

## Statement of Verification

BREG EN EPD No.: 000477

Issue 01

This is to verify that the  
**Environmental Product Declaration**  
provided by:  
**Aquatherm, GmbH**



is in accordance with the requirements of:  
**EN 15804:2012+A2:2019**  
and  
**BRE Global Scheme Document SD207**

This declaration is for:  
**1m of black piping system**

### Company Address

Aquatherm, GmbH  
Biggen 5,  
57439 Attendorn,  
Germany



Emma Baker  
Operator

10 February 2023  
Date of this Issue

10 February 2023  
Date of First Issue

09 February 2028  
Expiry Date



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## Environmental Product Declaration

EPD Number: 000477

### General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804+A2 PN 514 Rev 3.0.
Commissioner of LCA study	LCA consultant/Tool
Aquatherm, GmbH Biggen 5, 57439 Attendorn, Germany	Sphera Solutions - GaBi Innovation Centre Warwick Technology Park Gallows Hill, Heathcote CV34 6UW
Declared Unit	Applicability/Coverage
1m of black piping system	Other (please specify). Specific product
EPD Type	Background database
Cradle to Gate, with A5 & Module C1-4 and D	GaBi Software System and Database for Life Cycle Engineering 1992-2022 © Sphera Solutions GmbH
Demonstration of Verification	
RIGID AND FLEXIBLE BUILDING PIPING SYSTEMS IN NORTH AMERICA (PCR-1002) <sup>a</sup> in combination with the general program rules of BRE.	
Independent verification of the declaration and data according to EN ISO 14025:2010 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
(Where appropriate <sup>b</sup> )Third party verifier: Nigel Jones	
a: Product category rules 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+A2:2019. 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+A2:2019 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
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Note: Ticks indicate the Information Modules declared.

## Manufacturing sites

Attendorn  
Biggen 5,  
57439 Attendorn,  
Germany

Radeberg  
Wilhelm-Rönsch-Strasse 4,  
01454 Radeberg,  
Germany

## Construction Product

### Product Description

#### Aquatherm black pipe system

Aquatherm black system is a multiple awarded surface heating and cooling system. Versatile, manufactured in compact register design and equipped with a future-proof technology – these are some of the essential features of the Aquatherm black system. The special feature: It can be installed in the ceiling as well as in the wall and floor. Depending on the requirements, the surface temperature of the elements is driven a few degrees above or below the desired room temperature. The radiant energy provides either pleasant heat or cooling without disturbing draughts or dust turbulence.

Aquatherm black system works energy-saving thanks to perfect control technology. The system is ideal for use with low temperature systems such as heat pumps. Building owners and architects can be pleased about the flexible areas of application and the associated freedom of design: whether as a cooling ceiling in the office, as wall heating in the bathroom or as underfloor heating in a renovated old building – the possibilities are almost unlimited. Finally, the panel heating and cooling elements can be installed in drywall construction, in plastered ceilings, walls or in suspended coffered ceilings and are invisible afterwards.

#### Product characteristics:

- High comfort due to radiant heat
- No draught
- Energy-efficient in operation
- Versatile
- Architectural design freedom
- Quick assembly
- Low installation height
- Suitable for retrofitting
- Cooling and heating systems

## Technical Information

Property	Value, Unit
Density of the Piping system's material (PP-R)	0,9 g/cm <sup>3</sup>
Pipe colour/s	Black
Weight per square metre of specific product	1,765 kg/m <sup>2</sup>
Pipe profile diameters (rectangular heating- / distribution pipe)	12 x 12mm / 14 x 24mm

The results of this EPD refer to a specific product of pipe diameter of 12 x 12mm and product weight 1,765 kg/m<sup>2</sup>. Information on the full product range (1,765 kg/m<sup>2</sup> & 12 x 12mm / 14 x 24mm) can be found in Annex 1.



## Main Product Contents

Material Input	%
Polypropylene-R Granulate	80.4%
Brass inserts for transition fittings	0%
Reinforcement / functional layers	19.2%
Pigments	0.4%

### Material: Fusiolen® PP-R (PP-R = polypropylene random copolymer) properties are:

The Aquatherm black system high performance modules can be used as heating and cooling system. Their surface temperature is only a few degrees above or below the desired room temperature. This makes the modules ideal for use with heating systems that use renewable energies, such as heat pumps. The uniform heat or cold transfer by means of radiation ensures increased comfort. In addition, there are no draughts or dust swirls, as is the case with air conditioning systems.

