



PEP Ecopassport®

Sintesis™ eXcellent
GVAF Chillers



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



Company Description

Trane® by Trane Technologies® is a world leader in heating and cooling systems, services, and solutions. 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 commercial buildings and industrial applications.

Trane systems and services have a proven track record for reliability, high quality, and advanced innovation; and are available through a powerful direct sales and service network. Trane employees and experts are respected industry-wide for their skills and performance in designing, manufacturing, marketing, and supporting commercial and industrial systems.

Company	Trane Technologies
Contact Information	enquiries@trane.eu
Registration Number	TRNE-00001-V01.01-EN

Product Information

Reference Product	Sintesis eXcellent™ GVAF with free cooling
Product Description	Sintesis eXcellent™ GVAF air-cooled chillers are designed for comfort cooling and mission critical process cooling applications like data centers. GVAF chillers operate based on vapor compression refrigeration cycle extracting the building heat into outdoor ambient while producing chilled water. The combination of magnetic bearing centrifugal compressors, innovative “zero superheat” serial counterflow evaporator, and the Trane Symbio 800 controller makes the GVAF product family deliver market leading full load and seasonal efficiencies, reliability and application flexibility. For more information, visit www.trane.eu .
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	Sintesis eXcellent™ GVAF with free cooling
Chiller Technology	Air to water
Reversible or Non-reversible	Non-reversible
Cooling Capacity	955 kW
SCOP or SEER	SEER = 6.17 kW/kW
Refrigerant Used	R-1234ze
Refill Threshold (per PSR)	90%
Note: a “data center special” unit configuration with glycol-free free cooling was selected for this analysis.	

Constituent Materials

Total weight of the reference product: 8,470 kg

Plastics as % of weight		Metals as % of weight		Others as % of weight	
Product only: 8,470 kg					
Polyurethane	0.9%	Steel	63.2%	Refrigerant	1.4%
Various plastics	0.4%	Aluminum	12.8%	Other miscellaneous	0.8%
	-	Various metals	20.6%		-
Packaging only: 0 kg					
-	0%	-	0%	-	0%
Total plastics	1.3%	Total metals	96.6%	Total others	2.1%

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 GVAF Chillers. The final assembly of the product is carried out at Trane Technologies' plant in Epinal, France. This plant recently installed electric heat pumps for facility heating needs, reducing reliance on fossil fuels in the manufacturing process; the facility has also been a zero-waste-to-landfill site since 2012. 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 Technologies' 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 is equipped with integrated free cooling, which will significantly reduce product energy usage during operation during times of lower outdoor temperatures. 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 Europe. 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 Europe.
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 Sphera Managed LCA Content 2024.1

Energy Model Used

Manufacturing	Manufacturing electricity considers the country specific region from which the product is being manufactured from Sphera's MLC. Natural gas used during manufacturing is country specific, in this case France.
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 European 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 use an average European grid mix.



