# PEP Ecopassport®

Product Environmental Profile-Ascend® Model ACRC Chillers with Integrated Free Cooling

DECEMBER 2024 RN TRNE-10001-V01.01-EN

**Product Environmental Profile - PEP Ecopassport.**
**Document in compliance with ISO 14025: 2006 "Environmental labels and declarations. Type III environmental declarations."**

| | |
|---|---|
| Company | Trane Technologies |
| Contact Information | Trane Product Support (SalesSupportPueblo@trane.com) |
| Registration Number | TRNE-10001-V01.01-EN |

## Company Description

Trane Technologies® is a world leader in heating and cooling systems, services, and solutions. Together with our brands, Trane® and Thermo King®, we bring efficient and sustainable climate innovations to buildings, homes, and transportation.

Trane helps customers succeed by providing innovative solutions that optimize indoor environments through a broad portfolio of energy-efficient heating, ventilating, and air conditioning systems, buildings, contracting and energy services, parts support, and advanced controls for homes and commercial buildings.

Trane serves engineers, contractors, and building owners on all continents and in an array of markets including education, healthcare, government, industrial/ manufacturing, data centers, lodging, retail, and commercial real estate. With more than 900 U.S. patents to date, Trane creates comfortable and energy-efficient environments around the world.

Trane systems and services have a reputation for reliability, high quality, and advanced innovation; and are available through a powerful distribution network. Trane employees and distributors are respected industry-wide for their skills and performance in designing, manufacturing, marketing, and supporting commercial and residential systems.

| | Product Information |
|---|---|
| **Reference Product** | Ascend® Model ACRC with Integrated Free Cooling |
| **Product Description** | Ascend® Model ACRC<br>A combination of high-energy efficiency and quiet performance<br><br>Trane model ACR air-cooled chillers deliver an industry leading combination of part-load and full-load efficiencies, while offering multiple sound reduction options for noise sensitive installations.<br><br>• Capacity range: 150 to 550 tons<br><br>• Integrated Free Cooling—a factory installed and integrated water side economizer to help save on first cost, installation cost and energy cost throughout the life of the asset.<br><br>• Rapid Restart™ capability—After a power interruption, ACR chillers can quickly regain full operational capacity, so mission- critical applications can continue with reduced interruption.<br><br>• Optional harmonic filtration system—A filter design provides the harmonic solution to meet the requirements of IEEE® 519, reducing harmonic distortion to 5% or less total demand distortion (TDD).<br><br>• Maintenance-free, long-life motors—ACR chillers' compressor and condenser fans are powered by variable speed, permanent magnet motors that require no periodic maintenance and are designed for exceptionally long operational life.<br><br>• Transverse "open V" design condenser coils—This design allows easier cleaning of the condenser coils from the inside out, to keep the coils and the chiller properly functioning.<br><br>• Trane Intelligent Services® enabled—ACR chillers can be remotely monitored by Trane Intelligent Services (TIS) 24 hours a day.<br><br>• Enabled by Symbio® 800 with adaptive controls - Reliable controller platform with proven algorithms to ensure smooth operations.<br><br>• The ACR chiller's design is enhanced with the next-generation, low-global warming refrigerant R-513A.<br><br>• Light weight, anti-corrosive microchannel condenser coils lower refrigerant charge. |
| **Functional Unit** | To produce 1 kW of cooling, according to the appropriate usage scenario defined in the EN 14825 standard and during the 22-year reference lifetime of the product |
| **Other Products Covered** | List of other products covered in this PEP is presented in the section which concerned the extrapolation rules |
| **Reference Lifetime*** | 22 Years |

*Reference lifetime was defined as 22 years by the Product Category Rules which governed this analysis.

| Technical Characteristics | |
|---|---|
| **Data Point** | **Ascend® Model ACRC with Integrated Free Cooling** |
| Chiller Technology | Air to water |
| Reversible or Non-reversible | Non-reversible |
| Cooling Capacity* | 1043 kW |
| SCOP or SEER* | SEER = 5.29 kW/kW |
| Refrigerant Used | R-513A |
| Refill Threshold** | 90% |