- high heating and cooling capacity due to excellent contact transfer surface
- short assembly times due to prefabricated, adhesive-active modules
- noiseless and invisible heating and cooling function
- no draught
- excellently suited for the use of heat pump and condensing boiler technology due to low flow and return temperatures
- high sound absorption with metal ceiling tiles with micro-perforation or with perforated plasterboard tiles
- retrofittable into already existing metal ceiling system

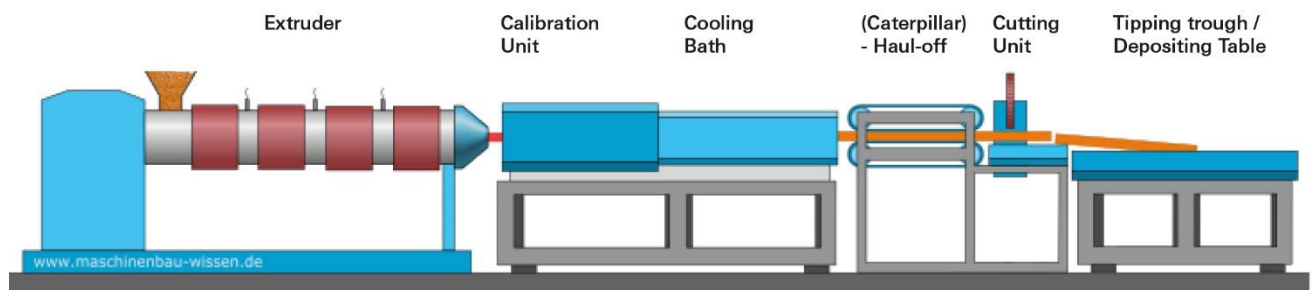
## Manufacturing Process

### Pipe production / Extrusion:

Plastic granulates are continuously melted and pressed through a shaping opening. The ejected semi-finished parts (pipe, profiles, plates, foils) are cooled down immediately after leaving the tool.

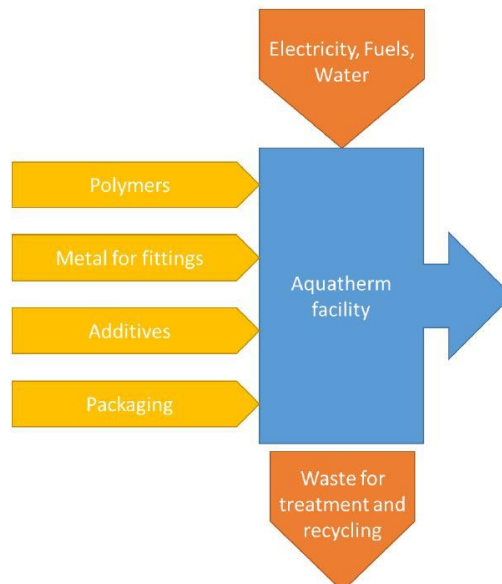
The single production steps are as following described:

1. Feeding the granulates to the extruder.
2. Melting of the material while moving it forward with the lead screw.
3. Extrude via jet.
4. Enforcing and cooling.
5. Cutting to the requested length.



## Process flow diagram

The following diagram shows the input flows for the production of the pipes:



## Construction Installation

Module A5 Installation has been partially included within the system boundaries of this study. The only impacts considered within module A5 is the end of life of packaging used to package Aquatherm products.

## End of Life

Modules C1 – C4 have been included within the system boundaries of this study in accordance to EN 15804 +A2. The EoL scenario's considered within module C3 are 100% incineration of the piping system.

## Life Cycle Assessment Calculation Rules

### Declared unit description

The declared unit being evaluated, in accordance with the guiding PCR is: ***"1 meter of piping system."***

### System boundary

The scope of this EPD is "cradle to gate + Module C and D with options (module A5)." It follows the module approach required by EN 15804+A2. Transport to the construction site and impacts from installation and use B1 – B7 were excluded from the study. However, processing of packaging is included in module A5. This EPD also includes modules C and D under the requirements of the revised EN 15804+ A2 standard.

### Data sources, quality and allocation

Data for the manufacture of Aquatherm piping systems has been collected by the client. For the data collection a specifically prepared questionnaire by Sphera has been used. The collection of the foreground data refers to the year 2019 (annual average production). Plant-level data is allocated to the declared product based on yearly produced mass. The data acquisition was done by the client considering the following data sources: Measurements of technical machines/equipment and material consumption.

The EPD uses background data from the GaBi database, 2021, v2, and EPD data for the specific primary input material used. The quality of the data used for the EPD is quantified in terms of its temporal, geographical and technological representativeness in accordance with EN 15804:2012+A2:2019. The data quality of this EPD has been determined as being "good".

