# Statement of Verification

BREG EN EPD No.: 000333 Issue 03

This is to verify that the

**Environmental Product Declaration**

provided by:

EcoTherm Insulation (UK) Ltd T/A Building Innovation

BRE Global Verified EPD

is in accordance with the requirements of:

EN 15804:2012+A1:2013

and

BRE Global Scheme Document SD207

This declaration is for:

Inno-Torch

## Company Address

Harvey Road
Burnt Mills Industrial Estate
Basildon
SS13 1QJ

building innovation
TAPERED INSULATION SOLUTIONS

| | | |
|---|---|---|
| Signed for BRE Global Ltd | Emma Baker<br>Operator | 07 April 2022<br>Date of this Issue |
| 05 January 2021<br>Date of First Issue | | 04 January 2026<br>Expiry Date |

BRE Global Verified EPD



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# Environmental Product Declaration

## EPD Number: 000333

## General Information

| EPD Programme Operator | Applicable Product Category Rules |
|---|---|
| BRE Global<br>Watford, Herts<br>WD25 9XX<br>United Kingdom | BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804:2012+A1:2013 |
| **Commissioner of LCA study** | **LCA consultant/Tool** |
| Building Innovation Ltd<br>Harvey Road<br>Burnt Mills Industrial Estate<br>Basildon<br>SS13 1QJ | BRE LINA Tool v2.07 |
| **Declared/Functional Unit** | **Applicability/Coverage** |
| 1m² of PIR insulation at a thickness that gives an R-value of 2.667m².K/W (72mm) | Product Specific. |
| **EPD Type** | **Background database** |
| Cradle to Gate with options | Ecoinvent 3.2 |

| Demonstration of Verification |
|---|
| CEN standard EN 15804 serves as the core PCR [a] |
| Independent verification of the declaration and data according to EN ISO 14025:2010<br>☐Internal ☒ External |
| (Where appropriate [b])Third party verifier:<br>Nigel Jones |
| a: Product category rules<br>b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4) |

| Comparability |
|---|
| Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A1:2013. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A1:2013 for further guidance |

## Information modules covered

| Product | | | Construction | | Use stage | | | | | | | End-of-life | | | | | Benefits and loads beyond the system boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Related to the building fabric | | | | | Related to the building | | | | | | | |
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | | D |
| Raw materials supply | Transport | Manufacturing | Transport to site | Construction – Installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction demolition | Transport | Waste processing | Disposal | | Reuse, Recovery and/or Recycling potential |
| ☑ | ☑ | ☑ | ☑ | ☑ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ | ☑ | ☑ | | ☐ |

Note: Ticks indicate the Information Modules declared.

## Manufacturing site(s)

Harvey Road
Burnt Mills Industrial Estate
Basildon
SS13 1QJ

Torvale Industrial Estate
Pembridge
Herefordshire
HR6 9LA

Bree Industrial Estate
Bree
Castleblayney
Co.Monaghan
A75 X966
Ireland

Enterprise Way
Sherburn in Elmet
Leeds
LS25 6NF

# Construction Product

## Product Description

Building Innovation Inno-Torch consists a high performance rigid thermoset fibre free PIR insulation core faced with a coated glass tissue on one side and bitumenised glass tissue with polypropylene fleece on the other.
Product information is available on Building-innovation.co.uk

## Technical Information

| Property | Value, Unit |
|---|---|
| Thermal Conductivity - EN 13166:2012+A2:2016 | 0.027 W/mK <80 mm<br>0.025 W/mK 80 - 110 mm<br>0.024 W/mK >120 mm |
| Compressive strength at 10% compression | 150 kPa |
| Board Size at range of thicknesses | 1.2 x 0.6 m |

