MITSUBISHI ELECTRIC

Embodied Carbon in the Built Environment

An Overview

les.mitsubishielectric.co.uk

This Mitsubishi Electric guide gives an overview of **Embodied Carbon**

We have put this guide together to help explain what Embodied Carbon is, why it is so important and what we are doing now to ensure we can support our customers in **delivering sustainable Net Zero buildings by 2050**.

Reducing the environmental impacts of the built environment has become a priority given the climate crisis we all face. As the built environment is a significant contributor to man-made emissions, it is imperative that we better understand the main causes of these emissions and work to reduce them.

Buildings generate emissions throughout their lifetime, from design, build, use and end-of-life disposal. Much focus has been placed on reducing those emissions produced during a building's use stage - known as Operational Carbon. While operational emissions from the built environment are significant, they do not account for the emissions generated through the construction process; the manufacture, transportation, and installation of its component parts or, for the disposal of these at the end of the building's useful life. These emissions are known as **Embodied Carbon**.

To make well-informed decisions that will help to mitigate global warming, consulting engineers, architects and clients need to embrace whole-life carbon emissions. This term refers to both operational and embodied carbon emissions, from manufacturing, transportation, constructing, repairing, and maintaining a building, through to deconstructing the building and processing waste.

As a leading manufacturer of HVAC equipment, Mitsubishi Electric intend to offer a greater degree of transparency to the industry. This will enable our clients to truly assess the impact of using or specifying our equipment.

NET ZERO


CO_2

The climate change imperative

The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. They provide regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation through the IPCC Assessment Reports.

The 6th Assessment report presents the findings of a collaboration of hundreds of experts across many countries, cultures and disciplines and represents the clearest scientific evidence for man-made impacts on the climate.

This report addresses the most up-to-date physical understanding of the climate system and climate change, bringing together the latest advances in climate science, and combining multiple lines of evidence from paleoclimate, observations, process understanding, and global and regional climate simulations. The report also shows that human actions still have the potential to determine the future course of the climate.

The evidence is clear that carbon dioxide (CO_2) is the main driver of climate change. Reducing man made emissions can limit the trajectory of global average temperature increases and through this, avoid the worst effects of a rapidly changing climate system.

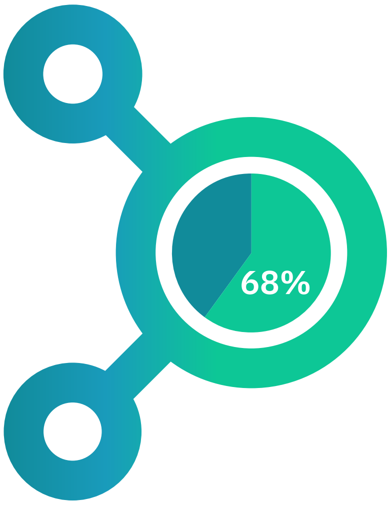
Global action

Global action is required to meet the climate change imperative. From multilateral agreements and resulting regulatory changes across different industries, to operational changes in the way companies do business and how individuals live, work, and consume, changes will be required at all levels.

International agreements have been a driving force behind our progress in reducing man-made emissions, and multilateral cooperation is a key driver of many of the changes that are being made regarding sustainability.

The Paris Agreement is a legally binding international treaty on climate change. Adopted in 2015 by 196 nation states, its goal is to limit global warming to well below 2, preferably to 1.5 degree Celsius, compared to pre-industrial levels.

Reaching this goal will require economic and social transformation by all of its signatories. To achieve this the agreement calls for nations to carry out a process known as the 'ratchet mechanism' every five years. This will provide improved commitments to emissions reductions through their Nationally Determined Contribution (NDC).



Nationally Determined Contribution (NDC)

On 12 December 2020, the UK communicated its new National Determined Contribution (NDC) under the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC).

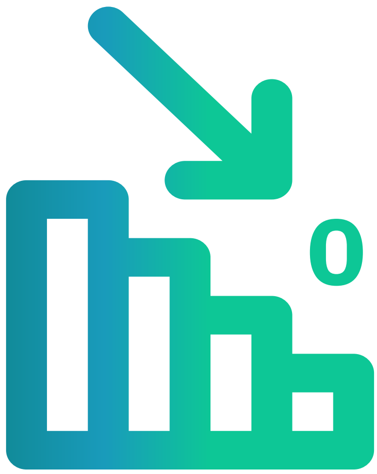
The NDC commits the UK to reducing economy-wide greenhouse gas emissions by at least **68% by 2030**, compared to 1990 levels. It also includes information on how this target was developed and is quantified, known as 'information to facilitate clarity, transparency and understanding' (ICTU).

PARIS2015 UN CLIMATE CHANGE CONFERENCE COP21·CMP11	**Intended Nationally Determined Contributions**	CAT analysis of NDC update	✔ Stronger target ✔ Fixed/absolute target ✔ Net Zero target	✔ Economy-wide coverage ⊖ Additional supporting targets ✔ NDC aligned with Net Zero

The United Nations Framework Convention on Climate Change (UNFCCC) is the parent treaty of the Paris Agreement. States that are Parties to the UNFCCC meet annually at the Conference of the Parties (COP) event.

The COP event is where the final decisions are taken between all the countries that have signed up to the Paris Agreement.

This regular meeting looks at all the national plans, discusses whether these are sufficient to meet the goals and works to make it easier to implement them.



What is Net Zero?

Net Zero refers to a state in which the amount of greenhouse gases (GHG) being emitted into the atmosphere are balanced by processes to remove them. This is an important milestone, as the damage done to the climate is a result of the difference between our current emissions and the amount of carbon removed from our atmosphere. When a balance between these has been reached, the warming effect on our climate will stop accelerating.

The Paris Agreement highlights the need for global Net Zero carbon emissions to be reached, requiring states to 'achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century'. Net Zero is the internationally agreed upon goal for mitigating global warming, and the IPCC has concluded that this goal must be achieved by 2050 in order to limit global average temperature rises to no more than 1.5 degrees.

Pledges to be Net Zero by 2050, 2040 or even 2030 are being made and we need to **act now** and decide how we are going to achieve these milestones.

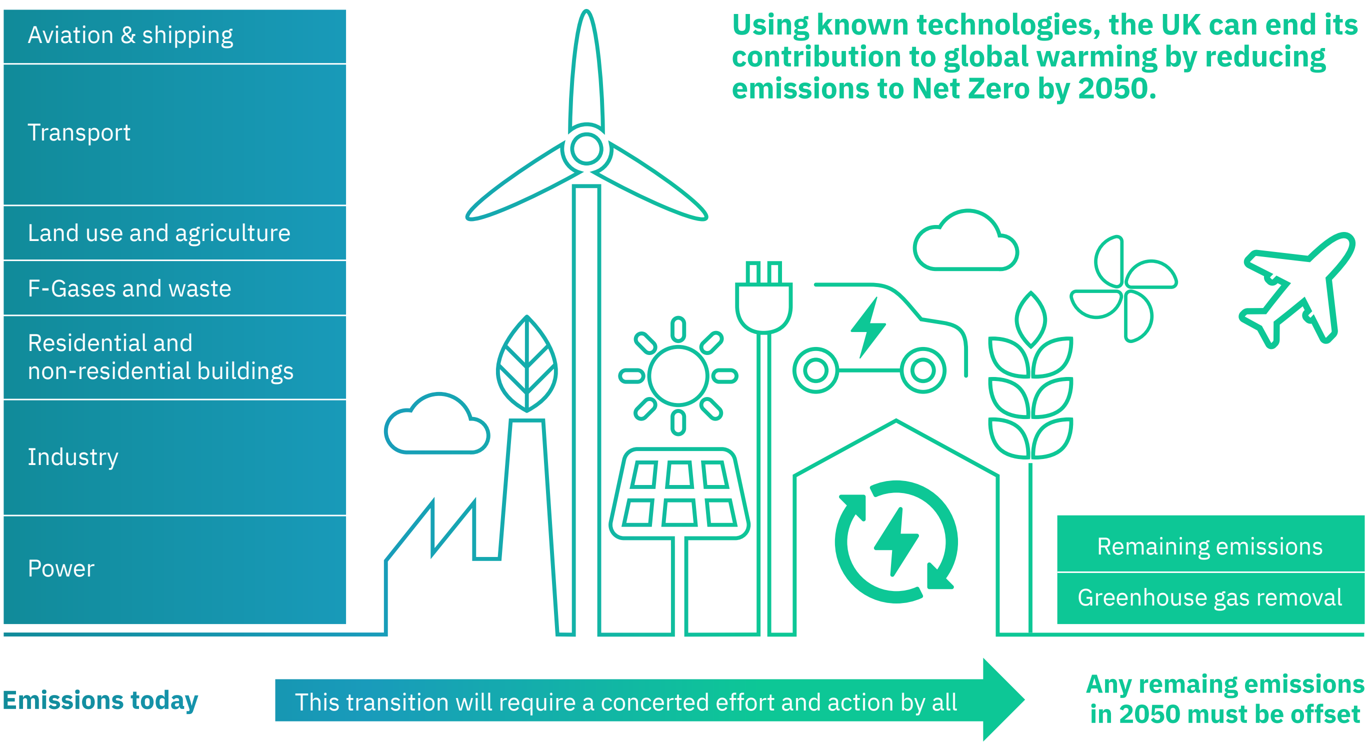
NET ZERO

There are two different routes that can help us achieve Net Zero, which work in tandem: reducing existing emissions and actively removing greenhouse gases - also known as ‘Carbon Capture’ or ‘Carbon Sequestering’. A Net Zero target requires deep reductions in emissions across many different sectors and this requires actions from agents at every level of an economy, from nation states to companies to individuals.

Government Strategies

Country-level emissions accounting across the world is conducted on a territorial basis, with each country only counting emissions that directly arise from activity within their geographical boundary. This prevents double counting of emissions and more closely links to levers available at the country level to reduce emissions. The UK, for example, has set a Net Zero target for 2050, that relates to its territorial (or production) emissions.

The graphic below depicts the various UK contributors to emissions on the left, and the task ahead to reduce these to the levels on the right. There are some emissions that are irreducible and, by 2050, every kilogram of CO_2 equivalent greenhouse gas that is emitted in the UK will have to be offset through a form of Carbon Sequestration to achieve the balance of being a Net Zero economy.



Source: Climate Change Committee

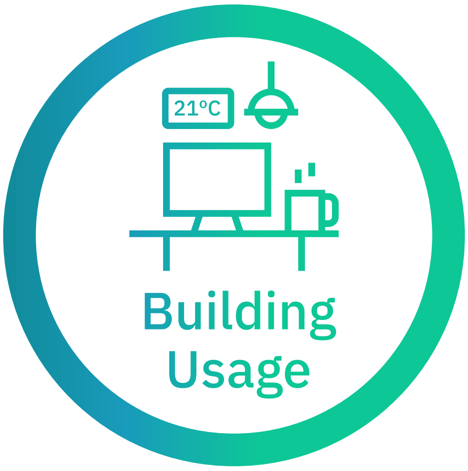
The built environment

Given that buildings contribute around 40% of greenhouse gas emissions worldwide, it is critical that architecture, engineering, and construction professionals understand the role they need to play in reducing the sector's carbon footprint and how to use the tools available to assist them. Emissions from the built environment can be separated into two categories: **Operational Carbon Emissions** and **Embodied Carbon Emissions**.