*Note: Per the Product Category Rules and Product Specific Rules, chiller capacity and SEER must be calculated per European EN 14825 standards. These values and test conditions differ from ASHRAE and AHRI standards typically used in North America. They also do not take into account the use of free cooling in certain applications. For North America applications, please refer to existing product literature for other product capacity and efficiency metrics best befitting those local standards and test conditions. Do not use these values as substitutes or replacements for those other values.

**Refill threshold denotes the ratio of refrigerant (expressed as a %) at which a refill back up to the original charge takes place. Per the Product Category Rules, the refill threshold is considered 90% by default.

| Constituent Materials >> Total weight of the reference product: 11,670 kg | | | | | |
|---|---|---|---|---|---|
| **Plastics as % of weight** | | **Metals as % of weight** | | **Others as % of weight** | |
| Product only: 11,670 kg | | | | | |
| Thermoplastic polyolefins | 1.6% | Steel | 63.7% | Refrigerant | 2.1% |
| Other plastics | 1.8% | Aluminum | 12.7% | Other miscellaneous | 2.4% |
| | | Other metals | 15.7% | | |
| Packaging only: 0 kg | | | | | |
| | 0% | | 0% | | 0% |
| **Total plastics** | **3.4%** | **Total metals** | **92.1%** | **Total others** | **4.5%** |

| | **Life Cycle Stages** |
|---|---|
| **Manufacturing** | The manufacturing stage includes the production of raw and intermediate materials, as well as transportation to the manufacturer's last logistic platform of ACRC Chillers. The final assembly of the product is carried out at Trane's plant in Pueblo, Colorado, USA. As a member of SteelZero, Trane has pledged to procure, specify or stock 50% net-zero steel by 2030 and 100% net-zero steel by 2050; the Pueblo facility is one of the first to begin to utilize this low-carbon steel. The main process steps for production include cutting, rolling, machining, brazing, welding, painting, sub- and final assemblies, and end-of-the-line testing. |
| **Distribution** | The transport from Trane's manufacturing facility to the customer was considered. The distance was calculated using averages for all shipped orders in 2023. |
| **Installation** | The installation stage includes diesel used to fuel machinery used to move and place the product during installation. This unit is typically shipped without any required packaging, so no modeling of packaging disposal was required. |
| **Use** | The use stage is conducted in alignment with the PSR, which models energy use associated with comfort cooling applications. This chiller can be equipped with integrated free cooling, which will help to significantly reduce product energy usage during operation during times of lower outdoor temperatures in a process cooling application requiring cooling all year round like data centers.<br>Refrigerant replacement and electricity usage are both considered in this stage. |
| **End of Life** | The end-of-life stage includes transportation to the end-of-life facility of the disposal of product. End of life fates were modeled by material for the region where they are being disposed, in this case the United States. Impacts associated with recycling of the product were modeled via the cut off approach. |
| **Benefits and loads beyond the system boundaries** | Throughout the life cycle of the product, net loads and benefits beyond system boundaries are included. |

| | **Data Quality and Software** |
|---|---|
| **Geographical Representativeness** | The geographical scope of this PEP is North America. |
| **Temporal Representativeness** | Primary data was collected from 2023. Secondary data refers to the Sphera MLC published in 2024. The temporal coverage for each secondary process used in the LCA model is specified in the metadata section of the MLC database. |
| **Technological Representativeness** | Overall technology representativeness is considered good. |
| **Software and Database Used** | Sphera LCA for Experts 10.8.0.14<br>Sphera Managed LCA Content 2024.1 |

| | Energy Model Used |
|---|---|
| **Manufacturing** | Manufacturing electricity considers the eGRID specific region from which the product is being manufactured from Sphera's MLC. Natural gas used during manufacturing is country specific, in this case the United States. |
| **Distribution** | No energy consumption occurs during the distribution stage. |
| **Installation** | No energy consumption occurs during the installation stage. |
| **Use** | Use stage electricity is modeled using an average United States grid mix dataset. |
| **End of Life** | No energy consumption occurs during the end of life stage. |
| **Benefits and loads beyond the system boundaries** | End of life benefits consider average US electricity. |