## Main Product Contents

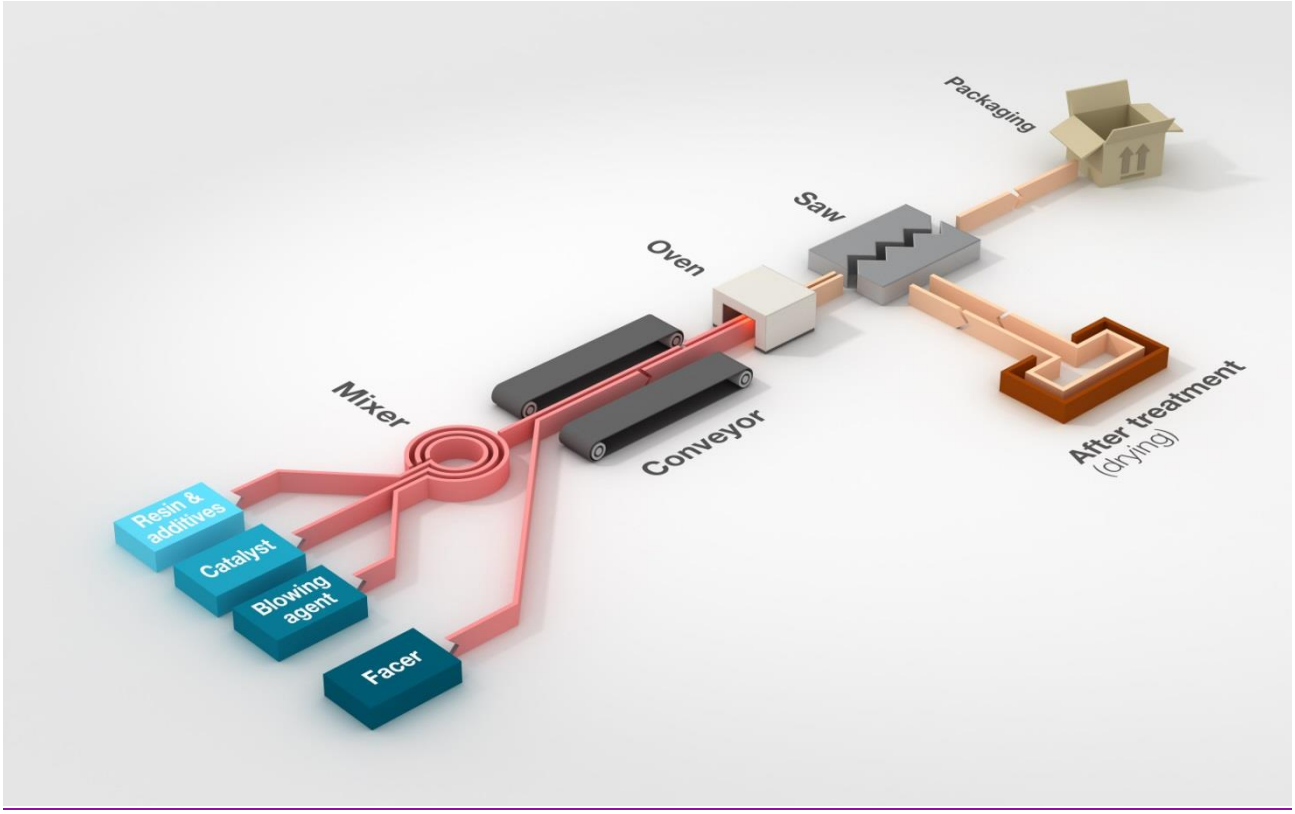
| Material/Chemical Input | % |
|---|---|
| Rigid thermoset fibre free PIR insulation core | 58% |
| facers | 42% |

**Average percentages applicable for 1m$^2$ of insulation at thickness that gives an R-value of 2.667m$^2$K/W*

## Manufacturing Process

Building Innovation PIR is made through a manufacturing process in which a foam forms an insulating core between two facing elements. At the start of the process a mix of chemicals is added directly to the bottom layer of facing and then expands to meet the top layer of facing. As it dries, the foam becomes tacky and adheres itself to the facing, top and bottom. Once it has reached the necessary thickness the foam is cooked under pressure. The insulation boards are then cut into the necessary sizes, packaged and sent to the loading bay for collection.

## Process flow diagram




## Construction Installation

The product will be installed in a variety of building roof applications using standard construction techniques.

## Use Information

The product will be left alone after installation, and there are no known associated environmental impacts.

## End of Life

The insulation will be removed for disposal when the building reaches the end of its life.

# Life Cycle Assessment Calculation Rules

## Declared / Functional unit description

1m$^2$ of insulation at a thickness that gives an R-value of 2.667m$^2$.K/W (72mm)

## System boundary

Cradle to gate with options: Modules A1-3, A4, A5, C2, C3 and C4.
The following processes are included in the A1-A3 production stage: Manufacture of preliminary products (resin, blowing agent, additives). Transportation of raw materials and preliminary products to the manufacturing site. Manufacturing process on the production site including, energy, disposal of residual materials, water consumption and VOC emissions to air.
The following process is included within the A4 construction stage: Transportation of the product to the construction site.
The following processes are included in the A5 construction stage: installation wastage rate, material wastes produced by installation.
The following processes are included in the C2, C3 and C4 End of life scenarios: Transportation of waste from the construction site to the waste processing plant, waste processing operations for recovery, waste sent to landfill.

## Data sources, quality and allocation

This EPD covers all Building Innovation Inno-Torch Board manufactured the Pembridge, Castleblayney, Basildon and Selby sites, representing 100% of production of these products in 2018 over all sites included in this EPD, and 3.0% of the total site output at the Pembridge site (722.13 tonnes), 3.1% at the Castleblayney site (417.73 tonnes), 0.4% at the Basildon site (26.99 tonnes) and 0.3% at the Selby site (38.65 tonnes).

A profile for the PIR foam was created separately as this covered a range of PIR products. The profile included all the impacts from the manufacture of the product, including all the data for the following sections: ‘ancillary materials’, ‘packaging’, ‘fuel/energy’, ‘water’, ‘emissions to air, water and soil’, ‘production waste, ‘other waste’ and ‘water discharged’. Allocation of these factors to the products was achieved by using a proportion of the total PIR foam output. The foam profile was then used as an input for this (and other) end product profiles.

