350 Euston Road was due for replacement, British Land and Broadgate Estates Ltd partnered with Climaveneta, to identify the most efficient solution, and worked closely with Cavendish Engineers to integrate it into the building. The old central heating, ventilation and air conditioning (HVAC) system comprised three boilers, two air-cooled chillers and two air handling units (AHUs) without heat recovery, as well as on-floor fan coil units.

The selected heat pump (Climaveneta INTEGRA ERACS2-Q) efficiently produces a combination of hot and chilled water, replacing the need for separate boiler and chiller units and saving valuable roof space.

- **34.6% Reduction in CO_2**
- **£51,000 Operational cost savings**
- **Payback within a year**
- **81.5% Reduction in gas use**
- **46.8% Primary energy reduction**
- **218 Tonnes less CO_2 in the first year**
- **32% Electric energy reduction**

"We believe that British Land is one of the first landlords to retrofit this type of technology in the UK. The air source heat pump has proven well suited to the building's position and to occupiers' heating and cooling demands. We will continue to identify further opportunities to retrofit this and other low or zero carbon technologies."

Matthew Webster,
Sustainability and Wellbeing Executive at British Land

Installation summary:

1 x ERACS2-Q/SL-CA/S 2222
1x TECS2/SL-CAE/S 0512, 1x ClimaPRO
Cooling capacity: 1,022 kW
Heating capacity: 541 kW

i-BX Air Cooled Chillers

Climaveneta's range of small to medium sized, cooling only chillers efficiently and easily adapt to a wide range of cooling capacities. The range all contain inverter driven compressors for enhanced efficiency and control.

Key Features

- Packaged monobloc unit for easy installation
- Full inverter technology with Mitsubishi Electric BLDC compressors
- Extended cooling range, water outlet temperature -8 ~ 18°C, at ambient range of -10 ~ 45°C
- Dynamic water set point, varies outlet temperature depending on ambient temperature
- EC water pump, relief valve, flow switch, safety valve and expansion vessel
- Night function incorporated to reduce noise levels during the night
- ErP 2021 compliant
- Modbus connectivity option
- Additional accessories available upon request

i-BX Air Cooled Chiller (4.3-12.9kW) Cooling Only - Single Phase

MODEL		i-BX 004 MNAN RV	i-BX 006 MNAN RV	i-BX 008 MNAN RV	i-BX 010 MNAN RV	i-BX 013 MNAN RV
POWER SUPPLY	V / ph / Hz	230 / 1 / 50	230 / 1 / 50	230 / 1 / 50	230 / 1 / 50	230 / 1 / 50
PERFORMANCE						
COOLING CAPACITY *1	kW	4.3	6.11	8.1	10.6	12.9
TOTAL POWER INPUT *1	kW	1.55	2.12	2.82	3.64	4.74
EER *1		2.77	2.88	2.87	2.91	2.72
ESEER *1		4.2	4.36	4.7	4.29	4.55
COOLING ONLY (EN14511 VALUE)						
COOLING CAPACITY *1 *2	kW	4.3	6.11	8.11	10.6	12.9
EER *1 *2		2.82	2.92	2.92	2.92	2.74
ESEER *1 *2		4.53	4.6	5.08	4.34	4.69
COOLING ENERGY CLASS		C	B	B	B	C
SEASONAL EFFICIENCY IN COOLING (Reg.EU 2016/2281) - Average Climate Conditions						
SEER		4.38	4.43	4.93	4.39	4.78
PERFORMANCE (ηs) *3	%	172	174	194	172	188
HEAT EXCHANGER (USER SIDE)						
WATER FLOW *1	l/s	0.21	0.29	0.39	0.51	0.62
MIN. SYSTEM WATER CONTENT	l	10	15	19	24	31
INLET / OUTLET CONNECTION SIZE	in	1"	1"	1"	1"	1"1/4
REFRIGERANT CIRCUIT						
COMPRESSORS	N°	1	1	1	1	1
CIRCUITS	N°	1	1	1	1	1
REGULATION		STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
MIN. CAPACITY STEP	%	25	25	25	25	25
REFRIGERANT CHARGE R410A	kg	1.45	2.1	3.55	3.6	3.65
CO_2 EQUIVALENT	t	3.02	4.38	7.41	7.51	7.62
OIL CHARGE	kg	0.35	0.35	0.4	0.87	1.4
ELECTRICAL						
FULL LOAD POWER (F.L.I.)	kW	1.9	2.7	3.7	4.9	6.5
FULL LOAD CURRENT (F.L.A.)	A	8.7	12.3	16.1	22.6	25.3
INRUSH CURRENT (S.A.)	A	1	1	1	1	1
FANS						
QUANTITY	N°	1	1	1	2	2
AIRFLOW	m^3/s	1.02	0.98	0.99	1.74	1.58
FANS POWER INPUT	kW	0.12	0.12	0.12	0.12	0.12
NOISE LEVEL						
SOUND PRESSURE *4	dB(A)	33	34	35	38	39
SOUND POWER *5 *6	dB(A)	64	65	66	69	70
SIZE AND WEIGHT						
WIDTH *7	mm	900	900	900	900	900
DEPTH *7	mm	370	370	420	420	420
HEIGHT *7	mm	940	940	1240	1240	1240
OPERATING WEIGHT *7	kg	75	80	95	110	125