## Environmental Impacts

| per kW corresponding to the functional unit | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Environmental Impact Indicators | | Total Life Cycle Impacts (Excluding Module D) | | Manufacturing A1-A3 | Distribution A4 | Installation A5 | Use B1-B7 | End of Life C1-C4 | Module D |
| **Climate change - total** | GWP | 1.30E+03 | kg CO2 eq | 5.02E+01 | 1.99E+00 | 6.54E-03 | 1.23E+03 | 1.64E+01 | -1.48E+01 |
| **Climate change - fossil fuels** | GWPf | 1.30E+03 | kg CO2 eq | 5.04E+01 | 1.99E+00 | 6.54E-03 | 1.23E+03 | 1.63E+01 | -1.48E+01 |
| **Climate change - biogenics** | GWPb | -5.36E-02 | kg CO2 eq | -3.53E-01 | -2.14E-03 | 0.00E+00 | 2.29E-01 | 7.26E-02 | 5.10E-02 |
| **Climate change - land use and land use transformation** | GWPlu | 1.88E-01 | kg CO2 eq | 7.77E-02 | 1.11E-03 | 0.00E+00 | 1.10E-01 | 1.12E-04 | -4.34E-02 |
| **Ozone depletion** | ODP | 7.34E-09 | kg CFC-11 eq | 1.39E-10 | 2.94E-13 | 1.83E-13 | 7.20E-09 | 6.54E-13 | -7.62E-12 |
| **Acidification** | AP | 1.80E+00 | mole of H+ eq | 1.95E-01 | 9.91E-03 | 9.73E-05 | 1.59E+00 | 1.28E-03 | -8.70E-02 |
| **Eutrophication, freshwater** | Epf | 9.19E-04 | kg P eq | 2.00E-04 | 1.01E-05 | 2.01E-09 | 7.07E-04 | 1.81E-06 | -1.98E-05 |
| **Eutrophication, marine aquatic** | Epm | 4.00E-01 | kg of N eq | 3.56E-02 | 4.94E-03 | 4.47E-05 | 3.58E-01 | 5.17E-04 | -1.11E-02 |
| **Eutrophication, terrestrial** | Ept | 4.33E+00 | mole of N eq | 3.83E-01 | 5.45E-02 | 4.88E-04 | 3.89E+00 | 5.71E-03 | -1.17E-01 |
| **Photochemical ozone formation** | POCP | 1.16E+00 | kg NMVOC eq | 1.02E-01 | 1.01E-02 | 1.23E-04 | 1.05E+00 | 1.19E-03 | -3.56E-02 |
| **Abiotic resource depletion – elements** | ADPe | 3.40E-03 | kg Sb eq | 3.17E-03 | 2.62E-07 | 0.00E+00 | 2.30E-04 | -8.47E-09 | -1.39E-03 |
| **Abiotic resource depletion – fossil fuels** | ADPf | 2.05E+04 | MJ | 5.76E+02 | 2.63E+01 | 9.03E-02 | 1.99E+04 | 4.87E+00 | -1.64E+02 |
| **Water use** | WU | 2.80E+02 | m3 world eq | 1.01E+01 | 1.19E-01 | 0.00E+00 | 2.69E+02 | 1.90E-01 | -3.81E+00 |