Secondary data has been drawn from the BRE LINA database v2.0.62 and the background LCI datasets are based on Ecoinvent v3.2.

## Cut-off criteria

No inputs or outputs have been excluded. All raw materials, packaging materials, associated transport to the manufacturing site, and from the manufacturing site to the building site, process energy, water use, direct production waste, installations waste and emissions are included.

## LCA Results

(MND = module not declared; MND = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Parameters describing environmental impacts | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | GWP | ODP | AP | EP | POCP | ADPE | ADPF |
| | | | kg $CO_2$ equiv. | kg CFC 11 equiv. | kg $SO_2$ equiv. | kg $(PO_4)^{3-}$ equiv. | kg $C_2H_4$ equiv. | kg Sb equiv. | MJ, net calorific value. |
| Product stage | Raw material supply | A1 | AGG | AGG | AGG | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 7.27e+0 | 2.89e-7 | 3.81e-2 | 8.01e-3 | 9.13e-3 | 5.69e-5 | 1.64e+2 |
| Construction process stage | Transport | A4 | 1.10e-1 | 2.09e-8 | 3.76e-4 | 9.90e-5 | 7.77e-5 | 1.84e-7 | 1.71e+0 |
| | Construction | A5 | 1.48e-1 | 6.20e-9 | 7.70e-4 | 1.62e-4 | 1.84e-4 | 1.14e-6 | 3.31e+0 |
| Use stage | Use | B1 | MND | MND | MND | MND | MND | MND | MND |
| | Maintenance | B2 | MND | MND | MND | MND | MND | MND | MND |
| | Repair | B3 | MND | MND | MND | MND | MND | MND | MND |
| | Replacement | B4 | MND | MND | MND | MND | MND | MND | MND |
| | Refurbishment | B5 | MND | MND | MND | MND | MND | MND | MND |
| | Operational energy use | B6 | MND | MND | MND | MND | MND | MND | MND |
| | Operational water use | B7 | MND | MND | MND | MND | MND | MND | MND |
| End of life | Deconstruction, demolition | C1 | MND | MND | MND | MND | MND | MND | MND |
| | Transport | C2 | 1.10e-1 | 2.09e-8 | 3.76e-4 | 9.90e-5 | 7.77e-5 | 1.84e-7 | 1.71e+0 |
| | Waste processing | C3 | 1.77e-8 | 1.15e-15 | 9.59e-11 | 2.20e-11 | 5.46e-12 | 2.14e-14 | 2.72e-7 |
| | Disposal | C4 | 2.17e-3 | 5.72e-10 | 1.52e-5 | 5.00e-6 | 2.53e-6 | 3.08e-9 | 5.34e-2 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | MND | MND | MND | MND | MND | MND | MND |

GWP = Global Warming Potential;
ODP = Ozone Depletion Potential;
AP = Acidification Potential for Soil and Water;
EP = Eutrophication Potential;
POCP = Formation potential of tropospheric Ozone;
ADPE = Abiotic Depletion Potential – Elements;
ADPF = Abiotic Depletion Potential – Fossil Fuels;

## LCA Results (continued)

| Parameters describing resource use, primary energy | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | PERE | PERM | PERT | PENRE | PENRM | PENRT |
| | | | MJ | MJ | MJ | MJ | MJ | MJ |
| Product stage | Raw material supply | A1 | AGG | AGG | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 1.44e+1 | 1.56e-2 | 1.45e+1 | 8.79e+1 | 8.51e+1 | 1.73e+2 |
| Construction process stage | Transport | A4 | 2.59e-2 | 6.45e-8 | 2.59e-2 | 1.70e-2 | 0.00e+0 | 1.70e-2 |
| | Construction | A5 | 2.89e-1 | 3.12e-4 | 2.90e-1 | 3.49e+0 | 0.00e+0 | 3.49e+0 |
| Use stage | Use | B1 | MND | MND | MND | MND | MND | MND |
| | Maintenance | B2 | MND | MND | MND | MND | MND | MND |
| | Repair | B3 | MND | MND | MND | MND | MND | MND |
| | Replacement | B4 | MND | MND | MND | MND | MND | MND |
| | Refurbishment | B5 | MND | MND | MND | MND | MND | MND |
| | Operational energy use | B6 | MND | MND | MND | MND | MND | MND |
| | Operational water use | B7 | MND | MND | MND | MND | MND | MND |
| End of life | Deconstruction, demolition | C1 | MND | MND | MND | MND | MND | MND |
| | Transport | C2 | 2.59e-2 | 6.45e-8 | 2.59e-2 | 1.70e+0 | 0.00e+0 | 1.70e+0 |
| | Waste processing | C3 | 2.35e-8 | 4.25e-14 | 2.35e-8 | 3.63e-7 | 0.00e+0 | 3.63e-7 |
| | Disposal | C4 | 1.63e-3 | 4.46e-9 | 1.63e-3 | 5.37e-2 | 0.00e+0 | 5.37e-2 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | MND | MND | MND | MND | MND | MND |