Background data incl. allocations are documented at <http://database-documentation.gabi-software.com/support/gabi/>. There is no allocation key within the GaBi model.

### Cut-off criteria

In the assessment, all available data from the production process are considered, i.e all raw materials used, utilized thermal energy, and electric power consumption using best available LCI datasets. For validity for this LCA, the cut-off criteria for material and energy flows are 1% of the consumption of renewable and non-renewable primary energy and 1% of the total mass input of the respective process unit. The sum of the excluded material flows does not exceed 5% of mass, energy or environmental relevance. Machinery, plants and infrastructure required in the manufacturing process were not considered. With acknowledgement of the above exclusions, this EPD complies with the PCR requirements related to the exclusion of inputs and outputs.

## LCA Results

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO <sub>2</sub> eq	kg CO <sub>2</sub> eq	kg CO <sub>2</sub> eq	kg CO <sub>2</sub> eq	kg CFC11 eq	mol H <sup>+</sup> eq	kg (PO <sub>4</sub> ) <sup>3-</sup> eq
Product stage	Raw material supply	A1	5.97E+00	5.92E+00	4.56E-02	2.36E-03	2.68E-14	6.89E-03	1.83E-05
	Transport	A2	1.22E-01	1.21E-01	3.17E-04	7.73E-04	2.14E-17	1.08E-03	2.87E-07
	Manufacturing	A3	1.63E-01	1.45E-01	1.73E-02	2.14E-04	4.39E-15	3.06E-04	3.09E-05
	Total (of product stage)	A1-3	6.26E+00	6.19E+00	6.32E-02	3.35E-03	3.12E-14	8.28E-03	4.95E-05
Construction process stage	Construction	A5	3.06E-03	4.28E-04	2.63E-03	5.74E-07	9.11E-18	1.31E-06	4.14E-09
<b>100% incineration scenario for plastic pipe &amp; 100% recycling scenario for brass fittings</b>									
End of life	Deconstruction, demolition	C1	2.67E-02	2.63E-02	3.23E-04	6.68E-05	8.96E-16	3.77E-05	1.10E-07
	Transport	C2	1.08E-02	1.07E-02	3.21E-05	8.76E-05	2.12E-18	1.14E-05	3.19E-08
	Waste processing	C3	5.27E+00	5.27E+00	1.85E-04	3.02E-05	4.15E-16	5.34E-04	5.72E-08
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-3.64E+00	-3.63E+00	-4.05E-03	-4.66E-04	-4.34E-15	-3.43E-03	-3.08E-07

GWP-total = Global warming potential, total;  
 GWP-fossil = Global warming potential, fossil;  
 GWP-biogenic = Global warming potential, biogenic;  
 GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;  
 AP = Acidification potential, accumulated exceedance; and  
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

## LCA Results (continued)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m <sup>3</sup> world eq deprived	disease incidence
Product stage	Raw material supply	A1	2.27E-03	2.36E-02	8.85E-03	8.83E-07	1.70E+02	5.24E-02	5.81E-08
	Transport	A2	2.90E-04	3.21E-03	8.09E-04	9.17E-09	1.58E+00	9.18E-04	1.74E-08
	Manufacturing	A3	2.23E-04	1.11E-03	2.92E-04	3.41E-08	3.07E+00	1.89E+00	6.98E-09
	Total (of product stage)	A1-3	2.78E-03	2.79E-02	9.95E-03	9.26E-07	1.75E+02	1.94E+00	8.25E-08
Construction process stage	Construction	A5	3.68E-07	4.20E-06	1.06E-06	1.14E-10	7.28E-03	2.89E-04	1.05E-11
<b>100% incineration scenario for plastic pipe &amp; 100% recycling scenario for brass fittings</b>									
End of life	Deconstruction, demolition	C1	1.21E-05	1.26E-04	2.99E-05	1.07E-08	3.32E-01	5.69E-04	3.00E-10
	Transport	C2	3.63E-06	4.31E-05	9.88E-06	9.50E-10	1.43E-01	9.95E-05	7.83E-11
	Waste processing	C3	1.16E-04	2.51E-03	3.42E-04	6.29E-09	6.87E-01	4.92E-01	3.16E-09
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.23E-03	-1.35E-02	-3.49E-03	-1.53E-07	-5.70E+01	-1.25E-02	-3.30E-08

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;  
 EP-terrestrial = Eutrophication potential, accumulated exceedance;  
 POCP = Formation potential of tropospheric ozone;  
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;  
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and  
 PM = Particulate matter.