Operational Carbon

Operational Carbon refers to the total GHG emissions produced by a building during its useful or operational life.

These emissions arise from energy consuming activities such as the heating, cooling, ventilation, and lighting needs of the building - also known as 'regulated' emissions as they fall under **Part L of the Building Regulations 'Conservation of fuel and power'** - as well as other 'unregulated' emissions such as those from appliance use and small power plug loads from the day-to-day activities of the people using it.



To understand how a building's operational energy emissions can achieve Net Zero we must identify where the emissions are coming from:

Direct Emissions

Direct emissions are those generated in the building or on the site. A good example of this would be the burning of natural gas for the provision of heat using a traditional gas boiler. Gas is pumped into the building, burned as a fuel source and releases GHGs directly into the atmosphere as a result.

Indirect Emissions

Indirect emissions are those created due to the activities in the building but occur at a different location. This could be the emissions generated from the electricity used in the building; these emissions are not produced on the site of the building itself but are an indirect result of the building's electricity demand.

Great strides continue to be made in reducing operational carbon emissions in buildings by tackling direct and indirect sources:

	Direct	Indirect
Reduce energy demand within building e.g. using greater insulation	✓	✓
Reduce use of fossil fuel equipment on site	✓	
Decarbonise electricity grid by replacing fossil fuel with renewable generation sources		✓
Install highly energy efficient, electrically driven equipment		✓
Improve control systems to optimise operation of equipment	✓	✓
Install on-site electrical generation equipment		✓

Net Zero Carbon - Operational Energy:

“A ‘Net Zero Carbon - Operational Energy’ asset is one where no fossil fuels are used, all energy use has been minimised, meets the local energy use target (e.g. kWh/m²/a) and all energy use is generated on-or-off-site using renewables that demonstrate additionality. Direct emissions from renewables and any upstream emissions are ‘offset’.”

CIBSE LETI Net Zero FAQ document 2022.

We have in the past focused our climate efforts on operational-energy consumption in the pathway to Net Zero. However, there is another, less obvious source of GHG emissions associated with buildings: **Embodied Carbon**

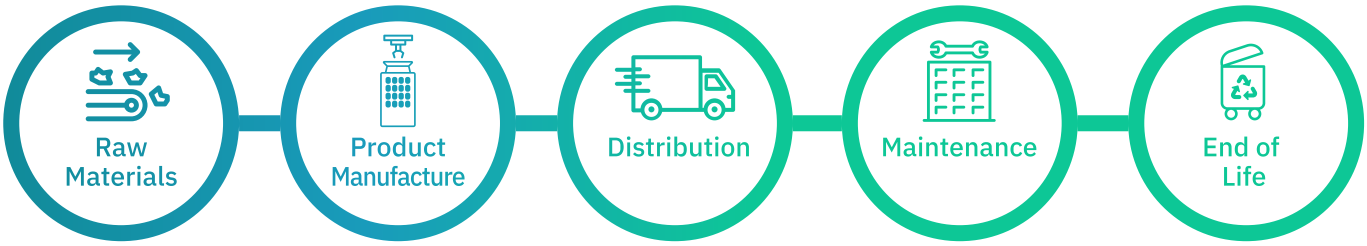
The built environment

Embodied Carbon

The definition of a 'building' when we consider embodied carbon is the sum of all the parts that make it; the materials used, and the equipment selected.

Embodied carbon is the total GHG emissions generated to produce a built asset. This means that to calculate the embodied carbon for a building we need to understand the environmental cost to the planet for the extraction, processing, manufacture, delivery and assembly of every single product or material used in its construction.

Throughout a building's lifetime some maintenance or replacement of these products or materials will be necessary and this also needs to be measured as a part of calculating embodied carbon. At the end of the building's useful life more emissions will be produced because the asset needs to be deconstructed or preferably refurbished and re-purposed. Any products that are disposed of must be part of an embodied carbon calculation.

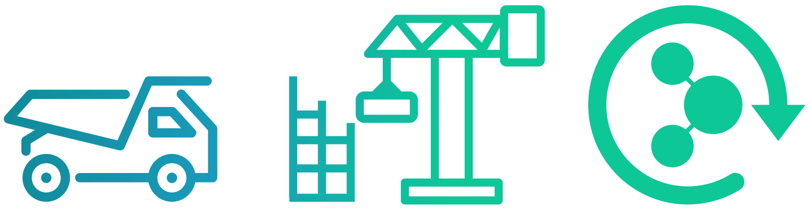


For building and construction projects to achieve true Net Zero carbon levels, the embodied carbon footprint needs to be included in the calculation or we are at risk of neglecting a large amount of upfront carbon emissions.

Net Zero Embodied Carbon

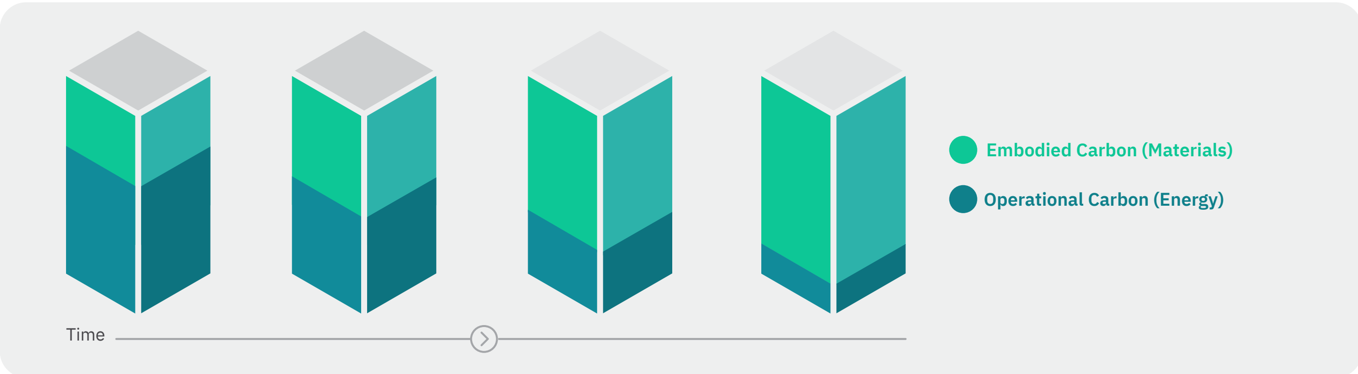
A **'Net Zero Embodied Carbon'** asset is one where the sum total of GHG emissions and removals over an asset's life cycle are minimised, meets local carbon targets (e.g. $kgCO_2e/m^2$) and with additional 'offsets', equals zero.

CIBSE LETI Net Zero FAQ document 2022.



The relationship between embodied and operational carbon emissions of a building will change over its lifetime. Operational carbon will continue to reduce because of the ever cleaning electrical grid and reduction of fossil fuels.

Potential breakdown between embodied and operational carbon for new buildings over time:



The embodied carbon of a building will not reduce over its lifetime. Therefore to reduce the embodied carbon emissions of new building projects we must consider how building materials, construction practices and the Mechanical and Electrical Products (MEP) used within the building will impact overall embodied carbon and address these elements in the design stage.

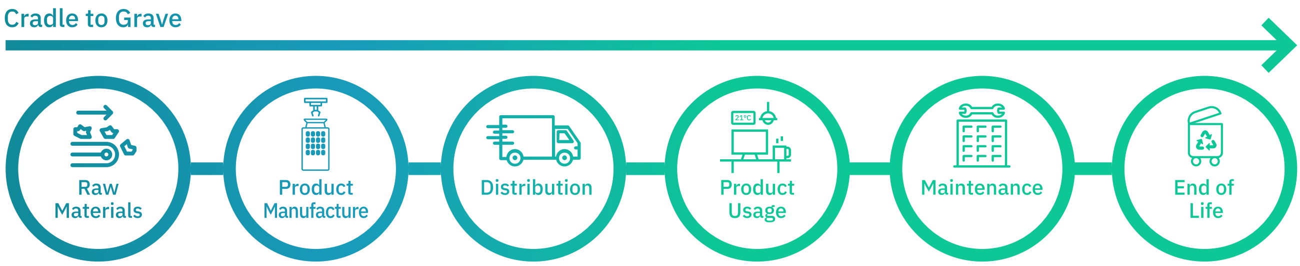
Ways to reduce embodied carbon within a building:

Action	Supporting Questions
Re-use existing building stock	Do we have to construct a new building? Can we re-use an existing building by refurbishing and upgrading?
Build efficiently	Can low carbon / recycled materials be used? Is the building design the most efficient use of the space and materials? Has wastage been minimised? Have efficient building practices been considered? E.g. modular build.
Sustainable supply chain	Are companies within the supply chain employing sustainable practices? Can building materials and MEP be sourced locally?
Select low embodied carbon MEP and HVAC systems	Do you have embodied carbon data for MEP on site? Are MEP being selected and deployed in the most efficient way?

By focussing on embodied carbon emissions at the design stage, our goal of Net Zero emissions may be easier to achieve as the volume of emissions that need to be offset is reduced.

Whole life carbon in the built environment

Only by considering both operational carbon and embodied carbon together can we understand the total emissions from a building over its lifetime. This is known as Whole Life Cycle (WLC) Carbon and this metric can be applied to the entire building and the MEPs used within it. This can also be referred to as a “Cradle to Grave” calculation.



Using WLC carbon as a measure we can get a better understanding of the trade-offs that can be made between embodied and operational carbon relating to their cumulative impact over time. A building component that delivers low operational carbon emissions over its lifetime may have higher embodied carbon emissions to begin with. Alternatively low embodied carbon products may have lower efficiency leading to higher operational carbon emissions. A WLC carbon analysis will enable us to deliver the minimum level of carbon emissions by the end of the building’s useful life, thus making the Net Zero target easier to achieve.

Mitsubishi Electric Corporation’s SUSTIE Net Zero-Energy Building (ZEB) test facility, Tokyo.

Working with embodied carbon in the built environment

The construction industry is just beginning to get to grips with the concept of embodied carbon for complex MEP products. Currently there is no specific requirement for embodied carbon of MEP products to be considered in building regulations or planning applications nationally, although some local authorities are starting to require this.

However we are seeing many clients focussing on embodied carbon and trying to go beyond the legislative requirements of the industry, reducing their carbon footprint and helping to mitigate their individual impact of climate change. To assist this positive choice, industry bodies such as UK Green Building Council (UKGBC), Royal Institute of British Architects (RIBA) & The London Energy Transformation Initiative (LETI) have come together to provide guidance on what realistic and stretch targets for the whole building embodied carbon per m^2 should be, both now and in the future.

This approach will facilitate better decision making and to provide clients with a reference to point to when requesting embodied carbon be considered in their building. Additionally forward-thinking construction companies and consultants are using their own knowledge of this subject to help grow their businesses and secure more environmentally conscious projects by considering embodied carbon within their designs.