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PERT = Total use of renewable primary energy resources;
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;
PENRT = Total use of non-renewable primary energy resource

## LCA Results (continued)

| Parameters describing resource use, secondary materials and fuels, use of water | | | | | | |
|---|---|---|---|---|---|---|
| | | | SM | RSF | NRSF | FW |
| | | | kg | MJ net calorific value | MJ net calorific value | $m^3$ |
| Product stage | Raw material supply | A1 | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 1.98e-1 |
| Construction process stage | Transport | A4 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 3.97e-4 |
| | Construction | A5 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 3.97e-3 |
| Use stage | Use | B1 | MND | MND | MND | MND |
| | Maintenance | B2 | MND | MND | MND | MND |
| | Repair | B3 | MND | MND | MND | MND |
| | Replacement | B4 | MND | MND | MND | MND |
| | Refurbishment | B5 | MND | MND | MND | MND |
| | Operational energy use | B6 | MND | MND | MND | MND |
| | Operational water use | B7 | MND | MND | MND | MND |
| End of life | Deconstruction, demolition | C1 | MND | MND | MND | MND |
| | Transport | C2 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 3.97e-4 |
| | Waste processing | C3 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 7.26e-11 |
| | Disposal | C4 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 6.01e-5 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | MND | MND | MND | MND |

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

## LCA Results (continued)

| Other environmental information describing waste categories | | | | | |
|---|---|---|---|---|---|
| | | | HWD | NHWD | RWD |
| | | | kg | kg | kg |
| Product stage | Raw material supply | A1 | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 1.98e-1 | 3.51e-1 | 1.37e-4 |
| Construction process stage | Transport | A4 | 6.42e-4 | 1.46e-1 | 1.18e-5 |
| | Construction | A5 | 3.98e-3 | 9.93e-3 | 2.98e-6 |
| Use stage | Use | B1 | MND | MND | MND |
| | Maintenance | B2 | MND | MND | MND |
| | Repair | B3 | MND | MND | MND |
| | Replacement | B4 | MND | MND | MND |
| | Refurbishment | B5 | MND | MND | MND |
| | Operational energy use | B6 | MND | MND | MND |
| | Operational water use | B7 | MND | MND | MND |
| End of life | Deconstruction, demolition | C1 | MND | MND | MND |
| | Transport | C2 | 6.42e-4 | 1.46e-1 | 1.18e-5 |
| | Waste processing | C3 | 4.14e-11 | 4.41e-10 | 2.00e-12 |
| | Disposal | C4 | 4.02e-5 | 2.10e-1 | 3.30e-7 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | MND | MND | MND |

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

## LCA Results (continued)

| Other environmental information describing output flows – at end of life | | | | | | |
|---|---|---|---|---|---|---|
| | | | CRU | MFR | MER | EE |
| | | | kg | kg | kg | MJ per energy carrier |
| Product stage | Raw material supply | A1 | AGG | AGG | AGG | AGG |
| | Transport | A2 | AGG | AGG | AGG | AGG |
| | Manufacturing | A3 | AGG | AGG | AGG | AGG |
| | Total (of product stage) | A1-3 | 0.00e+0 | 5.19e-2 | 2.70e-2 | 0.00e+0 |
| Construction process stage | Transport | A4 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 0.00e+0 |
| | Construction | A5 | 0.00e+0 | 1.04e-3 | 4.65e-2 | 0.00e+0 |
| Use stage | Use | B1 | MND | MND | MND | MND |
| | Maintenance | B2 | MND | MND | MND | MND |
| | Repair | B3 | MND | MND | MND | MND |
| | Replacement | B4 | MND | MND | MND | MND |
| | Refurbishment | B5 | MND | MND | MND | MND |
| | Operational energy use | B6 | MND | MND | MND | MND |
| | Operational water use | B7 | MND | MND | MND | MND |
| End of life | Deconstruction, demolition | C1 | MND | MND | MND | MND |
| | Transport | C2 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 0.00e+0 |
| | Waste processing | C3 | 0.00e+0 | 0.00e+0 | 2.09e+0 | 0.00e+0 |
| | Disposal | C4 | 0.00e+0 | 0.00e+0 | 0.00e+0 | 0.00e+0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | MND | MND | MND | MND |

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

## Scenarios and additional technical information

| Scenarios and additional technical information | | | |
|---|---|---|---|
| Scenario | Parameter | Units | Results |
| A4 – Transport to the building site | Description of scenario | | |
| | Fuel type / Vehicle type | Litre of fuel type per distance or vehicle type | Lorry >32 metric tons |
| | Distance: | km | 523 |
| | Capacity utilisation (incl. empty returns) | % | 86 |
| | Bulk density of transported products | kg/m$^3$ | 32 |
| A5 – Installation in the building | Description of scenario | | |
| | Installation wastage rate | % of product | 2 |
| | Installation waste sent to landfill | kg | 0.046 |
| C2, C3, C4 – End of life | Description of scenario | | |
| | Transport type | Vehicle type | Lorry >32 metric tons |
| | Distance | km | 523 |
| | Crushing and compacting of waste into briquettes | MJ | 1.06E-07 |
| | Waste for energy recovery | kg | 2.09 |
| | Waste to landfill | kg | 0.21 |