*1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C. *2 Values in compliance with EN14511-3:2013.
*3 Seasonal energy efficiency of space cooling. *4 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
*5 Sound power on the basis of measurements made in compliance with ISO 9614. *6 Sound power level in cooling, outdoors.
*7 Unit in standard configuration/execution, without optional accessories.

Eurovent Certified Data

i-BX Air Cooled Chiller (10.7-35.1kW) Cooling Only - Three Phase

MODEL		i-BX 010THAN RV	i-BX 013THAN RV	i-BX 015THAN RV	i-BX 020THAN RV	i-BX 025THAN RV	i-BX 030THAN RV	i-BX 035THAN RV
POWER SUPPLY	V / ph / Hz	415/3/50+N	415/3/50+N	415/3/50+N	415/3/50+N	415/3/50+N	415/3/50+N	415/3/50+N
PERFORMANCE								
COOLING CAPACITY *1	kW	10.7	13.3	15.5	20.6	25	29.8	35.1
TOTAL POWER INPUT *1	kW	3.64	4.74	5.44	7.2	8.69	10	11.8
EER *1		2.94	2.81	2.85	2.86	2.88	2.98	2.97
ESEER *1		4.36	4.57	4.14	4.12	4.26	4.15	4.29
COOLING ONLY (EN14511 VALUE)								
COOLING CAPACITY *1 *2	kW	10.7	13.3	15.5	20.6	25	29.9	35.2
EER *1 *2		2.95	2.82	2.87	2.88	2.9	3.01	3
ESEER *1 *2		4.42	4.69	4.2	4.2	4.36	4.27	4.39
COOLING ENERGY CLASS		B	C	C	C	B	B	B
SEASONAL EFFICIENCY IN COOLING (Reg.EU 2016/2281) - Average Climate Conditions								
SEER		4.46	4.8	4.31	4.31	4.52	4.52	4.57
PERFORMANCE (ηs) *3	%	176	189	169	169	178	178	180
HEAT EXCHANGER (USER SIDE)								
WATER FLOW *1	l/s	0.51	0.64	0.74	0.99	1.2	1.43	1.68
MIN. SYSTEM WATER CONTENT	l	26	32	37	49	60	71	84
INLET / OUTLET CONNECTION SIZE	in	1"	1"1/4	1"1/4	1"1/4	1"1/4	1"1/2	1"1/2
REFRIGERANT CIRCUIT								
COMPRESSORS	N°	1	1	1	1	1	1	1
CIRCUITS	N°	1	1	1	1	1	1	1
REGULATION		STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
MIN. CAPACITY STEP	%	25	25	25	25	25	25	25
REFRIGERANT CHARGE R410A	kg	3.6	3.65	4.7	6.8	7	7.9	8.4
CO_2 EQUIVALENT	t	7.51	7.62	9.81	14.19	14.62	16.49	17.54
OIL CHARGE	kg	0.87	1.4	1.4	1.4	1.4	2.3	2.3
ELECTRICAL								
FULL LOAD POWER (F.L.I.)	kW	4.9	6.5	7.4	9.4	11.3	13.7	16
FULL LOAD CURRENT (F.L.A.)	A	13	17	18	20	29	29	39
INRUSH CURRENT (S.A.)	A	1	1	1	1	1	1	1
FANS								
QUANTITY	N°	2	2	2	1	2	2	2
AIRFLOW	m^3/s	1.74	1.7	1.64	2.26	3.76	4.2	4.86
FANS POWER INPUT	kW	0.12	0.12	0.12	0.6	0.4	0.55	0.52
NOISE LEVEL								
SOUND PRESSURE *4	dB(A)	38	39	43	43	43	44	45
SOUND POWER *5 *6	dB(A)	69	70	74	74	75	76	77
SIZE AND WEIGHT								
WIDTH *7	mm	900	900	900	1450	1450	1450	1700
DEPTH *7	mm	420	420	420	550	550	550	650
HEIGHT *7	mm	1240	1240	1390	1200	1700	1700	1700
OPERATING WEIGHT *7	kg	110	125	135	190	250	270	305