| per kW corresponding to the functional unit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Inventory Flow Indicators | Total Life Cycle Impacts (Excluding Module D) | | Manufacturing A1-A3 | Distribution A4 | Installation A5 | Use B1-B7 | End of Life C1-C4 | Module D |
| **Use of renewable primary energy, excluding renewable primary energy resources used as raw materials** | ERP | 5.53E+03 | MJ | 1.52E+02 | 1.16E+00 | 0.00E+00 | 5.38E+03 | 4.47E-01 | -5.57E+01 |
| **Use of renewable primary energy resources used as raw materials** | ERM | 8.07E+00 | MJ | 8.07E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Total use of renewable primary energy resources** | ER | 5.54E+03 | MJ | 1.60E+02 | 1.16E+00 | 0.00E+00 | 5.38E+03 | 4.47E-01 | -5.57E+01 |
| **Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials** | ENRP | 2.05E+04 | MJ | 5.54E+02 | 2.63E+01 | 9.03E-02 | 1.99E+04 | 4.87E+00 | -1.65E+02 |
| **Use of non-renewable primary energy resources used as raw materials** | ENRM | 2.41E+01 | MJ | 2.41E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Total use of non-renewable primary energy resources** | ENR | 2.05E+04 | MJ | 5.78E+02 | 2.63E+01 | 9.03E-02 | 1.99E+04 | 4.87E+00 | -1.65E+02 |
| **Use of secondary materials** | USM | 4.72E+00 | kg | 4.72E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of renewable secondary fuels** | URSF | 0.00E+00 | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of non-renewable secondary fuels** | UNRSF | 0.00E+00 | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Recovered Energy** | RE | 0.00E+00 | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Net use of fresh water** | NUFW | 8.97E+00 | m3 | 7.45E-01 | 3.87E-03 | 0.00E+00 | 8.22E+00 | 4.44E-03 | -6.41E-01 |
| **Hazardous waste disposed** | HWD | 2.01E-05 | kg | 9.20E-06 | 3.55E-09 | 0.00E+00 | 1.08E-05 | 1.02E-09 | -3.90E-07 |
| **Non-hazardous waste disposed** | NHWD | 1.33E+01 | kg | 5.21E+00 | 2.62E-03 | 0.00E+00 | 6.75E+00 | 1.34E+00 | -2.40E+00 |
| **Radioactive waste disposed** | RWD | 2.04E+00 | kg | 1.25E-02 | 7.94E-05 | 0.00E+00 | 2.03E+00 | 1.50E-04 | -1.60E-03 |
| **Components for re-use** | CRU | 0.00E+00 | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for recycling** | MRE | 8.89E+00 | kg | 8.92E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.00E+00 | 0.00E+00 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Materials for energy recovery** | MER | 0.00E+00 | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy** | EE | 2.24E+00 | MJ | 1.86E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.06E+00 | 0.00E+00 |