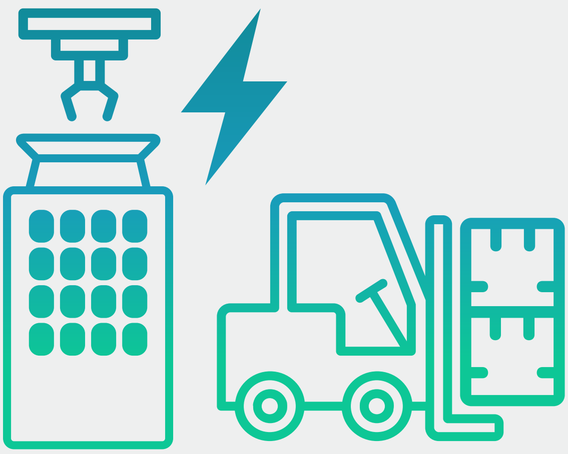
Product data - The starting point

It has become critical for manufacturers of MEP equipment to fully understand and document the raw material makeup, manufacturing energy usage and packaging break down of their products. This information must be detailed and clear so that it can be used to calculate the amount of embodied carbon within the product.

The Product Environmental Passport (PEP) is the standard being used in France and provides a formal template that manufacturers can use to collate product build data.

At least 95% of the product's official weight must be accounted for in the PEP for the document to be valid. Every material used in the product and packaging must be accounted for with an accurate associated weight.

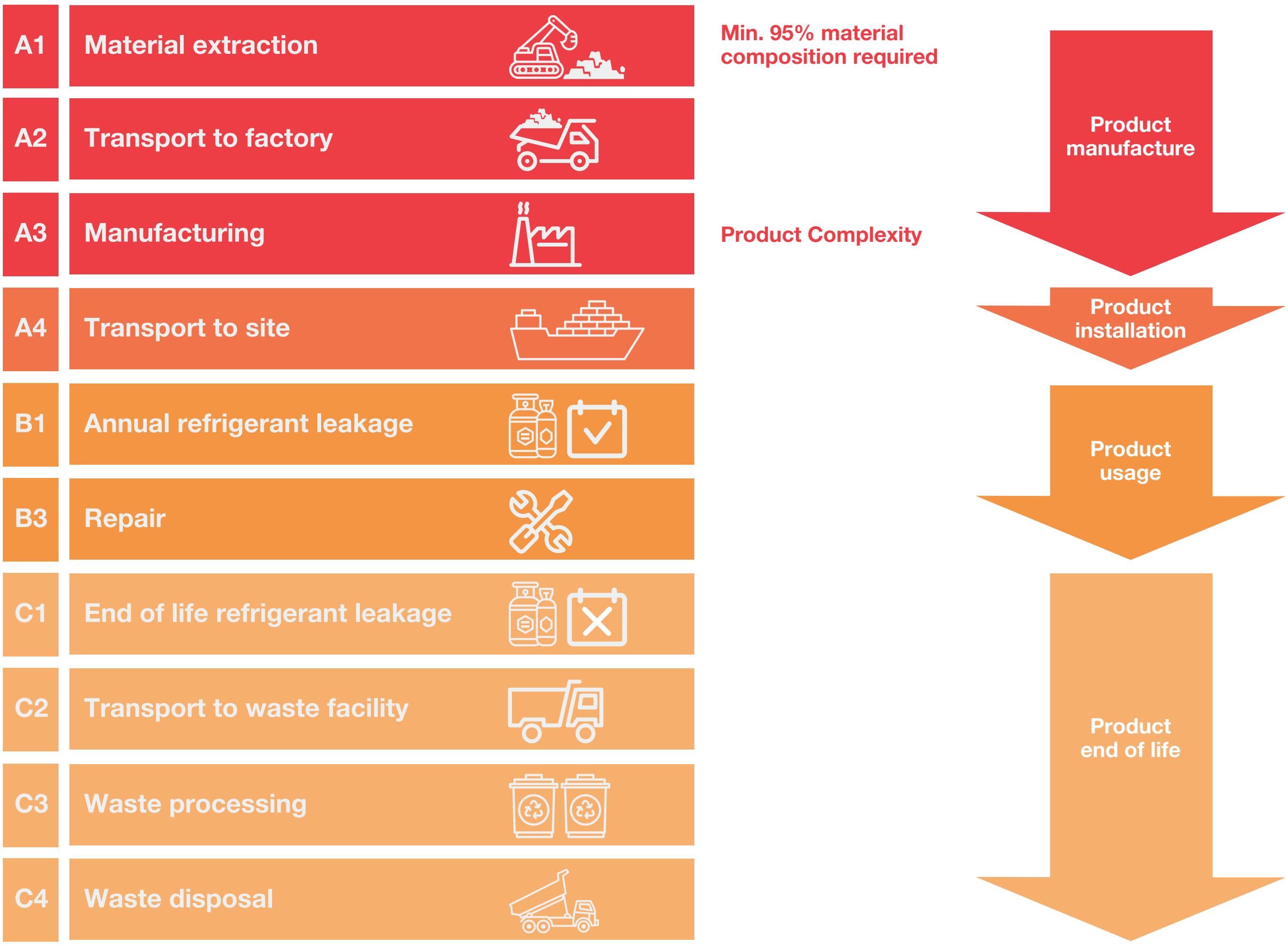
An important part of PEP is that it allows interpolation by weight between similar products within a range. As a large-scale manufacturer PEP allows us to to produce efficiently embodied carbon data for all our products.

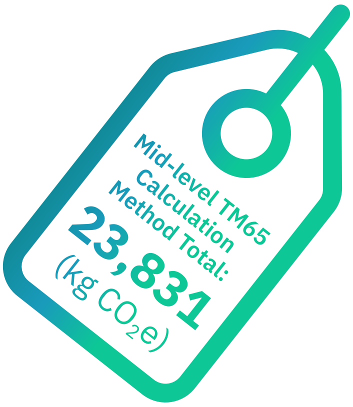


Working with embodied carbon in the built environment

Calculating embodied carbon from product raw data

In January 2021 The Chartered Institution of Building Services Engineers CIBSE issued their latest technical memorandum on **"Embodied Carbon In Building Services: A Calculation Methodology," TM65:2021**. This document has provided much-needed guidance and consistency in embodied carbon calculations and reporting for complex MEP services. **The TM65 calculation methodology takes all the information within the PEP and groups this data into sections for calculation. As follows:**





Each of these sections are aggregated in the calculation to obtain the overall embodied carbon of the product. The value of embodied carbon is given as kg of CO_2 equivalent. The higher this value, the more embodied carbon the product has.

It is important to note that the embodied carbon of any additional refrigerant required to be added on site, for example in a VRF system, is not included in the TM65 calculation for the outdoor unit. The amount of additional refrigerant required on site for VRF systems can vary greatly, depending on pipe run and system make up. This will give different values for embodied carbon and is not suitable for standardised TM65 product data. The carbon associated with the leakage of this additional refrigerant is also not included. However refrigerant added at the factory is included, as well as any leakage of this refrigerant over the lifespan of the system.

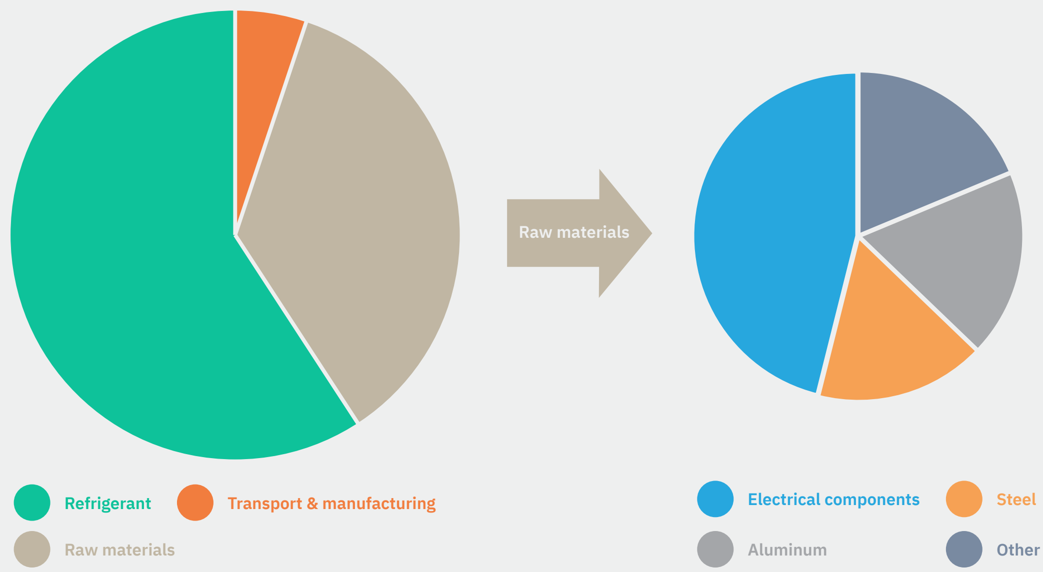
Working with embodied carbon in the built environment

TM65 Calculation analysis - CAHV-R450YA-HPB

Inputting the product raw data from the factory (via the PEP) for our CAHV-R450YA-HPB commercial air to water heat pump into the TM65 calculation gives a figure of **5,049kgCO_2e** for embodied carbon. The calculation methodology allows us to investigate the contribution of individual components to a product's overall embodied carbon.

CAHV-R450YA-HPB
Embodied Carbon TM65 Calculation
Click on the icon or Scan the QR Code

CAHV-R450YA-HPB



We see that a large contributor to embodied carbon in MEP are the small electrical components and printed circuit boards. These components have a high concentration of exotic metals and plastics and carbon intensive manufacturing processes resulting in a high carbon footprint. It is difficult for manufacturers to reduce embodied carbon by focussing on these elements.

However the choice and volume of refrigerant used has the largest impact on a product's embodied carbon. Selecting products using lower GWP refrigerants and systems that use lower refrigerant volumes will reduce a building's embodied carbon thus making it easier to offset during its lifetime.