*1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C. *2 Values in compliance with EN14511-3:2013.
*3 Seasonal energy efficiency of space cooling. *4 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
*5 Sound power on the basis of measurements made in compliance with ISO 9614. *6 Sound power level in cooling, outdoors.
*7 Unit in standard configuration/execution, without optional accessories.

Eurovent Certified Data

i-NX Air Cooled Chillers

Climaveneta's range of small to medium sized i-NX Cooling Only chillers efficiently and easily adapt to a wide range of cooling capacities.

With the exclusive 1 + i philosophy, both the fixed speed scroll compressor and the scroll inverter compressor are combined in the same circuit. This technology ensures maximum benefit in terms of efficiency at partial loads compared to a solution with separate circuits. In different load conditions, only the most efficient combination of compressors required for optimum adaptation to the system load conditions is called upon.

Key Features

- High Efficiency - inverter driven scroll compressor
- Aluminium microchannel coils
- Wide operating range
- Available with EC fans
- ERP 2021 compliant
- Available with hydronic module

i-NX Air Cooled Chiller (43.9-129kW) Cooling Only - Three Phase

MODEL		i-NX 0151P	i-NX 0182P	i-NX 0202P	i-NX 0262P	i-NX 0302P	i-NX 0352P	i-NX 0402P	i-NX 0502P
POWER SUPPLY	V / ph / Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3/50	400/3/50	400/3/50
PERFORMANCE									
COOLING CAPACITY *1	kW	43.9	52.9	63.1	72.1	83.8	101	120	129
TOTAL POWER INPUT *1	kW	15.7	18.8	21.4	25	29.2	35.2	41.9	46.8
EER *1		2.8	2.81	2.95	2.88	2.87	2.87	2.86	2.76
ESEER *1		4.56	4.55	4.51	4.54	4.51	4.66	4.58	4.53
COOLING ONLY (EN14511 VALUE)									
COOLING CAPACITY *1 *2	kW	43.6	52.6	62.7	71.7	83.4	100	119	129
EER *1 *2		2.73	2.75	2.88	2.82	2.82	2.82	2.8	2.72
ESEER *1 *2		4.27	4.19	4.17	4.23	4.24	4.36	4.27	4.25
COOLING ENERGY CLASS		C	C	C	C	C	C	C	C
SEASONAL EFFICIENCY IN COOLING (Reg.EU 2016/2281) - Average Climate Conditions									
SEER		4.15	4.11	4.13	4.18	4.23	4.36	4.32	4.3
PERFORMANCE (ηs) *3	%	163	161	162	164	166	171	170	169
HEAT EXCHANGER (USER SIDE)									
WATER FLOW *1	l/s	2.10	2.53	3.02	3.45	4.01	4.82	5.73	6.18
MIN. SYSTEM WATER CONTENT	l	154	185	221	252	293	354	420	452
PRESSURE DROP	kPa	37.2	41.2	42.3	39.4	35	36.2	42.9	38.9
INLET / OUTLET CONNECTION SIZE	in	1 1/2" VICTAULIC	1 1/2" VICTAULIC	1 1/2" VICTAULIC	2" VICTAULIC	2" VICTAULIC	2" VICTAULIC	2 1/2" VICTAULIC	2 1/2" VICTAULIC
REFRIGERANT CIRCUIT									
COMPRESSORS	N°	1	2	2	2	2	2	2	2
CIRCUITS	N°	1	1	1	1	1	1	1	1
REGULATION		STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
MIN. CAPACITY STEP	%	30	22	19	22	19	23	20	18
REFRIGERANT CHARGE R410A	kg	7	7.2	8.9	9.4	9.5	12.5	12.9	13.5
CO_2 EQUIVALENT	t	14.6	15	18.6	19.6	19.8	26.1	26.9	28.2
OIL CHARGE	kg	3.5	6.1	6.4	6.7	7	13.4	13.4	13.4
ELECTRICAL									
FULL LOAD POWER (F.L.I.)	kW	23.5	27.4	30.2	37.5	41.4	53.9	59.7	64.6
FULL LOAD CURRENT (F.L.A.)	A	39	46	52	63	70	87	96	104
INRUSH CURRENT (S.A.)	A	4	118	164	174	225	198	243	288
FANS									
QUANTITY	N°	4	4	5	5	6	2	2	2
AIRFLOW	m³/s	3.77	5.07	6.57	6.57	7.66	9.08	11.53	11.53
FANS POWER INPUT	kW	0.2	0.3	0.3	0.3	0.3	1.2	2	2
NOISE LEVEL									
SOUND PRESSURE *4	dB(A)	51	52	53	53	54	55	57	57
SOUND POWER *5 *6	dB(A)	83	84	85	85	86	87	89	89
SIZE AND WEIGHT									
WIDTH *7	mm	2000	2000	2625	2625	2625	3250	3250	3250
DEPTH *7	mm	1350	1350	1350	1350	1350	1350	1350	1350
HEIGHT *7	mm	2070	2070	2070	2070	2070	2170	2170	2170
OPERATING WEIGHT *7	kg	600	660	750	780	810	1060	1070	1080