## Annex - Conversion factors to 1m² of insulation at the stated thickness

To convert the EPD results please use the following calculation methodology:

Environmental indicator life cycle result x Conversion factor

E.g. The calculation for GWP of A1-3 for 1m2 insulation with a thickness of 30mm would be as follows: 7.27 x 0.409 = 2.97 kg CO2 eq.

| Module A1 – A3 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | 30mm | 50mm | 80mm | 100mm | 120mm | 130mm | 140mm | 150mm |
| GWP | kg CO2 eq. | 0.409 | 0.681 | 1.089 | 1.360 | 1.637 | 1.774 | 1.912 | 2.036 |
| ODP | kg CFC 11 eq. | 0.433 | 0.723 | 1.156 | 1.446 | 1.737 | 1.879 | 2.024 | 2.170 |
| AP | kg SO2 eq. | 0.415 | 0.693 | 1.108 | 1.386 | 1.661 | 1.801 | 1.940 | 2.079 |
| EP | kg (PO4)3– eq. | 0.428 | 0.715 | 1.144 | 1.423 | 1.710 | 1.860 | 1.998 | 2.147 |
| POCP | kg C2H4 eq. | 0.394 | 0.658 | 1.053 | 1.314 | 1.577 | 1.709 | 1.840 | 1.972 |
| ADPE | kg Sb eq. | 0.459 | 0.764 | 1.223 | 1.527 | 1.828 | 1.986 | 2.144 | 2.285 |
| ADPF | MJ eq. | 0.404 | 0.671 | 1.079 | 1.348 | 1.616 | 1.750 | 1.884 | 2.018 |
| PERE | MJ | 0.395 | 0.659 | 1.056 | 1.319 | 1.583 | 1.715 | 1.840 | 1.972 |
| PERM | MJ | 0.379 | 0.633 | 1.013 | 1.263 | 1.519 | 1.647 | 1.769 | 1.897 |
| PERT | MJ | 0.392 | 0.655 | 1.048 | 1.310 | 1.572 | 1.703 | 1.834 | 1.966 |
| PENRE | MJ | 0.404 | 0.671 | 1.075 | 1.347 | 1.613 | 1.751 | 1.884 | 2.017 |
| PENRM | MJ | 0.404 | 0.671 | 1.075 | 1.347 | 1.613 | 1.751 | 1.884 | 2.017 |
| PENRT | MJ | 0.404 | 0.671 | 1.075 | 1.347 | 1.613 | 1.751 | 1.884 | 2.017 |
| SM | kg | 0.397 | 0.662 | 1.061 | 1.323 | 1.591 | 1.722 | 1.854 | 1.990 |
| RSF | MJ | 0.397 | 0.662 | 1.061 | 1.323 | 1.591 | 1.722 | 1.854 | 1.990 |
| NRSF | MJ | 0.397 | 0.662 | 1.061 | 1.323 | 1.591 | 1.722 | 1.854 | 1.990 |
| FW | m3 | 0.397 | 0.662 | 1.061 | 1.323 | 1.591 | 1.722 | 1.854 | 1.990 |
| HWD | kg | 0.399 | 0.667 | 1.066 | 1.328 | 1.596 | 1.727 | 1.864 | 1.995 |
| NHWD | kg | 0.425 | 0.707 | 1.131 | 1.416 | 1.698 | 1.840 | 1.980 | 2.123 |
| RWD | kg | 0.436 | 0.728 | 1.161 | 1.453 | 1.745 | 1.891 | 2.036 | 2.182 |
| CRU | kg | 0.380 | 0.632 | 1.012 | 1.264 | 1.516 | 1.644 | 1.771 | 1.896 |
| MFR | kg | 0.380 | 0.632 | 1.012 | 1.264 | 1.516 | 1.644 | 1.771 | 1.896 |
| MER | kg | 0.381 | 0.633 | 1.015 | 1.267 | 1.519 | 1.648 | 1.774 | 1.900 |
| EE | MJ | 0.380 | 0.632 | 1.012 | 1.264 | 1.516 | 1.644 | 1.771 | 1.896 |