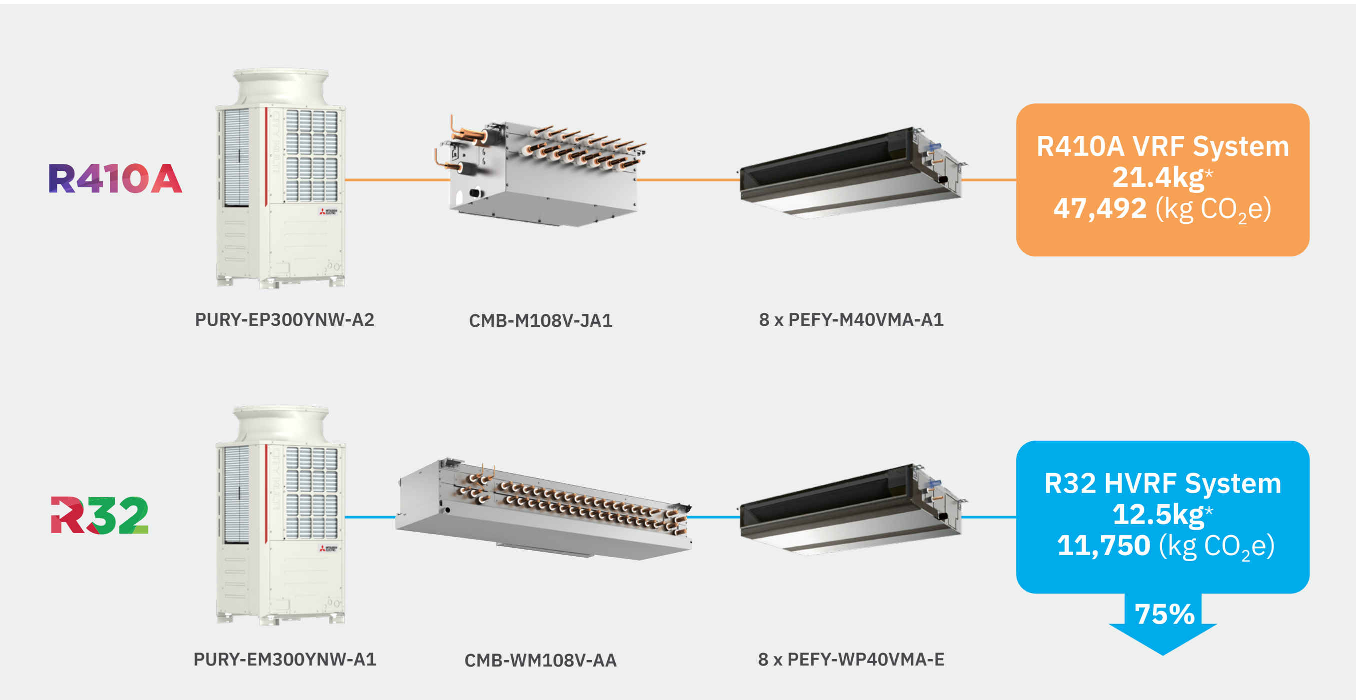
Whole System Analysis

To understand fully the embodied carbon associated with a complete system we must consider all the component parts that make up the system.

A TM65 calculation can be completed for each component giving an individual embodied carbon figure in kgCO_2e. These individual figures can be added together to generate an embodied carbon figure in kgCO_2e for the whole system. Although the additional refrigerant charge of the outdoor unit is not included in its TM65 calculation, it is possible and essential to account for working refrigerant charge when considering the embodied carbon of a whole HVAC system.

The following example shows 2 different ways to achieve a 32kW cooling requirement using VRF systems. The output and experience for the end user will be similar when using these systems but each has a unique level of embodied carbon, primarily governed by the type and quantity of refrigerant used.

High efficiency heat recovery system delivering 32kW cooling via 8 x 4kW ducted indoor units (50m main pipe run):



Note: This calculation does not include physical pipework, structural accessories, electrical wiring and electrical accessories.
The Percentage of the R32 example is in comparison to the R410A example.

*Additional refrigerant charge

Working with embodied carbon in the built environment

Whole System Analysis

High efficiency heat recovery system delivering 32kW cooling via 8 x 4kW ducted indoor units (assumes 50m pipe run for added refrigerant).

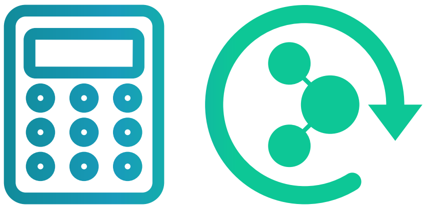
$kgCO_2e$	R410A VRF		R32 HVRF	
Outdoor unit + Factory Charge Refrigerant	PURY-EP300YNW-A2 + 5.2kg Refrigerant	10,858	PURY-EM300YNW-A1 + 5.2kg Refrigerant	3,510
Site Added Refrigerant	+ 16.2kg Refrigerant	33,826	+ 7.3kg Refrigerant	4,928
BC Box	CMB-M108V-JA1	545	CMB-WM108V-AA	848
Indoor Units	8 x PEFY-M40VMA-A1	(8 x 283) 2,264	8 x PEFY-WP40VMA-E	(8 x 308) 2,464
Total Embodied Carbon	47,492		11,750	
Embodied Carbon per kW	1,484		367	
Approximate Embodied Carbon Reduction	Baseline		75%	

Note: This calculation does not include physical pipework, structural accessories, electrical wiring and electrical accessories

Significant reductions in system embodied carbon can be achieved by using lower GWP technologies such as HVRF. We are focussing our product development efforts to minimise impacts of both operational and embodied carbon.

Mitsubishi Electric is continually collating product raw material data and producing TM65 calculations. All future products will have an accompanying TM65 documents as soon as practicable after launch. TM65 calculations can be found on our Document Library here: **library.mitsubishielectric.co.uk**

As a summary of the data, the embodied carbon values ($kgCO_2e$) of our products derived from TM65 calculations can be found in the tables at the end of this document.

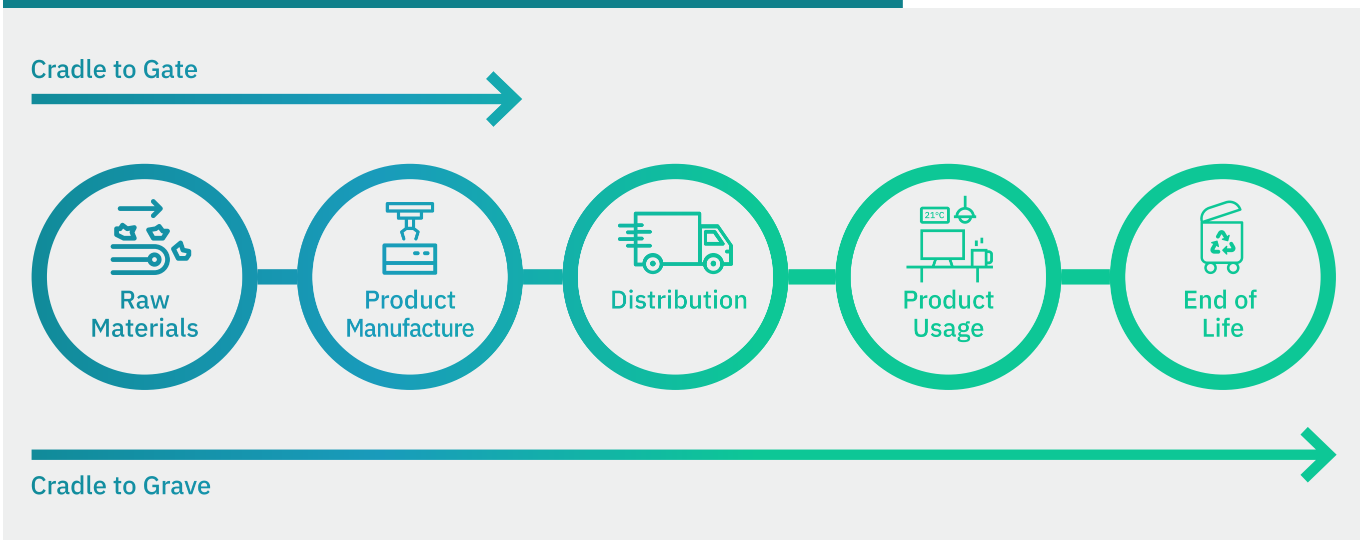


The future of embodied carbon calculation

Whilst embodied carbon is becoming ever more important, as an industry, we must not detract our focus from continually driving down operational carbon emissions from building services products, therefore allowing a Whole Life-Cycle Carbon approach to be maintained. Whole Life-Cycle Carbon is the true measure of a product or building's impact on the environment.

An Environmental Product Declaration (EPD) is a document that transparently communicates the overall environmental impact of a product or material over its whole life-cycle. Just like the TM65 calculation, EPD's also include emissions outside of WLC associated with reuse, recovery and recycle at the end of life. In addition, operational carbon emissions are also included in the calculation methodology to give the total carbon emissions figure.

Environmental Product Declarations (EPD)



EPDs are a standardised way of providing the Whole Life-Cycle Carbon and other environmental impacts of a product.

Due to the level of detail required in the methodology and complexity of building services products and their supply chains, very few EPDs have been produced within the industry. This will change in the future as manufacturers become more familiar with the requirements of EPD. Mitsubishi Electric will work towards producing EPDs on certain product ranges as part of our commitment to improved accuracy in assessing the environmental impact of our products.

Alongside PEPs and TM65, EPDs provide a consistent method of comparing the embodied carbon of equivalent products from multiple manufacturers. Different systems and technologies from various manufacturers delivering similar outputs can also be assessed together using these standardised reports.

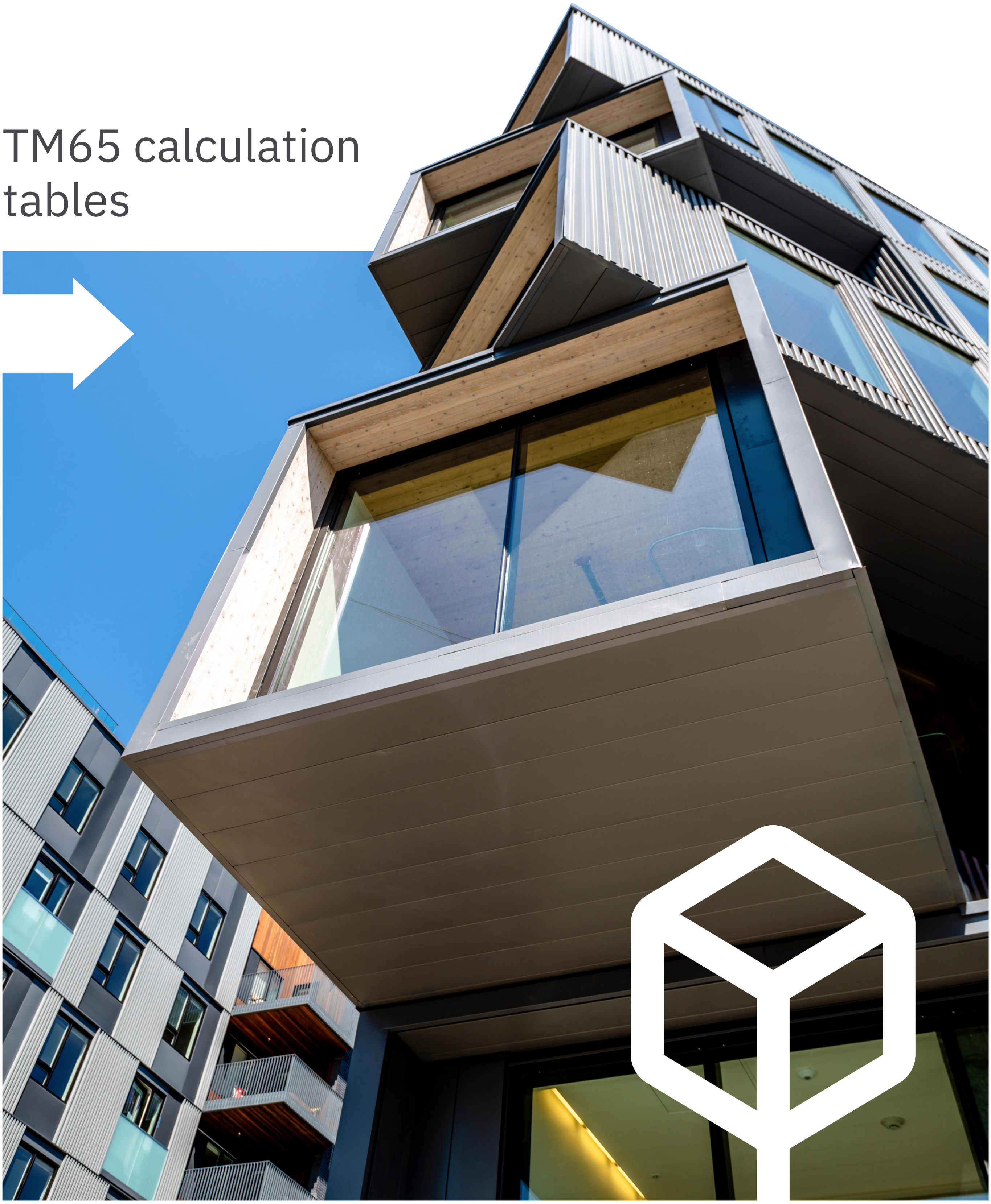
The future of embodied carbon calculation

Customers are now seeking EPDs, TM65 & PEPs on MEP products to feed embodied carbon data into software packages that will generate overall carbon information for the whole building. This practice will only increase going forwards. Due to the clarity of these reports, industry professionals can see the logic behind manufacturers' carbon data and make allowances in the software to best suit the project needs.