Environmental Impacts

Per kW corresponding to the functional unit

Environmental Impact Indicators		Total Life Cycle Impacts (excluding Module D)		Manufacturing	Distribution	Installation	Use	End of Life	Module D
				A1-A3	A4	A5	B1-B7	C1-C4	D
Climate change - total	GWP	7.02E+02	kg CO ₂ eq	4.11E+01	5.67E-01	7.18E-03	6.52E+02	8.46E+00	-1.21E+01
Climate change - fossil fuels	GWPf	6.96E+02	kg CO ₂ eq	4.12E+01	5.67E-01	7.18E-03	6.46E+02	8.46E+00	-1.21E+01
Climate change - biogenics	GWPb	5.63E+00	kg CO ₂ eq	-1.70E-01	-6.10E-04	0.00E+00	5.79E+00	2.54E-03	-4.36E-03
Climate change - land use and land use transformation	GWP _{lu}	1.24E-01	kg CO ₂ eq	2.61E-02	3.17E-04	0.00E+00	9.79E-02	1.64E-04	-1.40E-02
Ozone depletion	ODP	1.47E-08	kg CFC-11 eq	1.34E-10	8.36E-14	2.01E-13	1.46E-08	3.76E-12	-3.94E-11
Acidification	AP	1.42E+00	mole of H ⁺ eq	1.74E-01	2.82E-03	1.07E-04	1.25E+00	4.48E-04	-5.16E-02
Eutrophication, freshwater	Epf	2.82E-03	kg P eq	1.46E-04	2.88E-06	2.20E-09	2.67E-03	9.76E-07	-1.50E-05
Eutrophication, marine aquatic	Epm	3.46E-01	kg of N eq	3.38E-02	1.41E-03	4.90E-05	3.11E-01	1.63E-04	-9.57E-03
Eutrophication, terrestrial	Ept	3.64E+00	mole of N eq	3.65E-01	1.55E-02	5.36E-04	3.26E+00	1.92E-03	-1.00E-01
Photochemical ozone formation	POCP	9.28E-01	kg NMVOC eq	1.02E-01	2.88E-03	1.35E-04	8.23E-01	3.86E-04	-2.99E-02
Abiotic resource depletion – elements	ADPe	1.52E-03	kg Sb eq	1.35E-03	7.47E-08	0.00E+00	1.77E-04	1.03E-08	-4.66E-04
Abiotic resource depletion – fossil fuels	ADPf	1.40E+04	MJ	4.99E+02	7.50E+00	9.92E-02	1.35E+04	1.63E+00	-1.38E+02
Water use	WU	1.82E+02	m ³ world eq	3.39E+00	3.39E-02	0.00E+00	1.78E+02	4.99E-02	-1.83E+00

Inventory Flow Indicators		Total Life Cycle Impacts (excluding Module D)		Manufacturing	Distribution	Installation	Use	End of Life	Module D
				A1-A3	A4	A5	B1-B7	C1-C4	D
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	ERP	9.86E+03	MJ	9.33E+01	3.32E-01	0.00E+00	9.77E+03	1.61E-01	-4.43E+01
Use of renewable primary energy resources used as raw materials	ERM	4.89E+00	MJ	4.89E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00



Total use of renewable primary energy resources	ER	9.87E+03	MJ	9.82E+01	3.32E-01	0.00E+00	9.77E+03	1.61E-01	-4.43E+01
Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	ENRP	1.40E+04	MJ	4.96E+02	7.50E+00	9.92E-02	1.35E+04	1.63E+00	-1.38E+02
Use of non-renewable primary energy resources used as raw materials	ENRM	4.00E+00	MJ	4.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	ENR	1.40E+04	MJ	5.00E+02	7.50E+00	9.92E-02	1.35E+04	1.63E+00	-1.38E+02
Use of secondary materials	USM	4.58E+00	kg	4.58E+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	7.62E+00	m3	1.40E-01	1.10E-03	0.00E+00	7.48E+00	1.21E-03	-4.70E-01
Hazardous waste disposed	HWD	2.88E-04	kg	2.69E-04	1.01E-09	0.00E+00	1.95E-05	3.61E-10	-1.66E-04
Non-hazardous waste disposed	NHWD	1.69E+01	kg	4.48E+00	7.47E-04	0.00E+00	1.12E+01	1.28E+00	-2.00E+00
Radioactive waste disposed	RWD	2.18E+00	kg	1.85E-02	2.26E-05	0.00E+00	2.16E+00	1.98E-05	-4.84E-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	8.03E+00	kg	7.89E-01	0.00E+00	0.00E+00	0.00E+00	7.24E+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	2.57E+00	MJ	1.11E+00	0.00E+00	0.00E+00	0.00E+00	1.46E+00	0.00E+00