| Module A4 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | 30mm | 50mm | 80mm | 100mm | 120mm | 130mm | 140mm | 150mm |
| GWP | kg CO2 eq. | 0.415 | 0.693 | 1.109 | 1.382 | 1.664 | 1.800 | 1.936 | 2.082 |
| ODP | kg CFC 11 eq. | 0.416 | 0.694 | 1.110 | 1.388 | 1.665 | 1.804 | 1.943 | 2.081 |
| AP | kg SO2 eq. | 0.418 | 0.697 | 1.114 | 1.391 | 1.670 | 1.809 | 1.949 | 2.088 |
| EP | kg (PO4)3– eq. | 0.417 | 0.696 | 1.111 | 1.394 | 1.667 | 1.808 | 1.949 | 2.091 |
| POCP | kg C2H4 eq. | 0.417 | 0.696 | 1.113 | 1.390 | 1.673 | 1.815 | 1.943 | 2.085 |
| ADPE | kg Sb eq. | 0.417 | 0.696 | 1.114 | 1.391 | 1.668 | 1.804 | 1.946 | 2.087 |

| Module A4 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ADPF | MJ eq. | 0.417 | 0.696 | 1.111 | 1.392 | 1.667 | 1.807 | 1.947 | 2.088 |
| PERE | MJ | 0.417 | 0.695 | 1.112 | 1.390 | 1.668 | 1.807 | 1.946 | 2.085 |
| PERM | MJ | 0.417 | 0.696 | 1.113 | 1.391 | 1.674 | 1.814 | 1.953 | 2.093 |
| PERT | MJ | 0.417 | 0.695 | 1.112 | 1.390 | 1.668 | 1.807 | 1.946 | 2.085 |
| PENRE | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| PENRM | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| PENRT | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| SM | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| RSF | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| NRSF | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| FW | m3 | 0.418 | 0.695 | 1.113 | 1.393 | 1.670 | 1.809 | 1.950 | 2.088 |
| HWD | kg | 0.417 | 0.696 | 1.114 | 1.391 | 1.667 | 1.807 | 1.947 | 2.087 |
| NHWD | kg | 0.417 | 0.692 | 1.110 | 1.390 | 1.664 | 1.808 | 1.945 | 2.082 |
| RWD | kg | 0.419 | 0.698 | 1.119 | 1.398 | 1.678 | 1.814 | 1.958 | 2.093 |
| CRU | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| MFR | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| MER | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| EE | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |

| Module A5 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | 30mm | 50mm | 80mm | 100mm | 120mm | 130mm | 140mm | 150mm |
| GWP | kg CO2 eq. | 0.409 | 0.682 | 1.088 | 1.365 | 1.635 | 1.770 | 1.905 | 2.041 |
| ODP | kg CFC 11 eq. | 0.431 | 0.720 | 1.152 | 1.439 | 1.722 | 1.864 | 2.006 | 2.164 |
| AP | kg SO2 eq. | 0.415 | 0.692 | 1.107 | 1.384 | 1.656 | 1.798 | 1.940 | 2.083 |
| EP | kg (PO4)3– eq. | 0.429 | 0.718 | 1.147 | 1.429 | 1.718 | 1.859 | 2.000 | 2.147 |
| POCP | kg C2H4 eq. | 0.394 | 0.659 | 1.049 | 1.314 | 1.578 | 1.708 | 1.838 | 1.973 |
| ADPE | kg Sb eq. | 0.459 | 0.766 | 1.228 | 1.526 | 1.833 | 1.991 | 2.140 | 2.298 |
| ADPF | MJ eq. | 0.404 | 0.675 | 1.078 | 1.349 | 1.617 | 1.753 | 1.889 | 2.024 |
| PERE | MJ | 0.393 | 0.655 | 1.048 | 1.310 | 1.576 | 1.707 | 1.838 | 1.969 |
| PERM | MJ | 0.378 | 0.635 | 1.013 | 1.266 | 1.519 | 1.644 | 1.772 | 1.897 |
| PERT | MJ | 0.393 | 0.659 | 1.052 | 1.314 | 1.576 | 1.707 | 1.838 | 1.969 |
| PENRE | MJ | 0.406 | 0.674 | 1.080 | 1.349 | 1.617 | 1.754 | 1.889 | 2.023 |
| PENRM | MJ | 0.406 | 0.674 | 1.080 | 1.349 | 1.617 | 1.754 | 1.889 | 2.023 |
| PENRT | MJ | 0.406 | 0.674 | 1.080 | 1.349 | 1.617 | 1.754 | 1.889 | 2.023 |
| SM | kg | 0.397 | 0.663 | 1.060 | 1.327 | 1.590 | 1.724 | 1.857 | 1.990 |
| RSF | MJ | 0.397 | 0.663 | 1.060 | 1.327 | 1.590 | 1.724 | 1.857 | 1.990 |
| NRSF | MJ | 0.397 | 0.663 | 1.060 | 1.327 | 1.590 | 1.724 | 1.857 | 1.990 |
| FW | m3 | 0.397 | 0.663 | 1.060 | 1.327 | 1.590 | 1.724 | 1.857 | 1.990 |
| HWD | kg | 0.398 | 0.664 | 1.063 | 1.328 | 1.594 | 1.727 | 1.860 | 1.992 |
| NHWD | kg | 0.418 | 0.698 | 1.116 | 1.395 | 1.673 | 1.821 | 1.839 | 2.089 |
| RWD | kg | 0.431 | 0.722 | 1.154 | 1.444 | 1.732 | 1.876 | 2.016 | 2.163 |