The demand for embodied carbon data of building services products is increasing rapidly. Customers and end users now expect manufacturers to provide some indication of the carbon within their products. This is a positive step for the industry as it demonstrates that multiple stakeholders want to know the overall environmental impact of their building project, and how that impact can be minimised.

Mitsubishi Electric will continue to produce embodied and operational carbon data on all our products to help the construction industry on the journey to Net Zero carbon emissions.

TM65 calculation tables



These tables show the TM65 mid display data across a wide range of our heating, cooling and ventilation products. For each table, a representative model has been used (as highlighted) to calculate the other models embodied carbon in the same product family. The method uses the weight of each product to interpolate the data using the representative model as the baseline.

City Multi VRF / Hybrid VRF Outdoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** (kgCO_2e)
PURY-EM200YNW-A1	Heat Recovery High Efficiency R32 HVRF	22.4	5,907
PURY-EM250YNW-A1	Heat Recovery High Efficiency R32 HVRF	28.0	5,907
PURY-EM300YNW-A1	**Heat Recovery High Efficiency R32 HVRF**	**33.5**	**5,907**
PURY-EM350YNW-A1	Heat Recovery High Efficiency R32 HVRF	40.0	7,058
PURY-EM400YNW-A1	Heat Recovery High Efficiency R32 HVRF	45.0	7,160
PURY-EM450YNW-A1	Heat Recovery High Efficiency R32 HVRF	50.0	7,799
PURY-EM500YNW-A1	Heat Recovery High Efficiency R32 HVRF	56.0	8,899
PURY-M200YNW-A1	Heat Recovery High Efficiency R32 HVRF	22.4	5,612
PURY-M250YNW-A1	Heat Recovery High Efficiency R32 HVRF	28.0	5,612
PURY-M300YNW-A1	**Heat Recovery High Efficiency R32 HVRF**	**33.5**	**5,612**
PURY-M350YNW-A1	Heat Recovery High Efficiency R32 HVRF	40.0	6,675
PURY-M400YNW-A1	Heat Recovery High Efficiency R32 HVRF	45.0	6,749
PURY-M450YNW-A1	Heat Recovery High Efficiency R32 HVRF	50.0	7,244
PURY-M500YNW-A1	Heat Recovery High Efficiency R32 HVRF	56.0	8,331
PURY-EP200YNW-A2	R410A VRF R2 Series High Efficiency	22.4	12,187
PURY-EP250YNW-A2	R410A VRF R2 Series High Efficiency	28.0	12,688
PURY-EP300YNW-A2	**R410A VRF R2 Series High Efficiency**	**33.5**	**12,799**
PURY-EP350YNW-A2	R410A VRF R2 Series High Efficiency	40.0	22,492
PURY-EP400YNW-A2	R410A VRF R2 Series High Efficiency	45.0	22,573
PURY-EP450YNW-A2	**R410A VRF R2 Series High Efficiency**	**50.0**	**24,618**
PURY-EP500YNW-A2	R410A VRF R2 Series High Efficiency	56.0	25,065
PURY-EP550YNW-A2	**R410A VRF R2 Series High Efficiency**	**60.0**	**25,065**
PURY-P200YNW-A2	R410A VRF R2 Series Standard Efficiency	22.4	11,872
PURY-P250YNW-A2	R410A VRF R2 Series Standard Efficiency	28.0	12,371
PURY-P300YNW-A2	**R410A VRF R2 Series Standard Efficiency**	**33.5**	**12,482**
PURY-P350YNW-A2	R410A VRF R2 Series Standard Efficiency	40.0	22,344
PURY-P400YNW-A2	R410A VRF R2 Series Standard Efficiency	45.0	22,344
PURY-P450YNW-A2	**R410A VRF R2 Series Standard Efficiency**	**50.0**	**24,409**
PURY-P500YNW-A2	R410A VRF R2 Series Standard Efficiency	56.0	24,409
PURY-P550YNW-A2	**R410A VRF R2 Series Standard Efficiency**	**63.0**	**24,409**

City Multi VRF / Hybrid VRF Outdoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** (kgCO_2e)
PUHY-P200YNW-A2	R410A VRF Y Series	22.4	14,246
PUHY-P250YNW-A2	R410A VRF Y Series	28	14,246
PUHY-P300YNW-A2	**R410A VRF Y Series**	33.5	15,116
PUHY-P350YNW-A2	R410A VRF Y Series	40	15,116
PUHY-P400YNW-A2	R410A VRF Y Series	45.0	24,088
PUHY-P450YNW-A2	**R410A VRF Y Series**	50.0	24,088
PUHY-P500YNW-A2	R410A VRF Y Series	56.0	24,457
PUMY-P200YKM2	**Mini Heat Pump Twin Fan R410A**	22.4	15,337
PUMY-P250YBM	**Mini Heat Pump Twin Fan R410A**	28.0	20,087
PUMY-P300YBM	**Mini Heat Pump Twin Fan R410A**	33.5	20,087
PUMY-SP112VKM2	R410A Mini VRF Y Series Single Fan	12.5	8,030
PUMY-SP125VKM2	R410A Mini VRF Y Series Single Fan	14.0	8,030
PUMY-SP140VKM2	R410A Mini VRF Y Series Single Fan	15.5	8,030
PUMY-SP112-YKM2	R410A Mini VRF Y Series Single Fan	12.5	8,040
PUMY-SP125-YKM2	R410A Mini VRF Y Series Single Fan	14.0	8,040
PUMY-SP140-YKM2	R410A Mini VRF Y Series Single Fan	15.5	8,040
PUMY-P112VKM6	R410A Mini VRF Y Series Twin Fan	12.5	10,581
PUMY-P125VKM6	R410A Mini VRF Y Series Twin Fan	14.0	10,581
PUMY-P140VKM6	R410A Mini VRF Y Series Twin Fan	15.5	10,581
PUMY-P112YKM5	R410A Mini VRF Y Series Twin Fan	12.5	10,656
PUMY-P125YKM5	R410A Mini VRF Y Series Twin Fan	14.0	10,656
PUMY-P140YKM5	R410A Mini VRF Y Series Twin Fan	15.5	10,656
PUMY-P200YKM3	R410A Mini VRF Y Series Twin Fan	22.4	15,671
PUMY-P250YBM2	R410A Mini VRF Y Series Twin Fan	22.4	20,242
PUMY-P300YBM2	**R410A Mini VRF Y Series Twin Fan**	28.0	20,242

Notes. All other calculations have been interpolated from the reference model highlighted. PURY-EM and PURY-M units used for VRF / HVRF systems. PUMY-P and PUMY-SP units used for City multi, Mr.Slim and the Stylish M series indoor unit

City Multi VRF / Hybrid VRF Outdoor Units
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

City Multi VRF Indoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** (kgCO_2e)
PEFY-P15VMS1-E	**Ultra Thin Ceiling Concealed Ducted R410A**	**1.7**	**245**
PEFY-P20VMS1-E	Ultra Thin Ceiling Concealed Ducted R410A	2.2	245
PEFY-P25VMS1-E	Ultra Thin Ceiling Concealed Ducted R410A	2.8	245
PEFY-P32VMS1-E	Ultra Thin Ceiling Concealed Ducted R410A	3.6	258
PEFY-P40VMS1-E	Ultra Thin Ceiling Concealed Ducted R410A	4.5	309
PEFY-P50VMS1-E	Ultra Thin Ceiling Concealed Ducted R410A	5.6	309
PEFY-P63VMS1-E	Ultra Thin Ceiling Concealed Ducted R410A	7.1	361
PEFY-M20VMA-A	Standard Ceiling Concealed Ducted R410A	2.2	532
PEFY-M25VMA-A	Standard Ceiling Concealed Ducted R410A	2.8	532
PEFY-M32VMA-A	Standard Ceiling Concealed Ducted R410A	3.6	532
PEFY-M40VMA-A	Standard Ceiling Concealed Ducted R410A	4.5	614
PEFY-M50VMA-A	**Standard Ceiling Concealed Ducted R410A**	**5.6**	**614**
PEFY-M63VMA-A	Standard Ceiling Concealed Ducted R410A	7.1	655
PEFY-M80VMA-A	Standard Ceiling Concealed Ducted R410A	9.0	716
PEFY-M100VMA-A	Standard Ceiling Concealed Ducted R410A	11.2	860
PEFY-M125VMA-A	Standard Ceiling Concealed Ducted R410A	14.0	880
PEFY-M20VMA-A1	Standard Ceiling Concealed Ducted R410A	2.2	252
PEFY-M25VMA-A1	Standard Ceiling Concealed Ducted R410A	2.8	252
PEFY-M32VMA-A1	Standard Ceiling Concealed Ducted R410A	3.6	252
PEFY-M40VMA-A1	Standard Ceiling Concealed Ducted R410A	4.5	283
PEFY-M50VMA-A1	Standard Ceiling Concealed Ducted R410A	5.6	324
PEFY-M63VMA-A1	Standard Ceiling Concealed Ducted R410A	7.1	324
PEFY-M80VMA-A1	Standard Ceiling Concealed Ducted R410A	9.0	384
PEFY-M100VMA-A1	Standard Ceiling Concealed Ducted R410A	11.2	384
PEFY-M125VMA-A1	Standard Ceiling Concealed Ducted R410A	14.0	390
PFFY-P20VKM-E2	Floor Standing Exposed Indoor Unit R410A	2.2	232
PFFY-P25VKM-E2	Floor Standing Exposed Indoor Unit R410A	2.8	232
PFFY-P32VKM-E2	Floor Standing Exposed Indoor Unit R410A	3.6	232
PFFY-P40VKM-E2	Floor Standing Exposed Indoor Unit R410A	4.5	232
PKFY-P63VKM-E	Wall Mounted R410A	7.1	269
PCFY-P40VKM-E	Ceiling Suspended R410A	4.5	273
PCFY-P63VKM-E	Ceiling Suspended R410	7.1	326
PCFY-P100VKM-E	Ceiling Suspended R410	11.2	354
PCFY-P125VKM-E	Ceiling Suspended R410	14.0	376