| Per device corresponding to the reference product | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Environmental Impact Indicators** | | **Total Life Cycle Impacts (Excluding Module D)** | | **Manufacturing A1-A3** | **Distribution A4** | **Installation A5** | **Use B1-B7** | **End of Life C1-C4** | **Module D** |
| **Climate change - total** | GWP | 1.35E+06 | kg CO2 eq | 5.23E+04 | 2.08E+03 | 6.82E+00 | 1.28E+06 | 1.71E+04 | -1.55E+04 |
| **Climate change - fossil fuels** | GWPf | 1.35E+06 | kg CO2 eq | 5.26E+04 | 2.08E+03 | 6.82E+00 | 1.28E+06 | 1.70E+04 | -1.55E+04 |
| **Climate change - biogenics** | GWPb | -5.60E+01 | kg CO2 eq | -3.69E+02 | -2.24E+00 | 0.00E+00 | 2.39E+02 | 7.58E+01 | 5.32E+01 |
| **Climate change - land use and land use transformation** | GWPlu | 1.97E+02 | kg CO2 eq | 8.11E+01 | 1.16E+00 | 0.00E+00 | 1.14E+02 | 1.16E-01 | -4.52E+01 |
| **Ozone depletion** | ODP | 7.66E-06 | kg CFC-11 eq | 1.45E-07 | 3.06E-10 | 1.91E-10 | 7.51E-06 | 6.83E-10 | -7.96E-09 |
| **Acidification** | AP | 1.88E+03 | mole of H+ eq | 2.03E+02 | 1.03E+01 | 1.02E-01 | 1.66E+03 | 1.33E+00 | -9.08E+01 |
| **Eutrophication, freshwater** | Epf | 9.59E-01 | kg P eq | 2.09E-01 | 1.06E-02 | 2.09E-06 | 7.38E-01 | 1.89E-03 | -2.06E-02 |
| **Eutrophication, marine aquatic** | Epm | 4.17E+02 | kg of N eq | 3.72E+01 | 5.16E+00 | 4.66E-02 | 3.74E+02 | 5.40E-01 | -1.15E+01 |
| **Eutrophication, terrestrial** | Ept | 4.52E+03 | mole of N eq | 4.00E+02 | 5.69E+01 | 5.10E-01 | 4.06E+03 | 5.96E+00 | -1.22E+02 |
| **Photochemical ozone formation** | POCP | 1.21E+03 | kg NMVOC eq | 1.07E+02 | 1.06E+01 | 1.28E-01 | 1.09E+03 | 1.24E+00 | -3.72E+01 |
| **Abiotic resource depletion – elements** | ADPe | 3.55E+00 | kg Sb eq | 3.31E+00 | 2.74E-04 | 0.00E+00 | 2.40E-01 | -8.84E-06 | -1.45E+00 |
| **Abiotic resource depletion – fossil fuels** | ADPf | 2.14E+07 | MJ | 6.02E+05 | 2.75E+04 | 9.42E+01 | 2.07E+07 | 5.08E+03 | -1.71E+05 |
| **Water use** | WU | 2.92E+05 | m3 world eq | 1.05E+04 | 1.24E+02 | 0.00E+00 | 2.81E+05 | 1.99E+02 | -3.97E+03 |

| Per device corresponding to the reference product | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Inventory Flow Indicators** | | **Total Life Cycle Impacts (Excluding Module D)** | | **Manufacturing A1-A3** | **Distribution A4** | **Installation A5** | **Use B1-B7** | **End of Life C1-C4** | **Module D** |
| **Use of renewable primary energy, excluding renewable primary energy resources used as raw materials** | ERP | 5.78E+06 | MJ | 1.58E+05 | 1.22E+03 | 0.00E+00 | 5.62E+06 | 4.66E+02 | -5.81E+04 |
| **Use of renewable primary energy resources used as raw materials** | ERM | 8.43E+03 | MJ | 8.43E+03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Total use of renewable primary energy resources** | ER | 5.78E+06 | MJ | 1.67E+05 | 1.22E+03 | 0.00E+00 | 5.62E+06 | 4.66E+02 | -5.81E+04 |
| **Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials** | ENRP | 2.13E+07 | MJ | 5.78E+05 | 2.75E+04 | 9.42E+01 | 2.07E+07 | 5.08E+03 | -1.72E+05 |
| **Use of non-renewable primary energy resources used as raw materials** | ENRM | 2.52E+04 | MJ | 2.52E+04 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Total use of non-renewable primary energy resources** | ENR | 2.14E+07 | MJ | 6.04E+05 | 2.75E+04 | 9.42E+01 | 2.07E+07 | 5.08E+03 | -1.72E+05 |
| **Use of secondary materials** | USM | 4.93E+03 | kg | 4.93E+03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of renewable secondary fuels** | URSF | 0.00E+00 | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Use of non-renewable secondary fuels** | UNRSF | 0.00E+00 | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Recovered Energy** | RE | 0.00E+00 | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Net use of fresh water** | NUFW | 9.36E+03 | m3 | 7.77E+02 | 4.04E+00 | 0.00E+00 | 8.58E+03 | 4.64E+00 | -6.69E+02 |
| **Hazardous waste disposed** | HWD | 2.09E-02 | kg | 9.60E-03 | 3.70E-06 | 0.00E+00 | 1.13E-02 | 1.07E-06 | -4.07E-04 |
| **Non-hazardous waste disposed** | NHWD | 1.39E+04 | kg | 5.44E+03 | 2.74E+00 | 0.00E+00 | 7.04E+03 | 1.40E+03 | -2.51E+03 |
| **Radioactive waste disposed** | RWD | 2.13E+03 | kg | 1.30E+01 | 8.28E-02 | 0.00E+00 | 2.12E+03 | 1.57E-01 | -1.67E+00 |
| **Components for re-use** | CRU | 0.00E+00 | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Materials for recycling** | MRE | 9.28E+03 | kg | 9.31E+02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 8.35E+03 | 0.00E+00 |
| **Materials for energy recovery** | MER | 0.00E+00 | kg | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| **Exported energy** | EE | 2.34E+03 | MJ | 1.94E+02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.15E+03 | 0.00E+00 |