Environmental Impacts

Per device corresponding to the reference product

Environmental Impact Indicators		Total Life Cycle Impacts (excluding Module D)		Manufacturing	Distribution	Installation	Use	End of Life	Module D
				A1-A3	A4	A5	B1-B7	C1-C4	D
Climate change - total	GWP	6.70E+05	kg CO ₂ eq	3.92E+04	5.41E+02	6.86E+00	6.22E+05	8.08E+03	-1.15E+04
Climate change - fossil fuels	GWPf	6.65E+05	kg CO ₂ eq	3.93E+04	5.42E+02	6.86E+00	6.17E+05	8.08E+03	-1.15E+04
Climate change - biogenics	GWPb	5.37E+03	kg CO ₂ eq	-1.62E+02	-5.83E-01	0.00E+00	5.53E+03	2.42E+00	-4.17E+00
Climate change - land use and land use transformation	GWPlu	1.19E+02	kg CO ₂ eq	2.49E+01	3.03E-01	0.00E+00	9.35E+01	1.57E-01	-1.33E+01
Ozone depletion	ODP	1.41E-05	kg CFC-11 eq	1.28E-07	7.98E-11	1.92E-10	1.39E-05	3.59E-09	-3.77E-08
Acidification	AP	1.36E+03	mole of H ⁺ eq	1.67E+02	2.70E+00	1.02E-01	1.19E+03	4.27E-01	-4.93E+01
Eutrophication, freshwater	Epf	2.70E+00	kg P eq	1.40E-01	2.75E-03	2.10E-06	2.55E+00	9.33E-04	-1.44E-02
Eutrophication, marine aquatic	Epm	3.31E+02	kg of N eq	3.23E+01	1.34E+00	4.68E-02	2.97E+02	1.55E-01	-9.14E+00
Eutrophication, terrestrial	Ept	3.47E+03	mole of N eq	3.49E+02	1.48E+01	5.12E-01	3.11E+03	1.83E+00	-9.56E+01
Photochemical ozone formation	POCP	8.86E+02	kg NMVOC eq	9.71E+01	2.75E+00	1.29E-01	7.86E+02	3.69E-01	-2.86E+01
Abiotic resource depletion – elements	ADPe	1.46E+00	kg Sb eq	1.29E+00	7.14E-05	0.00E+00	1.69E-01	9.81E-06	-4.45E-01
Abiotic resource depletion – fossil fuels	ADPf	1.34E+07	MJ	4.77E+05	7.16E+03	9.47E+01	1.29E+07	1.56E+03	-1.32E+05
Water use	WU	1.74E+05	m ³ world eq	3.24E+03	3.24E+01	0.00E+00	1.70E+05	4.77E+01	-1.75E+03

Inventory Flow Indicators		Total Life Cycle Impacts (excluding Module D)		Manufacturing	Distribution	Installation	Use	End of Life	Module D
				A1-A3	A4	A5	B1-B7	C1-C4	D
Use of renewable primary energy, excluding renewable primary energy resources used as raw materials	ERP	9.42E+06	MJ	8.91E+04	3.17E+02	0.00E+00	9.33E+06	1.54E+02	-4.23E+04
Use of renewable primary energy resources used as raw materials	ERM	4.67E+03	MJ	4.67E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	ER	9.42E+06	MJ	9.38E+04	3.17E+02	0.00E+00	9.33E+06	1.54E+02	-4.23E+04