*1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C. *2 Values in compliance with EN14511-3:2013.
*3 Seasonal energy efficiency of space cooling. *4 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
*5 Sound power on the basis of measurements made in compliance with ISO 9614. *6 Sound power level in cooling, outdoors.
*7 Unit in standard configuration/execution, without optional accessories.

Eurovent Certified Data

i-NX Air Cooled Chiller
(43.9-129kW)

i-NX Air Cooled Chiller Low Noise Version
(42.6-124kW)

up to a **7dB(A)** reduction against the baseline model

i-NX Air Cooled Chiller Low Noise Version (42.6-124kW) Cooling Only - Three Phase

MODEL		i-NX SL 0151P	i-NX SL 0182P	i-NX SL 0202P	i-NX SL 0262P	i-NX SL 0302P	i-NX SL 0352P	i-NX SL 0402P	i-NX SL 0502P
POWER SUPPLY	V / ph / Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE									
COOLING CAPACITY *1	kW	42.6	51.2	60.1	68.1	81.2	96.7	115	124
TOTAL POWER INPUT *1	kW	14.4	17.8	20.9	24.5	28.3	33.9	39.3	44.3
EER *1		2.96	2.88	2.88	2.78	2.87	2.85	2.93	2.81
ESEER *1		4.48	4.58	4.49	4.55	4.54	4.75	4.78	4.7
COOLING ONLY (EN14511 VALUE)									
COOLING CAPACITY *1 *2	kW	42.3	50.9	59.8	67.7	80.8	96.3	115	124
EER *1 *2		2.89	2.81	2.81	2.73	2.82	2.8	2.88	2.76
ESEER *1 *2		4.21	4.26	4.2	4.25	4.26	4.48	4.5	4.43
COOLING ENERGY CLASS		C	C	C	C	C	C	C	C
SEASONAL EFFICIENCY IN COOLING (Reg.EU 2016/2281) - Average Climate Conditions									
SEER		4.18	4.1	4.11	4.17	4.22	4.46	4.5	4.48
PERFORMANCE (ηs) *3	%	164	161	162	164	166	176	177	176
HEAT EXCHANGER (USER SIDE)									
WATER FLOW *1	l/s	2.04	2.45	2.87	3.26	3.88	4.62	5.5	5.95
MIN. SYSTEM WATER CONTENT	l	149	179	210	238	284	338	403	434
PRESSURE DROP	kPa	35.1	38.7	38.3	35.2	32.9	33.2	39.6	36
INLET / OUTLET CONNECTION SIZE	in	1 1/2" VICTAULIC	1 1/2" VICTAULIC	1 1/2" VICTAULIC	2" VICTAULIC	2" VICTAULIC	2" VICTAULIC	2 1/2" VICTAULIC	2 1/2" VICTAULIC
REFRIGERANT CIRCUIT									
COMPRESSORS	N°	1	2	2	2	2	2	2	2
CIRCUITS	N°	1	1	1	1	1	1	1	1
REGULATION		STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
MIN. CAPACITY STEP	%	30	23	20	23	20	24	21	19
REFRIGERANT CHARGE R410A	kg	8.1	8.3	8.7	9.2	11.8	12.3	14.7	15.2
CO_2 EQUIVALENT	t	16.9	17.3	18.2	19.2	24.6	25.7	30.7	31.7
OIL CHARGE	kg	3.5	6.1	6.4	6.7	7	13.4	13.4	13.4
ELECTRICAL									
FULL LOAD POWER (F.L.I.)	kW	23.8	27.4	30.5	37.8	43.6	53.9	59.3	64.3
FULL LOAD CURRENT (F.L.A.)	A	40	47	53	64	71	87	95	104
INRUSH CURRENT (S.A.)	A	6	120	165	175	226	198	242	287
FANS									
QUANTITY	N°	5	5	6	6	2	2	2	2
AIRFLOW	m³/s	4.28	5.03	5.73	5.73	7.37	8.41	10.47	10.47
FANS POWER INPUT	kW	0.2	0.2	0.2	0.2	0.9	1.1	1.15	1.15
NOISE LEVEL									
SOUND PRESSURE *4	dB(A)	45	45	46	46	47	48	50	50
SOUND POWER *5 *6	dB(A)	77	77	78	78	79	80	82	82
SIZE AND WEIGHT									
WIDTH *7	mm	2625	2625	2625	2625	3250	3250	3875	3875
DEPTH *7	mm	1350	1350	1350	1350	1350	1350	1350	1350
HEIGHT *7	mm	2070	2070	2070	2070	2170	2170	2170	2170
OPERATING WEIGHT *7	kg	700	760	790	820	980	1090	1180	1200