## Extrapolation Factors

ACRC products are part of a homogenous family of Trane chillers. Additional products covered by this PEP are detailed below, with the reference product denoted in blue. Extrapolation factors are provided for units both with and without free cooling, aside from ACRC 150, ACRC 375, and ACRC 440 as free cooling is not an option for these products.

| |
|---|
| ACRC 150 |
| ACRC 165 |
| ACRC 180 |
| ACRC 200 |
| ACRC 225 |
| ACRC 250 |
| ACRC 275 |
| **ACRC 300** |
| ACRC 330 |
| ACRC 375 |
| ACRC 380 |
| ACRC 440 |
| ACRC 450 |
| ACRC 500 |
| ACRC 550 |

For products other than the reference product, the environmental impacts can be calculated using the below extrapolation rules. The following tables contain factors to be used in the extrapolation of LCIA results for the ACRC Chillers covered in this report. These scaling factors are intended to allow interested parties to determine the environmental impacts of ACRC products of interest.

**To use these scaling factors, individuals should:**

1. Identify the LCIA result of interest and product of interest.

2. Multiply the results in the reference product's environmental impact indicator table, found on page 4-6 , by the corresponding cell in the table that pertains to the product of interest, found below.

| | | Extrapolation Factors - Functional Unit | | | | | Extrapolation Factors - Declared Unit | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Product | | A1-A3 | A4 | A5 | B1-B7 | C1-C4 | A1-A3 | A4 | A5 | B1-B7 | C1-C4 |
| With Free Cooling | ACRC 165 | 1.34 | 1.34 | 1.83 | 1.03 | 1.34 | 0.73 | 0.73 | 1.00 | 0.56 | 0.73 |
| | ACRC 180 | 1.30 | 1.30 | 1.70 | 1.04 | 1.30 | 0.77 | 0.77 | 1.00 | 0.61 | 0.77 |
| | ACRC 200 | 1.24 | 1.24 | 1.53 | 1.03 | 1.24 | 0.81 | 0.81 | 1.00 | 0.67 | 0.81 |
| | ACRC 225 | 1.14 | 1.14 | 1.31 | 1.01 | 1.14 | 0.87 | 0.87 | 1.00 | 0.77 | 0.87 |
| | ACRC 250 | 1.07 | 1.07 | 1.21 | 1.02 | 1.07 | 0.88 | 0.88 | 1.00 | 0.84 | 0.88 |
| | ACRC 275 | 1.14 | 1.14 | 1.11 | 1.00 | 1.14 | 1.03 | 1.03 | 1.00 | 0.90 | 1.03 |