City Multi VRF Indoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
PLFY-M32VEM-E	4-Way Blow Ceiling Cassette R410A	3.6	170
PLFY-M40VEM-E	4-Way Blow Ceiling Cassette R410A	4.5	170
PLFY-M50VEM-E	**4-Way Blow Ceiling Cassette R410A**	**5.6**	**170**
PLFY-M63VEM-E	4-Way Blow Ceiling Cassette R410A	7.1	185
PLFY-M80VEM-E	4-Way Blow Ceiling Cassette R410A	9.0	185
PLFY-M100VEM-E	4-Way Blow Ceiling Cassette R410A	11.2	207
PLFY-M125VEM-E	4-Way Blow Ceiling Cassette R410A	14.0	207
PLP-6EA Grille	4-Way Blow Decoration Panel		33

Note. Also applicible to PLFY-M-VEM6

PLFY-P15VFM-E	600 x 600 4-Way Blow Ceiling Cassette R410A	1.7	143
PLFY-P20VFM-E	600 x 600 4-Way Blow Ceiling Cassette R410A	2.2	143
PLFY-P25VFM-E	**600 x 600 4-Way Blow Ceiling Cassette R410A**	**2.8**	**143**
PLFY-P32VFM-E	600 x 600 4-Way Blow Ceiling Cassette R410A	3.6	151
PLFY-P40VFM-E	600 x 600 4-Way Blow Ceiling Cassette R410A	4.5	151
PLFY-P50VFM-E	600 x 600 4-Way Blow Ceiling Cassette R410A	5.6	151
SLP-2FA	600 x 600 4-Way Blow Decoration Panel		20

Note. all other calculations have been interpolated from the reference model highlighted

PKFY-P10VLM-E	Wall Mounted R410A	1.2	132
PKFY-P15VLM-E	Wall Mounted R410A	1.7	132
PKFY-P15VLM-E	Wall Mounted R410A	2.2	132
PKFY-P25VLM-E	Wall Mounted R410A	2.8	132
PKFY-P32VLM-E	Wall Mounted R410A	3.6	132
PKFY-P40VLM-E	Wall Mounted R410A	4.5	150
PKFY-P50VLM-E	Wall Mounted R410A	5.6	150
PKFY-P63VLM-E	**Wall Mounted R410A**	**7.1**	**241**

Note. all other calculations have been interpolated from the reference model highlighted

City Multi VRF Indoor Units
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

City Multi VRF Branch Controllers

Model	Description	TM65 Mid Display (kgCO_2e)
CMB-M108V-JA1	**8 Port BC Controller R410A**	**545**
CMB-M1012V-JA1	12 Port BC Controller R410A	660
CMB-M1016V-JA1	16 Port BC Controller R410A	736
CMB-P1016V-KA1	16 Port BC Controller R410A	746

Note. All other calculations have been interpolated from the reference model highlighted

City Multi VRF Branch Controllers
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

City Multi Hybrid VRF Indoor Units

Model	Description	Cooling Capacity (kW)	TM65 Mid Display (kgCO_2e)
PEFY-WP10VMS1-E	Ultra Thin Ceiling Concealed Ducted	1.2	245
PEFY-WP15VMS1-E	**Ultra Thin Ceiling Concealed Ducted**	**1.7**	**245**
PEFY-WP20VMS1-E	Ultra Thin Ceiling Concealed Ducted	2.2	256
PEFY-WP25VMS1-E	Ultra Thin Ceiling Concealed Ducted	2.8	256
PEFY-WP32VMS1-E	Ultra Thin Ceiling Concealed Ducted	3.6	312
PEFY-WP40VMS1-E	Ultra Thin Ceiling Concealed Ducted	4.5	312
PEFY-WP50VMS1-E	Ultra Thin Ceiling Concealed Ducted	5.6	334
PEFY-WP20VMA-A	Standard Ceiling Concealed Ducted	2.2	225
PEFY-WP25VMA-A	Standard Ceiling Concealed Ducted	2.8	266
PEFY-WP32VMA-A	Standard Ceiling Concealed Ducted	3.6	266
PEFY-WP40VMA-A	Standard Ceiling Concealed Ducted	4.5	308
PEFY-WP50VMA-A	**Standard Ceiling Concealed Ducted**	**5.6**	**308**
PEFY-WP63VMA-A	Standard Ceiling Concealed Ducted	7.1	308
PEFY-WP80VMA-A	Standard Ceiling Concealed Ducted	9.0	383
PLFY-WL32VEM-E	4-Way Blow Ceiling Cassette	3.6	229
PLFY-WL40VEM-E	4-Way Blow Ceiling Cassette	4.5	229
PLFY-WL50VEM-E	4-Way Blow Ceiling Cassette	5.6	229
PLFY-WL63VEM-E	**4-Way Blow Ceiling Cassette**	**7.1**	**258**
PLFY-WL80VEM-E	4-Way Blow Ceiling Cassette	9.0	258
PLP-6EA Grille	4-Way Blow Decoration Panel		33

City Multi Hybrid VRF Indoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
PLFY-WL15VFM-E	600 x 600 4-Way Blow Ceiling Cassette	1.7	137
PLFY-WL20VFM-E	600 x 600 4-Way Blow Ceiling Cassette	2.2	146
PLFY-WL25VFM-E	**600 x 600 4-Way Blow Ceiling Cassette**	2.8	146
PLFY-WL32VFM-E	600 x 600 4-Way Blow Ceiling Cassette	3.6	146
PLFY-WL40VFM-E	600 x 600 4-Way Blow Ceiling Cassette	4.5	146
SLP-2FA	600 x 600 4-Way Blow Decoration Panel		20

Note. All other calculations have been interpolated from the reference model highlighted

City Multi Hybrid VRF Indoor Units
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

City Multi Hybrid VRF Branch Controllers

Model	Description	**TM65 Mid Display** ($kgCO_2e$)
CMB-WM108V-AA	**8 Port Horizontal Main HBC Controller**	848
CMB-WM1016V-AA	**16 Port Horizontal Main HBC Controller**	935
CMB-WM108V-BB	**8 Port Horizontal Sub HBC Controller**	502
CMB-WM1016V-BB	**16 Port Horizontal Sub HBC Controller**	605
CMB-WM350F-AA	**6 Port Vertical Main HBC Controller**	1,605
CMB-WM500F-AA	**6 Port Vertical Main HBC Controller**	1,680

Note. All other calculations have been interpolated from the reference model highlighted

City Multi Hybrid VRF Branch Controllers
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

Embodied Carbon
An Overview

Commercial Ventilation

Model	Description	**Airflow** (l/s)	**TM65 Mid Display** ($kgCO_2e$)
LGH-15RVX-E	Commercial Lossnay	42	193
LGH-25RVX-E	Commercial Lossnay	69	214
LGH-35RVX-E	Commercial Lossnay	97	264
LGH-50RVX-E	Commercial Lossnay	139	285
LGH-65RVX-E	Commercial Lossnay	181	321
LGH-80RVX-E	Commercial Lossnay	222	392
LGH-100RVX-E	**Commercial Lossnay**	**278**	**435**
LGH-150RVX-E	Commercial Lossnay	417	749
LGH-200RVX-E	Commercial Lossnay	556	834
LGH-50RVS-E	Commercial Lossnay	139	520
LGH-80RVS-E	Commercial Lossnay	222	567
LGH-100RVS-E	Commercial Lossnay	278	628

Note. all other calculations have been interpolated from the reference model highlighted

Commercial Ventilation
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Residential Ventilation

Model	Description	**Airflow** (l/s)	**TM65 Mid Display** ($kgCO_2e$)
VL-250CZPVU-R/L-E	**Residential Lossnay**	**69**	**304**
VL-350CZPVU-R/L-E	Residential Lossnay	89	360
VL-500CZPVU-R/L-E	Residential Lossnay	139	426

Note. All other calculations have been interpolated from the reference model highlighted

Residential Ventilation
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Commercial Heat Pumps & Chillers

Model	Description	Cooling / Heating Capacity (kW)	TM65 Mid Display ($kgCO_2e$)
EAHV-M1500YCL-N	**Modular Air Source Heat Pump R32**	150 / 150	23,831
EAHV-M1800YCL-N	Modular Air Source Heat Pump R32	180 / 180	23,831
CAHV-R450YA-HPB	Ecodan Air Source Heat Pump R454C	- / 40	5,039
CAHV-P500YB-HPB	**Ecodan Air Source Heat Pump R407c**	- / 42.6	11,273
QAHV-N560YA-HPB	**Ecodan Air Source Heat Pump R744**	- / 40	3,619
EHWT17D-MHEDW	**Hydrodan Water to Water Heat Pump R32**	- / 8.0	1,399

Model	Version	Description	Heating Capacity (kW)	TM65 Mid Display ($kgCO_2e$)
EW-HT /0152	**-**	**Water Sourced High Temperature Heat Pump (R314a)**	70.2	4,834
EW-HT /0182	-	Water Sourced High Temperature Heat Pump (R314a)	79.5	5,360
EW-HT /0202	-	Water Sourced High Temperature Heat Pump (R314a)	92.7	5,907
EW-HT /0262	-	Water Sourced High Temperature Heat Pump (R314a)	113.2	6,552
EW-HT /0302	**-**	**Water Sourced High Temperature Heat Pump (R314a)**	139.4	7,045
EW-HT /0412	-	Water Sourced High Temperature Heat Pump (R314a)	181	8,717
EW-HT /0512	-	Water Sourced High Temperature Heat Pump (R314a)	225.2	10,166
EW-HT /0612	-	Water Sourced High Temperature Heat Pump (R314a)	279.7	11,185
i-FX-N-G05 /0472	A	Air Sourced Heat Pump (R513A)	453.2	84,603
	SL-A	Air Sourced Heat Pump (R513A)	448.6	88,134
i-FX-N-G05 /0512	A	Air Sourced Heat Pump (R513A)	506.8	92,895
	SL-A	Air Sourced Heat Pump (R513A)	500.4	96,682
i-FX-N-G05 /0572	A	Air Sourced Heat Pump (R513A)	547.9	93,082
	SL-A	Air Sourced Heat Pump (R513A)	542.4	100,374
i-FX-N-G05 /0602	A	Air Sourced Heat Pump (R513A)	575.7	98,218
	SL-A	Air Sourced Heat Pump (R513A)	568.3	105,473
i-FX-N-G05 /0652	A	Air Sourced Heat Pump (R513A)	664.3	102,634
	SL-A	Air Sourced Heat Pump (R513A)	657.9	109,408
i-FX-N-G05 /0772	A	Air Sourced Heat Pump (R513A)	748.1	126,226
	SL-A	**Air Sourced Heat Pump (R513A)**	740.1	128,649
i-FX-N-G05 /0902	A	Air Sourced Heat Pump (R513A)	872	153,818
	SL-A	Air Sourced Heat Pump (R513A)	863.2	163,438
i-FX-N-G05 /1002	A	Air Sourced Heat Pump (R513A)	1,007	168,949
	SL-A	Air Sourced Heat Pump (R513A)	997.3	173,681
i-FX-N-G05 /1152	A	Air Sourced Heat Pump (R513A)	1,112	194,053
	SL-A	**Air Sourced Heat Pump (R513A)**	1,100	207,246