*1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C. *2 Values in compliance with EN14511-3:2013.
*3 Seasonal energy efficiency of space cooling. *4 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
*5 Sound power on the basis of measurements made in compliance with ISO 9614. *6 Sound power level in cooling, outdoors.
*7 Unit in standard configuration/execution, without optional accessories.

Eurovent Certified Data

i-NX-Q Air Cooled, 4 Pipe Chillers

Climaveneta's range of small to medium sized i-NX-Q chillers are designed to produce chilled and hot water simultaneously and efficiently using variable frequency drive compressors. The super low noise variant offers up to a 7dB(A) reduction against the baseline model.

The unit combines two variable speed scroll compressors in two separate refrigerant circuits. The full inverter solution applied on two separate refrigerant circuits ensures maximum reliability and total versatility, matching the thermal load request constantly and with maximum precision, while minimising energy consumption.

Key Features

- Simultaneous production of chilled water and hot water
- Two inverter scroll compressors
- Wide operating range
- ErP 2021 compliant
- Available with EC fans
- Available with factory installed pumps

i-NX-Q SL Air Cooled, 4 Pipe Chiller - Low Noise Version
(45-139kW) Heat Pump - Three Phase

MODEL		i-NX-Q SL 0152P	i-NX-Q SL 0182P	i-NX-Q SL 0202P	i-NX-Q SL 0252P	i-NX-Q SL 0262P	i-NX-Q SL 0302P	i-NX-Q SL 0352P	i-NX-Q SL 0402P	i-NX-Q SL 0502P	i-NX-Q SL 0552P
POWER SUPPLY	V/ph/Hz	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50	400/3+N/50
PERFORMANCE											
COOLING ONLY (EN14511 VALUE)											
COOLING CAPACITY *1 *2	kW	45.6	52.3	56.3	62.9	70.9	84.0	89.5	105.0	119.9	138.4
TOTAL POWER INPUT *1 *2	kW	14.12	17.26	18.7	22.71	25.97	29.27	30.86	37.37	44.08	49.78
EER *1 *2	kW/kW	3.23	3.03	3.01	2.77	2.73	2.87	2.9	2.81	2.72	2.78
HEATING ONLY (EN14511 VALUE)											
TOTAL HEATING CAPACITY *2 *3	kW	51.2	59.0	62.5	70.7	78.5	93.1	98.1	114.2	132.4	153.2
TOTAL POWER INPUT *2 *3	kW	15.19	17.82	18.38	21.49	23.22	27.63	28.43	34.09	39.4	45.33
COP *2 *3	kW/kW	3.37	3.31	3.4	3.29	3.38	3.37	3.45	3.35	3.36	3.38
COOLING WITH TOTAL HEAT RECOVERY											
COOLING CAPACITY *4	kW	46.14	53.06	57.75	65.22	75.09	84.65	94.59	109.4	126.4	145.5
TOTAL POWER INPUT *4	kW	13.78	16.52	17.25	20.42	22.95	26.96	27.75	33.52	39.5	44.93
RECOVERY HEAT EXCHANGER CAPACITY *4	kW	59.1	68.6	74.0	84.4	96.7	110.0	120.7	140.9	163.6	187.7
TER	kW/kW	7.62	7.37	7.61	7.33	7.47	7.21	7.77	7.47	7.34	7.42
SEASONAL COOLING EFFICIENCY											
P RATED CAPACITY *5	kW	45.6	52.3	56.3	62.9	70.9	84.0	89.5	105.0	119.9	138.4
SEER *5 *6	-	4.41	4.43	4.5	4.39	4.22	4.25	4.33	4.34	4.4	4.45
PERFORMANCE ηs *5 *7	%	174	174	177	173	166	167	170	170	173	175
SEASONAL HEATING EFFICIENCY *8											
RATED HEAT OUTPUT AT T DESIGN H *9 *10	Kw	37.0	43.0	45.0	52.0	59.0	70.0	74.0	79.0	97.0	115.0
SCOP *9 *10	-	3.93	3.97	3.98	4.0	3.97	4.04	4.09	4.01	4.11	4.13