| | ACRC 300 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | ACRC 330 | 0.94 | 0.94 | 0.92 | 1.00 | 0.94 | 1.02 | 1.02 | 1.00 | 1.09 | 1.02 |
| | ACRC 380 | 1.02 | 1.02 | 0.78 | 1.02 | 1.02 | 1.30 | 1.30 | 1.00 | 1.30 | 1.30 |
| | ACRC 450 | 0.90 | 0.90 | 0.69 | 1.03 | 0.90 | 1.30 | 1.30 | 1.00 | 1.49 | 1.30 |
| | ACRC 500 | 0.85 | 0.85 | 0.63 | 1.05 | 0.85 | 1.34 | 1.34 | 1.00 | 1.66 | 1.34 |
| | ACRC 550 | 0.75 | 0.75 | 0.56 | 1.07 | 0.75 | 1.34 | 1.34 | 1.00 | 1.91 | 1.34 |
| Without Free Cooling | ACRC 150 | 0.96 | 0.96 | 2.05 | 1.03 | 0.96 | 0.47 | 0.47 | 1.00 | 0.50 | 0.47 |
| | ACRC 165 | 0.93 | 0.93 | 1.83 | 1.03 | 0.93 | 0.51 | 0.51 | 1.00 | 0.56 | 0.51 |
| | ACRC 180 | 0.88 | 0.88 | 1.70 | 1.04 | 0.88 | 0.52 | 0.52 | 1.00 | 0.61 | 0.52 |
| | ACRC 200 | 0.87 | 0.87 | 1.53 | 1.03 | 0.87 | 0.57 | 0.57 | 1.00 | 0.67 | 0.57 |
| | ACRC 225 | 0.81 | 0.81 | 1.31 | 1.01 | 0.81 | 0.62 | 0.62 | 1.00 | 0.77 | 0.62 |
| | ACRC 250 | 0.77 | 0.77 | 1.21 | 1.02 | 0.77 | 0.63 | 0.63 | 1.00 | 0.84 | 0.63 |
| | ACRC 275 | 0.75 | 0.75 | 1.11 | 1.00 | 0.75 | 0.68 | 0.68 | 1.00 | 0.90 | 0.68 |
| | ACRC 300 | 0.72 | 0.72 | 1.00 | 1.00 | 0.72 | 0.72 | 0.72 | 1.00 | 1.00 | 0.72 |
| | ACRC 330 | 0.68 | 0.68 | 0.92 | 1.00 | 0.68 | 0.74 | 0.74 | 1.00 | 1.09 | 0.74 |
| | ACRC 375 | 0.79 | 0.79 | 0.80 | 1.04 | 0.79 | 0.99 | 0.99 | 1.00 | 1.30 | 0.99 |
| | ACRC 380 | 0.77 | 0.77 | 0.78 | 1.02 | 0.77 | 0.98 | 0.98 | 1.00 | 1.30 | 0.98 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| | ACRC 440 | 0.70 | 0.70 | 0.71 | 1.06 | 0.70 | 0.99 | 0.99 | 1.00 | 1.50 | 0.99 |
| | ACRC 450 | 0.68 | 0.68 | 0.69 | 1.03 | 0.68 | 0.98 | 0.98 | 1.00 | 1.49 | 0.98 |
| | ACRC 500 | 0.67 | 0.67 | 0.63 | 1.05 | 0.67 | 1.07 | 1.07 | 1.00 | 1.66 | 1.07 |
| | ACRC 550 | 0.60 | 0.60 | 0.56 | 1.07 | 0.60 | 1.07 | 1.07 | 1.00 | 1.91 | 1.07 |

## Comparability

EPDs published within the same product category, though originating from different programs, may not be comparable. Full conformance with a PCR allows PEP comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.