Note. All other calculations have been interpolated from the reference model highlighted

Commercial Heat Pumps & Chillers

Model	Version	Description	**Heating Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
i-FX-Q2-G05 0502	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	497.2	99,520
	SL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	492.4	102,514
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	438.6	102,115
i-FX-Q2-G05 0532	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	497.2	103,555
	SL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	492.4	106,550
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	466.8	106,342
i-FX-Q2-G05 0602	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	531.3	112,905
	SL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	526.4	115,897
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	507.3	115,754
i-FX-Q2-G05 0652	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	644.4	122,550
	SL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	637.8	125,531
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	566.3	125,030
i-FX-Q2-G05 0702	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	685.4	131,830
	SL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	679.4	134,801
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	627.3	134,463
i-FX-Q2-G05 0802	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	765.3	146,246
	SL-CA	**Air Sourced Multi-Functional 4-Pipe (R513A)**	**756.3**	**149,116**
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	728.8	148,969
i-FX-Q2-G05 0902	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	940.6	160,796
	SL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	882.2	163,200
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	834	162,811
i-FX-Q2-G05 1002	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	989.4	171,388
	SL-CA	**Air Sourced Multi-Functional 4-Pipe (R513A)**	**949**	**174,038**
	XL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	898	173,330
i-FX-Q2-G05 1102	CA	Air Sourced Multi-Functional 4-Pipe (R513A)	1,071	172,441
	SL-CA	Air Sourced Multi-Functional 4-Pipe (R513A)	1,018	174,969

Model	Description	**Cooling / Heating Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
MEHP-iS-G07 /0051	Air Sourced Heat Pump (R32)	48 / 50	8,516
MEHP-iS-G07 /0061	Air Sourced Heat Pump (R32)	53 / 60	8,562
MEHP-iS-G07 /0071	Air Sourced Heat Pump (R32)	60 / 70	8,625
MEHP-iS-G07 /0082	Air Sourced Heat Pump (R32)	68.3 / 80	11,458
MEHP-iS-G07 /0092	Air Sourced Heat Pump (R32)	74.1 / 90	11,525
MEHP-iS-G07 /0102	Air Sourced Heat Pump (R32)	85.9 / 100.3	13,847
MEHP-iS-G07 /0112	Air Sourced Heat Pump (R32)	93.8 / 110.3	13,915

Note. All other calculations have been interpolated from the reference model highlighted

Commercial Heat Pumps & Chillers

Model	Description	Cooling / Heating Capacity (kW)	TM65 Mid Display (kgCO$_2$e)
MEHP-iB-G07 07V	Air Sourced Heat Pump (R32)	6.20 / 6.74	1,889
MEHP-iB-G07 09V	Air Sourced Heat Pump (R32)	7.72 / 8.77	3,046
MEHP-iB-G07 11V	Air Sourced Heat Pump (R32)	10.37 / 11.24	3,209
MEHP-iB-G07 15V	Air Sourced Heat Pump (R32)	13.49 / 15.04	1,397
MEHP-iB-G07 15Y	**Air Sourced Heat Pump (R32)**	13.52 / 15.27	2,074
MEHP-iB-G07 18Y	Air Sourced Heat Pump (R32)	15.62 / 17.24	4,384
MEHP-iB-G07 23Y	Air Sourced Heat Pump (R32)	19.70 / 23.80	5,687
MEHP-iB-G07 27Y	**Air Sourced Heat Pump (R32)**	25.85 / 27.23	3,581
MEHP-iB-G07 35Y	Air Sourced Heat Pump (R32)	30.90 / 34.19	7,948
MEHP-iB-G07 40Y	**Air Sourced Heat Pump (R32)**	35.82 / 40.86	4,773
MECH-iS-G07 /0051	Air Sourced Chiller (R32)	50 / -	7,247
MECH-iS-G07 /0061	Air Sourced Chiller (R32)	60 / -	7,305
MECH-iS-G07 /0071	Air Sourced Chiller (R32)	70 / -	7,415
MECH-iS-G07 /0082	Air Sourced Chiller (R32)	80 / -	9,534
MECH-iS-G07 /0092	Air Sourced Chiller (R32)	90 / -	9,623
MECH-iS-G07 /0102	Air Sourced Chiller (R32)	100 / -	10,865
MECH-iS-G07 /0112	Air Sourced Chiller (R32)	110 / -	10,958

Note. All other calculations have been interpolated from the reference model highlighted

Commercial Heat Pumps & Chillers
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Residential Heat Pumps

Model	Description	Heating Capacity (kW)	TM65 Mid Display (kgCO$_2$e)
QUHZ-W40VA	**Monobloc Air Source Heat Pump R744**	4.3	618
PUZ-WM50VHA	**Monobloc Air Source Heat Pump R32**	5.0	1,294
PUZ-WM60VAA	**Monobloc Air Source Heat Pump R32**	6.0	1,362
PUZ-WM85VAA	**Monobloc Air Source Heat Pump R32**	8.5	1,362
PUZ-WM85YAA	Monobloc Air Source Heat Pump R32	8.5	1,517
PUZ-WM112VAA	Monobloc Air Source Heat Pump R32	11.2	1,677
PUZ-WM112YAA	Monobloc Air Source Heat Pump R32	11.2	1,838
PUZ-HWM140VHA	Monobloc Air Source Heat Pump R32	14.0	1,758
PUZ-HWM140YHA	Monobloc Air Source Heat Pump R32	14.0	1,885
PUZ-WZ50VAA	Monobloc Air Source Heat Pump R290	5.0	611
PUZ-WZ60VAA	Monobloc Air Source Heat Pump R290	6.0	611
PUZ-WZ80VAA	Monobloc Air Source Heat Pump R290	8.0	808

Note. All other calculations have been interpolated from the reference model highlighted

Residential Heat Pumps
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Embodied Carbon
An Overview

M Series - Indoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
MSZ-AP15VGK	Elegance Wall Mounted	1.5	106
MSZ-AP20VGK	**Elegance Wall Mounted**	**2.0**	**106**
MSZ-AP25VGK	Elegance Wall Mounted	2.5	144
MSZ-AP35VGK	Elegance Wall Mounted	3.5	144
MSZ-AP42VGK	Elegance Wall Mounted	4.2	144
MSZ-AP50VGK	Elegance Wall Mounted	5.0	144
MSZ-AP60VGK	Elegance Wall Mounted	6.1	193
MSZ-AP71VGK	Elegance Wall Mounted	7.1	204
MSZ-LN18VG2W	Premium Wall Mounted	1.8	169
MSZ-LN25VG2W	**Premium Wall Mounted**	**2.5**	**169**
MSZ-LN35VG2W	Premium Wall Mounted	3.5	169
MSZ-LN50VG2W	Premium Wall Mounted	5.0	169
MSZ-LN60VG2W	Premium Wall Mounted	6.1	169
MSZ-EF18VGK	Zen Wall Mounted	1.8	219
MSZ-EF25VGK	Zen Wall Mounted	2.5	219
MSZ-EF35VGK	Zen Wall Mounted	3.5	219
MSZ-EF50VGK	Zen Wall Mounted	5.0	219
MSZ-EF60VGK	Zen Wall Mounted	6.1	219
MSZ-AY25VGK	Elegance Wall Mounted	2.5	143
MSZ-AY35VGK	Elegance Wall Mounted	3.5	143
MSZ-AY42VGK	Elegance Wall Mounted	4.2	143
MSZ-AY50VGK	Elegance Wall Mounted	5.0	143
MSZ-HR25VF	Classic Wall Mounted System	2.5	1,453
MSZ-HR35VF	Classic Wall Mounted System	3.4	1,453
MSZ-HR42VF	Classic Wall Mounted System	4.2	1,459
MSZ-HR50VF	Classic Wall Mounted System	5.0	1,459
MFZ-KT25VG	Floor Mounted System	2.5	198
MFZ-KT35VG	Floor Mounted System	3.5	198
MFZ-KT50VG	Floor Mounted System	5.0	207
MFZ-KT60VG	Floor Mounted System	6.1	211

Note. All other calculations have been interpolated from the reference model highlighted

M Series - Indoor Units
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

M Series - Outdoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
MXZ-2F33VF3	Multi-Split Inverter Heat Pump R32	3.3	1 052
MXZ-2F42VF3	Multi-Split Inverter Heat Pump R32	4.2	1,144
MXZ-2F53VF3	Multi-Split Inverter Heat Pump R32	5.3	1,144
MXZ-3F54VF3	Multi-Split Inverter Heat Pump R32	5.4	1,624
MXZ-3F68VF3	Multi-Split Inverter Heat Pump R32	6.8	1,624
MXZ-4F72VF3	Multi-Split Inverter Heat Pump R32	7.2	1,647
MXZ-4F83VF3	**Multi-Split Inverter Heat Pump R32**	8.3	1,716
MXZ-5F102VF3	Multi-Split Inverter Heat Pump R32	10.2	1,716
MXZ-6F122VF3	Multi-Split Inverter Heat Pump R32	12.2	2,288
MXZ-2F33VF4	Inverter Heat Pump (3.3-12.0kW) - R32	3.3	797
MXZ-2F42VF4	Inverter Heat Pump (3.3-12.0kW) - R32	4.2	926
MXZ-2F53VF4	Inverter Heat Pump (3.3-12.0kW) - R32	5.3	926
MXZ-3F54VF4	Inverter Heat Pump (3.3-12.0kW) - R32	5.4	1,856
MXZ-3F68VF4	Inverter Heat Pump (3.3-12.0kW) - R32	6.8	1,856
MXZ-4F72VF4	Inverter Heat Pump (3.3-12.0kW) - R32	7.2	1,863
MXZ-4F83VF2	Inverter Heat Pump (3.3-12.0kW) - R32	8.3	1,816
MXZ-5F102VF2	Inverter Heat Pump (3.3-12.0kW) - R32	10.2	1,816
MXZ-6F120VF2	Inverter Heat Pump (3.3-12.0kW) - R32	12	2,097
MXZ-2HA40VF2	Inverter Heat Pump (4-5kW) - R32	4.0	876
MXZ-2HA50VF2	Inverter Heat Pump (4-5kW) - R32	5.0	876
MUZ-LN25VG2	Premium Inverter Heat Pump R32	2.5	839
MUZ-LN35VG2	Premium Inverter Heat Pump R32	3.5	846
MUZ-LN50VG2	Premium Inverter Heat Pump R32	5.0	1,088
MUZ-LN60VG2	Premium Inverter Heat Pump R32	6.1	1,143
MUZ-EF25VG	Zen Inverter Heat Pump R32	2.5	729
MUZ-EF35VG	Zen Inverter Heat Pump R32	3.5	817
MUZ-EF50VG	Zen Inverter Heat Pump R32	5.0	1,005
MUZ-AP20VGK	Elegance Inverter Heat Pump R32	2.0	700
MUZ-AP60VGK	Elegance Inverter Heat Pump R32	6.1	1,005
MUZ-AP71VGK	Elegance Inverter Heat Pump R32	7.1	1,502