SEASONAL SPACE HEATING ENERGY EFFICIENCY *9 *10	%	154	156	156	157	156	159	161	158	161	162
SEASONAL SPACE HEATING ENERGY EFFICIENCY CLASS *9 *10	-	A++	A++	A++	A++	A++	A++	-	-	-	-
HEAT EXCHANGERS											
HEAT EXCHANGER USER SIDE IN COOLING											
WATER FLOW RATE *1	l/s	2.18	2.51	2.7	3.01	3.4	4.03	4.29	5.03	5.75	6.63
PRESSURE DROP *1	kPa	26.1	34.4	22.4	27.9	23.7	33.2	27.0	34.8	35.3	35.0
HEAT EXCHANGER USER SIDE IN HEATING											
WATER FLOW RATE *3	l/s	2.47	2.84	3.01	3.4	3.78	4.48	4.72	5.5	6.38	7.38
PRESSURE DROP *3	kPa	33.2	44	27.9	35.6	29.3	41.1	32.7	41.6	43.4	43.3
REFRIGERANT CIRCUIT											
COMPRESSORS	N°	2	2	2	2	2	2	2	2	2	2
NO. CIRCUITS	N°	2	2	2	2	2	2	2	2	2	2
REFRIGERANT CHARGE R410A	kg	26.7	27.3	27.8	29.2	31.2	43.8	40.6	45.8	53.4	60.0
OIL CHARGE	kg	4.6	4.6	4.6	4.6	7.2	7.2	13.4	13.4	13.4	13.4
NOISE LEVEL											
SOUND PRESSURE *11	dB(A)	47	47	48	49	49	50	50	51	53	55
SOUND POWER LEVEL *12 *13	dB(A)	79	79	80	81	81	82	82	83	85	87
SIZE AND WEIGHT											
WIDTH (A) *14	mm	2625	2625	2625	2625	2625	3250	3250	3250	3875	4500
DEPTH (B) *14	mm	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
HEIGHT (H) *14	mm	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070
OPERATING WEIGHT *14	kg	960	960	990	990	1080	1210	1330	1440	1520	1660

*1 Plant (side) cooling heat exchanger water (in/out) 12.0°C/7.0°C; Source (side) heat exchanger air (in) 35.0°C. *2 Values in compliance with EN14511. *3 Plant (side) heating heat exchanger water (in/out) 40.0°C/45.0°C; Source (side) heat exchanger air (in) 7.0°C at 87% R.H. *4 Plant (side) cooling heat exchanger water (in/out) 12.0°C/7.0°C; Plant (side) heating heat exchanger water (in/out) 40.0°C/45.0°C. *5 Parameter calculated according to [Regulation (EU) N. 2016/2281]. *6 Seasonal energy efficiency ratio. *7 Seasonal space cooling energy efficiency. *8 Weather conditions average, bivalent temperature -7.0°C. *9 Seasonal space heating energy efficiency class LOW TEMPERATURE [REGULATION (EU) N. 813/2013]. *10 Calculated with variable flow rate and variable temperature. *11 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calcuated from the sound power level. *12 Sound power on the basis of measurements made in compliance with ISO 9614. *13 Sound power level in cooling and heating, outdoors. *14 Unit in standard configuration/execution, without optional accessories.

Eurovent Certified Data

Mitsubishi Electric is a market leader in providing solutions to cool, heat, ventilate and control our buildings

As a major manufacturer of some of these pivotal technologies, we hold the UK's energy challenges close to our heart.

We want to help the nation achieve its climate goals; we want to help individuals and businesses reduce the energy consumption of their buildings, whilst also helping to reduce their annual running costs.

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Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric's air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

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