| Module A5 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CRU | kg | 0.379 | 0.632 | 1.010 | 1.260 | 1.510 | 1.644 | 1.769 | 1.894 |
| MFR | kg | 0.379 | 0.632 | 1.010 | 1.260 | 1.510 | 1.644 | 1.769 | 1.894 |
| MER | kg | 0.379 | 0.632 | 1.011 | 1.264 | 1.518 | 1.643 | 1.771 | 1.904 |
| EE | MJ | 0.379 | 0.632 | 1.010 | 1.260 | 1.510 | 1.644 | 1.769 | 1.894 |

| Module C2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | 30mm | 50mm | 80mm | 100mm | 120mm | 130mm | 140mm | 150mm |
| GWP | kg CO2 eq. | 0.415 | 0.693 | 1.109 | 1.382 | 1.664 | 1.800 | 1.936 | 2.082 |
| ODP | kg CFC 11 eq. | 0.416 | 0.694 | 1.110 | 1.388 | 1.665 | 1.804 | 1.943 | 2.081 |
| AP | kg SO2 eq. | 0.418 | 0.697 | 1.114 | 1.391 | 1.670 | 1.809 | 1.949 | 2.088 |
| EP | kg (PO4)3– eq. | 0.417 | 0.696 | 1.111 | 1.394 | 1.667 | 1.808 | 1.949 | 2.091 |
| POCP | kg C2H4 eq. | 0.417 | 0.696 | 1.113 | 1.390 | 1.673 | 1.815 | 1.943 | 2.085 |
| ADPE | kg Sb eq. | 0.417 | 0.696 | 1.114 | 1.391 | 1.668 | 1.804 | 1.946 | 2.087 |
| ADPF | MJ eq. | 0.417 | 0.696 | 1.111 | 1.392 | 1.667 | 1.807 | 1.947 | 2.088 |
| PERE | MJ | 0.417 | 0.695 | 1.112 | 1.390 | 1.668 | 1.807 | 1.946 | 2.085 |
| PERM | MJ | 0.417 | 0.696 | 1.113 | 1.391 | 1.674 | 1.814 | 1.953 | 2.093 |
| PERT | MJ | 0.417 | 0.695 | 1.112 | 1.390 | 1.668 | 1.807 | 1.946 | 2.085 |
| PENRE | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| PENRM | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| PENRT | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| SM | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| RSF | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| NRSF | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| FW | m3 | 0.418 | 0.695 | 1.113 | 1.393 | 1.670 | 1.809 | 1.950 | 2.088 |
| HWD | kg | 0.417 | 0.696 | 1.114 | 1.391 | 1.667 | 1.807 | 1.947 | 2.087 |
| NHWD | kg | 0.417 | 0.692 | 1.110 | 1.390 | 1.664 | 1.808 | 1.945 | 2.082 |
| RWD | kg | 0.419 | 0.698 | 1.119 | 1.398 | 1.678 | 1.814 | 1.958 | 2.093 |
| CRU | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| MFR | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| MER | kg | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |
| EE | MJ | 0.417 | 0.694 | 1.112 | 1.388 | 1.671 | 1.806 | 1.947 | 2.088 |

| Module C3 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | 30mm | 50mm | 80mm | 100mm | 120mm | 130mm | 140mm | 150mm |
| GWP | kg CO2 eq. | 0.408 | 0.684 | 1.096 | 1.356 | 1.633 | 1.774 | 1.774 | 2.045 |
| ODP | kg CFC 11 eq. | 0.407 | 0.678 | 1.087 | 1.357 | 1.626 | 1.765 | 1.765 | 2.043 |
| AP | kg SO2 eq. | 0.409 | 0.681 | 1.095 | 1.356 | 1.637 | 1.773 | 1.773 | 2.044 |
| EP | kg (PO4)3– eq. | 0.409 | 0.682 | 1.095 | 1.359 | 1.632 | 1.773 | 1.773 | 2.045 |
| POCP | kg C2H4 eq. | 0.408 | 0.681 | 1.095 | 1.359 | 1.632 | 1.773 | 1.773 | 2.051 |
| ADPE | kg Sb eq. | 0.407 | 0.678 | 1.093 | 1.355 | 1.631 | 1.771 | 1.771 | 2.042 |
| ADPF | MJ eq. | 0.408 | 0.684 | 1.096 | 1.360 | 1.636 | 1.776 | 1.776 | 2.051 |