M Series - Outdoor Units

Model	Description	Cooling Capacity (kW)	TM65 Mid Display (kgCO_2e)
MUZ-AY25VGK	Elegance Inverter Heat Pump R32	2.5	583
MUZ-AY35VGK	Elegance Inverter Heat Pump R32	3.5	595
MUZ-AY42VGK	Elegance Inverter Heat Pump R32	4.2	730
MUZ-AY50VGK	Elegance Inverter Heat Pump R32	5.0	964
MUZ-HR25VF	Classic Inverter Heat Pump R32	2.5	517
MUZ-HR35VF	Classic Inverter Heat Pump R32	3.4	532
MUZ-HR50VF	Classic Inverter Heat Pump R32	5	785
MUZ-HR60VF	Classic Inverter Heat Pump R32	6.1	1,005
MUZ-HR71VF	Classic Inverter Heat Pump R32	7.1	1,005

Note. All other calculations have been interpolated from the reference model highlighted

M Series - Outdoor Units
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Mr Slim - Indoor Units

Model	Description	Cooling Capacity (kW)	TM65 Mid Display (kgCO_2e)
PLA-ZM35EA2	R32 4-Way Blow Ceiling Cassette System	3.6	358
PLA-ZM50EA2	R32 4-Way Blow Ceiling Cassette System	5	358
PLA-ZM60EA2	R32 4-Way Blow Ceiling Cassette System	6.1	358
PLA-ZM71EA2	R32 4-Way Blow Ceiling Cassette System	7.1	382
PLA-ZM100EA2	R32 4-Way Blow Ceiling Cassette System	9.5	405
PLA-ZM125EA2	R32 4-Way Blow Ceiling Cassette System	12.5	405
PLA-ZM140EA2	R32 4-Way Blow Ceiling Cassette System	13.4	405
PLA-M35EA2	R32 4-Way Blow Ceiling Cassette System	3.6	335
PLA-M50EA2	R32 4-Way Blow Ceiling Cassette System	5	335
PLA-M60EA2	R32 4-Way Blow Ceiling Cassette System	6.1	358
PLA-M71EA2	R32 4-Way Blow Ceiling Cassette System	7.1	358
PLA-M100EA2	R32 4-Way Blow Ceiling Cassette System	9.5	382
PLA-M125EA2	R32 4-Way Blow Ceiling Cassette System	12.5	405
PLA-M140EA2	R32 4-Way Blow Ceiling Cassette System	13.4	405

Mr Slim - Indoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
SLZ-M15FA2	R32 600x600 4-Way Blow Ceiling Casset	1.5	236
SLZ-M25FA2	R32 600x600 4-Way Blow Ceiling Cassette System	2.5	236
SLZ-M35FA2	R32 600x600 4-Way Blow Ceiling Cassette System	3.5	236
SLZ-M50FA2	R32 600x600 4-Way Blow Ceiling Cassette System	5	236
SLZ-M60FA2	R32 600x600 4-Way Blow Ceiling Cassette System	6	236
PKA-M35LA2	R32 Wall Mounted System	3.6	199
PKA-M50LA2	R32 Wall Mounted System	4.6	201
PKA-M60KA2	R32 Wall Mounted System	6.1	266
PKA-M71KA2	R32 Wall Mounted System	7.1	266
PKA-M100KA2	R32 Wall Mounted System	9.5	266
PEAD-M35JA2	R32 Ceiling Concealed Ducted System	3.6	299
PEAD-M50JA2	R32 Ceiling Concealed Ducted System	5	323
PEAD-M60JA2	R32 Ceiling Concealed Ducted System	6.1	359
PEAD-M71JA2	R32 Ceiling Concealed Ducted System	7.1	359
PEAD-M100JA2	R32 Ceiling Concealed Ducted System	9.5	466
PEAD-M125JA2	R32 Ceiling Concealed Ducted System	12.5	478
PEAD-M140JA2	R32 Ceiling Concealed Ducted System	13.4	526
PCA-M50KA2	R32 Ceiling Suspended System	5	295
PCA-M60KA2	R32 Ceiling Suspended System	6.1	316
PCA-M71KA2	R32 Ceiling Suspended System	7.1	316
PCA-M100KA2	R32 Ceiling Suspended System	9.5	357
PCA-M125KA2	R32 Ceiling Suspended System	12.5	370
PCA-M140KA2	R32 Ceiling Suspended System	13.4	395
PSA-M71KA	R32 Floor Standing System	7.1	443
PSA-M100KA	R32 Floor Standing System	9.5	443
PSA-M125KA	R32 Floor Standing System	12.5	443
PSA-M140KA	R32 Floor Standing System	13.4	479
SFZ-M25VA	R32 Floor Standing System	2.5	230
SFZ-M35VA	R32 Floor Standing System	3.5	257
SFZ-M50VA	R32 Floor Standing System	5	257
SFZ-M60VA	R32 Floor Standing System	6.1	285
SFZ-M71VA	R32 Floor Standing System	7.1	285

Note. All other calculations have been interpolated from the reference model highlighted

Mr Slim - Indoor Units
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Mr Slim - Outdoor Units

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
PUZ-ZM35-VKA2	Power Inverter Heat Pump (Single Phase) - R32	3.6	1,428
PUZ-ZM50-VKA2	Power Inverter Heat Pump (Single Phase) - R32	5.0	1,428
PUZ-ZM60-VHA2	Power Inverter Heat Pump (Single Phase) - R32	6.1	2,042
PUZ-ZM71-VHA2	Power Inverter Heat Pump (Single Phase) - R32	7.1	2,042
PUZ-ZM100-VKA2	Power Inverter Heat Pump (Single Phase) - R32	9.5	2,765
PUZ-ZM125-VKA2	Power Inverter Heat Pump (Single Phase) - R32	12.5	2,765
PUZ-ZM140-VKA2	Power Inverter Heat Pump (Single Phase) - R32	13.4	2,765
PUZ-ZM100-YKA2	Power Inverter Heat Pump (Three Phase) - R32	9.5	3,170
PUZ-ZM125-YKA2	Power Inverter Heat Pump (Three Phase) - R32	12.5	3,148
PUZ-ZM140-YKA2	Power Inverter Heat Pump (Three Phase) - R32	13.4	3,208
PUZ-ZM200-YKA2	Power Inverter Heat Pump (Three Phase) - R32	19.0	4,537
PUZ-ZM250-YKA2	Power Inverter Heat Pump (Three Phase) - R32	22.0	4,614
PUZ-M100-VKA2	Standard Inverter Heat Pump (Single Phase) - R32	9.5	2,219
PUZ-M125-VKA2	Standard Inverter Heat Pump (Single Phase) - R32	12.1	2,472
PUZ-M140-VKA2	Standard Inverter Heat Pump (Single Phase) - R32	13.4	2,472
PUZ-M100-YKA2	Standard Inverter Heat Pump (Three Phase) - R32	9.5	2,546
PUZ-M125-YKA2	Standard Inverter Heat Pump (Three Phase) - R32	12.5	2,793
PUZ-M140-YKA2	Standard Inverter Heat Pump (Three Phase) - R32	13.4	2,905
PUZ-M200-YKA2	Standard Inverter Heat Pump (Three Phase) - R32	19.0	4,139
PUZ-M250-YKA2	Standard Inverter Heat Pump (Three Phase) - R32	22.0	4,750

Note. All other calculations have been interpolated from the reference model highlighted

Mr Slim - Outdoor Units
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

IT Cooling

Model	Description	**Cooling Capacity** (kW)	**TM65 Mid Display** ($kgCO_2e$)
s-MEXT-G00-DX-F2-O-006-S	Air Cooled - Close Control Unit	6.81	956
s-MEXT-G00-DX-F2-O-009-S	Air Cooled - Close Control Unit	10.1	980
s-MEXT-G00-DX-F2-O-013-S	Air Cooled - Close Control Unit	11.9	1010
s-MEXT-G00-DX-F2-O-022-S	**Air Cooled - Close Control Unit**	**22.5**	**1397**
s-MEXT-G00-DX-F2-O-028-S	Air Cooled - Close Control Unit	27.4	1898
s-MEXT-G00-DX-F2-O-038-D	Air Cooled - Close Control Unit	38.9	1913
s-MEXT-G00-DX-F2-O-044-D	Air Cooled - Close Control Unit	42.3	1923
s-MEXT-G00-DX-F2-U-006-S	Air Cooled - Close Control Unit	6.81	1005
s-MEXT-G00-DX-F2-U-009-S	Air Cooled - Close Control Unit	10.1	1042
s-MEXT-G00-DX-F2-U-013-S	Air Cooled - Close Control Unit	11.9	1080
s-MEXT-G00-DX-F2-U-022-S	Air Cooled - Close Control Unit	22.5	1467
s-MEXT-G00-DX-F2-U-028-S	Air Cooled - Close Control Unit	27.4	1968
s-MEXT-G00-DX-F2-U-038-D	Air Cooled - Close Control Unit	38.9	1983
s-MEXT-G00-DX-F2-U-044-D	Air Cooled - Close Control Unit	42.3	1993

Note. All other calculations have been interpolated from the reference model highlighted

IT Cooling
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Refrigeration

Model	Description	Refrigerating Capacity (kW)		Cooling Capacity (kW)		TM65 Mid Display ($kgCO_2e$)
		ET = -10	ET = -30	ET = -10	ET = -30	
ECOV-X15VA	Natural Refrigerant Condensing Unit - R744	**4**	**2.27**	**296**	521	1,183
ECOV-X37VA	Natural Refrigerant Condensing Unit - R744	**10**	**5.07**	**268**	528	**2,678**
ECOV-X55VA	Natural Refrigerant Condensing Unit - R744	**16**	**7.95**	167	337	2,678

Note. All other calculations have been interpolated from the reference model highlighted

Refrigeration
Embodied Carbon TM65 Calculations
Click on the icon or Scan the QR Code

TM65

Changes for the Better

Telephone: 01707 282880

email: embodied.carbon@meuk.mee.com
les.mitsubishielectric.co.uk

@meuk_les @green_gateway | Mitsubishi Electric Living Environmental Systems UK | Mitsubishi Electric Cooling and Heating UK | mitsubishielectricuk_les | Mitsubishi Electric Living Environmental Systems UK | BLOG thehub.mitsubishielectric.co.uk

UNITED KINGDOM Mitsubishi Electric Europe Living Environment Systems Division, Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, England. Telephone: 01707 282880
IRELAND Mitsubishi Electric Europe, Westgate Business Park, Ballymount, Dublin 24, Ireland. Telephone: (01) 419 8800 International code: (003531)

Note: The fuse rating is for guidance only and 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), R290 (GWP:3), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R454C (GWP:148), 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).

Effective as of March 2024

Green Gateway greengateway.mitsubishielectric.co.uk