Use of non-renewable primary energy, excluding non-renewable primary energy resources used as raw materials	ENRP	1.34E+07	MJ	4.73E+05	7.16E+03	9.47E+01	1.29E+07	1.56E+03	-1.32E+05
Use of non-renewable primary energy resources used as raw materials	ENRM	3.82E+03	MJ	3.82E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	ENR	1.34E+07	MJ	4.77E+05	7.16E+03	9.47E+01	1.29E+07	1.56E+03	-1.32E+05
Use of secondary materials	USM	4.38E+03	kg	4.38E+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	7.28E+03	m3	1.34E+02	1.05E+00	0.00E+00	7.14E+03	1.15E+00	-4.49E+02
Hazardous waste disposed	HWD	2.75E-01	kg	2.56E-01	9.65E-07	0.00E+00	1.87E-02	3.44E-07	-1.59E-01
Non-hazardous waste disposed	NHWD	1.62E+04	kg	4.28E+03	7.13E-01	0.00E+00	1.06E+04	1.23E+03	-1.91E+03
Radioactive waste disposed	RWD	2.08E+03	kg	1.76E+01	2.16E-02	0.00E+00	2.06E+03	1.89E-02	-4.62E+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	7.67E+03	kg	7.53E+02	0.00E+00	0.00E+00	0.00E+00	6.91E+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	EEE	2.45E+03	MJ	1.06E+03	0.00E+00	0.00E+00	0.00E+00	1.40E+03	0.00E+00

Extrapolation Factors

GVAF 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 black. Extrapolation factors are provided for units both with and without free cooling.

GVAF 105 XSE
GVAF 140 XSE
GVAF 140 XSS
GVAF 210 XSE
GVAF 210 XSS
GVAF 285 XSE
GVAF 285 XSS
GVAF 330 XSE
GVAF 420 XSE
GVAF 455 XSS

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 GVAF Chillers covered in this report. These scaling factors are intended to allow interested parties to determine the environmental impacts of GVAF 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 6-9, by the corresponding cell in the table that pertains to the product of interest, found below.

Product		Extrapolation Factors - Declared Unit					Extrapolation Factors - Functional Unit				
		A1-A3	A4	A5	B1-B7	C1-C4	A1-A3	A4	A5	B1-B7	C1-C4
With Free Cooling	105 XSE	0.47	0.47	1	0.43	0.47	1.18	1.18	2.51	1.08	1.18
	140 XSE	0.54	0.54	1	0.52	0.54	1.07	1.07	2.00	1.04	1.07
	140 XSS	0.47	0.47	1	0.53	0.47	0.96	0.96	2.05	1.09	0.96
	210 XSE	0.74	0.74	1	0.85	0.74	0.91	0.91	1.24	1.05	0.91
	210 XSS	0.69	0.69	1	0.87	0.69	0.87	0.87	1.26	1.09	0.87
	285 XSE	1.00	1.00	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	285 XSS	0.97	0.97	1	1.03	0.97	1.00	1.00	1.03	1.06	1.00
	330 XSE	1.24	1.24	1	1.25	1.24	1.06	1.06	0.86	1.07	1.06
	420 XSE	1.40	1.40	1	1.48	1.40	0.96	0.96	0.68	1.01	0.96
	455 XSS	1.42	1.42	1	1.68	1.42	0.92	0.92	0.64	1.09	0.92
Without Free Cooling	105 XSE	0.29	0.29	1	0.43	0.29	0.73	0.73	2.51	1.08	0.73
	140 XSE	0.33	0.33	1	0.52	0.33	0.66	0.66	2.00	1.04	0.66
	140 XSS	0.29	0.29	1	0.53	0.29	0.60	0.60	2.05	1.09	0.60
	210 XSE	0.46	0.46	1	0.85	0.46	0.57	0.57	1.24	1.05	0.57
	210 XSS	0.42	0.42	1	0.87	0.42	0.53	0.53	1.26	1.09	0.53
	285 XSE	0.64	0.64	1	1.00	0.64	0.64	0.64	1.00	1.00	0.64
	285 XSS	0.56	0.56	1	1.03	0.56	0.58	0.58	1.03	1.06	0.58
	330 XSE	0.78	0.78	1	1.25	0.78	0.67	0.67	0.86	1.07	0.67
	420 XSE	0.92	0.92	1	1.48	0.92	0.62	0.62	0.68	1.01	0.62
	455 XSS	0.92	0.92	1	1.68	0.92	0.59	0.59	0.64	1.09	0.59

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.

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PEPs are compliant with XP C08-100-1:2016 and EN 50693:2019

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"