| Module C3 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ | 0.409 | 0.681 | 1.098 | 1.362 | 1.634 | 1.779 | 1.779 | 2.051 |
| PERM | MJ | 0.409 | 0.682 | 1.094 | 1.360 | 1.633 | 1.774 | 1.774 | 2.047 |
| PERT | MJ | 0.409 | 0.681 | 1.098 | 1.362 | 1.634 | 1.779 | 1.779 | 2.051 |
| PENRE | MJ | 0.408 | 0.680 | 1.094 | 1.358 | 1.631 | 1.774 | 1.774 | 2.047 |
| PENRM | MJ | 0.408 | 0.680 | 1.094 | 1.358 | 1.631 | 1.774 | 1.774 | 2.047 |
| PENRT | MJ | 0.408 | 0.680 | 1.094 | 1.358 | 1.631 | 1.774 | 1.774 | 2.047 |
| SM | kg | 0.408 | 0.680 | 1.094 | 1.358 | 1.625 | 1.777 | 1.777 | 2.052 |
| RSF | MJ | 0.408 | 0.680 | 1.094 | 1.358 | 1.625 | 1.777 | 1.777 | 2.052 |
| NRSF | MJ | 0.408 | 0.680 | 1.094 | 1.358 | 1.625 | 1.777 | 1.777 | 2.052 |
| FW | m3 | 0.408 | 0.680 | 1.094 | 1.358 | 1.625 | 1.777 | 1.777 | 2.052 |
| HWD | kg | 0.408 | 0.681 | 1.094 | 1.360 | 1.633 | 1.775 | 1.775 | 2.048 |
| NHWD | kg | 0.408 | 0.680 | 1.095 | 1.358 | 1.633 | 1.773 | 1.773 | 2.048 |
| RWD | kg | 0.409 | 0.680 | 1.095 | 1.360 | 1.630 | 1.775 | 1.775 | 2.045 |
| CRU | kg | 0.410 | 0.684 | 1.091 | 1.364 | 1.636 | 1.775 | 1.775 | 2.048 |
| MFR | kg | 0.410 | 0.684 | 1.091 | 1.364 | 1.636 | 1.775 | 1.775 | 2.048 |
| MER | kg | 0.410 | 0.684 | 1.091 | 1.364 | 1.636 | 1.775 | 1.775 | 2.048 |
| EE | MJ | 0.410 | 0.684 | 1.091 | 1.364 | 1.636 | 1.775 | 1.775 | 2.048 |

| Module C4 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | 30mm | 50mm | 80mm | 100mm | 120mm | 130mm | 140mm | 150mm |
| GWP | kg CO2 eq. | 0.382 | 0.668 | 1.097 | 1.336 | 1.622 | 1.765 | 1.765 | 2.000 |
| ODP | kg CFC 11 eq. | 0.381 | 0.668 | 1.096 | 1.334 | 1.621 | 1.766 | 1.766 | 1.993 |
| AP | kg SO2 eq. | 0.381 | 0.664 | 1.099 | 1.336 | 1.618 | 1.763 | 1.763 | 2.000 |
| EP | kg (PO4)3– eq. | 0.380 | 0.666 | 1.094 | 1.332 | 1.618 | 1.760 | 1.760 | 1.998 |
| POCP | kg C2H4 eq. | 0.381 | 0.668 | 1.095 | 1.332 | 1.617 | 1.759 | 1.759 | 2.000 |
| ADPE | kg Sb eq. | 0.380 | 0.669 | 1.097 | 1.334 | 1.620 | 1.763 | 1.763 | 2.003 |
| ADPF | MJ eq. | 0.380 | 0.667 | 1.096 | 1.333 | 1.618 | 1.760 | 1.760 | 2.004 |
| PERE | MJ | 0.381 | 0.669 | 1.092 | 1.331 | 1.620 | 1.761 | 1.761 | 2.000 |
| PERM | MJ | 0.381 | 0.666 | 1.094 | 1.332 | 1.619 | 1.762 | 1.762 | 2.000 |
| PERT | MJ | 0.381 | 0.669 | 1.092 | 1.331 | 1.620 | 1.761 | 1.761 | 2.000 |
| PENRE | MJ | 0.380 | 0.667 | 1.095 | 1.333 | 1.618 | 1.762 | 1.762 | 1.993 |
| PENRM | MJ | 0.380 | 0.667 | 1.095 | 1.333 | 1.618 | 1.762 | 1.762 | 1.993 |
| PENRT | MJ | 0.380 | 0.667 | 1.095 | 1.333 | 1.618 | 1.762 | 1.762 | 1.993 |
| SM | kg | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |
| RSF | MJ | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |
| NRSF | MJ | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |
| FW | m3 | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |
| HWD | kg | 0.381 | 0.667 | 1.095 | 1.333 | 1.617 | 1.761 | 1.761 | 1.998 |
| NHWD | kg | 0.382 | 0.667 | 1.095 | 1.338 | 1.624 | 1.767 | 1.767 | 2.005 |
| RWD | kg | 0.382 | 0.667 | 1.097 | 1.333 | 1.621 | 1.764 | 1.764 | 2.000 |
| CRU | kg | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |

| Module C4 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MFR | kg | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |
| MER | kg | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |
| EE | MJ | 0.381 | 0.666 | 1.095 | 1.333 | 1.617 | 1.764 | 1.764 | 1.997 |

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