## References


ABB. (2023, October). Retrieved from EPD: ABB MCCB XT XT5 Ekip (CN): https://library.e.abb.com/public/34865b0f81b840d39965e79fdd066904/ABBG-00170-V01.01-EN%20-%20EPD%20Tmax%20XT%20XT5%20ELT%20(CN).pdf?x-sign=ggfjYfAPQVxAi58IMiKw/euudnhYpr+Rfo7kzUaOvkHM3caPSBammWvkv0XQs/ZD

ABB. (2023, 09 19). Retrieved from STX300 Self-supplied wireless temperature sensors family EPD: https://library.e.abb.com/public/3443da4081254e3f9f1561064a6b4651/NEPD-5028-4359_STX300-Self-supplied-wireless-temperature-sensors-family.pdf?x-sign=FfFelQptB1zXsb+mla/SvrGyByjQnw+zSLg24Kln2gpKSyBy3VV6OB8b3sdqg9FS

California Air Resources Board. (2024). *High-GWP Refrigerants*. Retrieved from What is Global Warming Potential: https://ww2.arb.ca.gov/resources/documents/high-gwp-refrigerants

CEN. (2019). *EN 15804+A2: Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.* European Committee for Standardization.

CEN. (2022). *EN 14825 Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling, commercial and process cooling - Testing and rating at part load conditions and calculation of seasonal performance.* Brussels: European Committee for Standardization.

Danfoss. (2024, 04 11). Retrieved from VLT AQUA/HVAC/Refrigeration Drive FC-202/FC-102/FC-103 series D Frame Size: https://assets.danfoss.com/documents/374156/BI484950549620en-000101.pdf

EPA. (2024, March 27). *U.S. Electricity Grid & Markets*. Retrieved from EPA United States Environmental Protection Agency: https://www.epa.gov/green-power-markets/us-electricity-grid-markets

IPCC. (2013). *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

IPCC. (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

IPCC. (2023). *AR6 WGI Report.* Retrieved from AR6 WGI Report: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter_07_Supplementary_Material.pdf

ISO. (2006). *ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures.* Geneva: International Organization for Standardization.

ISO. (2006). *ISO 14040/Amd 1:2020: Environmental management - Life cycle assessment - Principles and framework.* Geneva: International Organization for Standardization.

ISO. (2006). *ISO 14044/Amd 1:2017/Amd 2:2020: Environmental Management - Life cycle assessment - Requirements and Guidelines.* Geneva: International Organization for Standardization.

ISO. (2017). *ISO 21930: Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.* Geneva: International Organization for Standardization.

Life Cycle Assessment of Trane® ACRC Air Cooled Chiller, WAP Sustainability Consulting, November 2024

Schneider Electric. (2020, 11). Retrieved from Industrial Control and Machine Tool Transformers: https://rexel-cdn.com/products/8c6eadb67b4c3fce7ea71351ac93a38b567c75db.pdf?i=B1B0DC8E-939C-4C49-89BF-7EC1C7C5369A

Schneider Electric. (2022, 12). *Product Environmental Profile.* Retrieved from Schneider Electric Chiller Family XRAC/F: file:///Users/llouie/Downloads/SCHN-00897-V01.01-EN.pdf

The International Aluminium Institute (IAI). (2020, October). *Aluminium Recycling.* Retrieved from https://international-aluminium.org/wp-content/uploads/2021/01/wa_factsheet_final.pdf

UL Environment. (2018). *Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010, V3.2.*

US EPA. (2012). *TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Version 2.1 - User Guide.* Retrieved from https://nepis.epa.gov/Adobe/PDF/P100HN53.pdf


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| **Verifier accreditation number:** VH44 | Information and reference documents: www.pep-ecopassport.org |
| **Date of issue:** 12-2024 | **Validity period:** 5 years |
| Independent verification of the declaration and data in compliance with ISO 14025:2006 | |
| **Internal:** | **External:** |
| The PCR review was conducted by a panel of experts chaired by Julie Orgelet (DDemain) | |
| PEPs are compliant with XP C08-100-1:2016 and EN 50693:2019<br>The components of the present PEP may not be compared with components from any other program. | |
| Document complies with ISO 14025:2006 "Environmental labels and declarations. Type III environmental declarations" | |

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