## LCA Results (continued)

Parameters describing environmental impacts			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U <sup>235</sup> eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	1.78E-01	6.73E+01	1.87E-09	1.03E-07	5.04E+00
	Transport	A2	3.86E-04	1.17E+00	2.32E-11	1.18E-09	4.33E-01
	Manufacturing	A3	1.50E-02	5.95E+00	2.41E-10	2.40E-08	4.55E+00
	Total (of product stage)	A1-3	1.93E-01	7.44E+01	2.13E-09	1.28E-07	1.00E+01
Construction process stage	Construction	A5	1.56E-04	3.26E-03	1.12E-13	6.17E-12	2.19E-03
<b>100% incineration scenario for plastic pipe &amp; 100% recycling scenario for brass fittings</b>							
End of life	Deconstruction, demolition	C1	2.46E-03	1.26E-01	5.00E-12	1.99E-10	1.69E-01
	Transport	C2	3.80E-05	1.06E-01	2.14E-12	1.11E-10	4.91E-02
	Waste processing	C3	6.14E-03	3.08E-01	3.41E-11	1.09E-09	1.90E-01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.13E-01	-7.62E+00	-3.42E-10	-1.87E-08	-3.39E-01

IRP = Potential human exposure efficiency relative to U235;  
 ETP-fw = Potential comparative toxic unit for ecosystems;  
 HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and  
 SQP = Potential soil quality index.

## 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	6.33E+00	0.00E+00	6.33E+00	9.38E+01	7.58E+01	1.70E+02
	Transport	A2	7.35E-02	0.00E+00	7.35E-02	1.59E+00		1.59E+00
	Manufacturing	A3	2.18E-01	6.81E-01	9.00E-01	2.01E+00	1.06E+00	3.07E+00
	Total (of product stage)	A1-3	6.62E+00	6.81E-01	7.30E+00	9.74E+01	7.69E+01	1.75E+02
Construction process stage	Construction	A5	6.85E-01	-6.81E-01	3.07E-03	1.07E+00	-1.06E+00	7.28E-03
<b>100% incineration scenario for plastic pipe &amp; 100% recycling scenario for brass fittings</b>								
End of life	Deconstruction, demolition	C1	2.17E-01	0.00E+00	2.17E-01	3.32E-01	0.00E+00	3.32E-01
	Transport	C2	8.22E-03	0.00E+00	8.22E-03	1.43E-01	0.00E+00	1.43E-01
	Waste processing	C3	1.34E-01	0.00E+00	1.34E-01	7.65E+01	-7.58E+01	6.87E-01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-5.37E-01	0.00E+00	-5.37E-01	-5.70E+01	0.00E+00	-5.70E+01

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 <sup>3</sup>
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	3.71E-02
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	8.47E-05
	Manufacturing	A3	2.33E-02	0.00E+00	0.00E+00	7.16E-04
	Total (of product stage)	A1-3	2.33E-02	0.00E+00	0.00E+00	3.79E-02
Construction process stage	Construction	A5	0.00E+00	0.00E+00	0.00E+00	8.32E-06
<b>100% incineration scenario for plastic pipe &amp; 100% recycling scenario for brass fittings</b>						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	1.02E-04
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	9.41E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.15E-02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-4.74E-03

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	2.61E-08	7.05E-02	2.15E-03
	Transport	A2	6.91E-11	2.31E-04	2.65E-06
	Manufacturing	A3	6.32E-10	4.91E-02	1.11E-04
	Total (of product stage)	A1-3	2.68E-08	1.20E-01	2.26E-03
Construction process stage	Construction	A5	1.87E-12	3.23E-04	9.58E-07
<b>100% incineration scenario for plastic pipe &amp; 100% recycling scenario for brass fittings</b>					
End of life	Deconstruction, demolition	C1	1.21E-10	2.59E-04	2.66E-05
	Transport	C2	7.55E-12	2.25E-05	2.60E-07
	Waste processing	C3	1.22E-10	2.47E-02	3.90E-05
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.25E-09	-1.42E-02	-2.75E-03

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	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-02
	Total (of product stage)	A1-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-02
Construction process stage	Construction	A5	0.00E+00	2.18E-03	0.00E+00	2.48E-03	0.00E+00	-1.67E-02
<b>100% incineration scenario for plastic pipe &amp; 100% recycling scenario for brass fittings</b>								
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.11E+01	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;  
MFR = Materials for recycling

MER = Materials for energy recovery;  
EE = Exported Energy

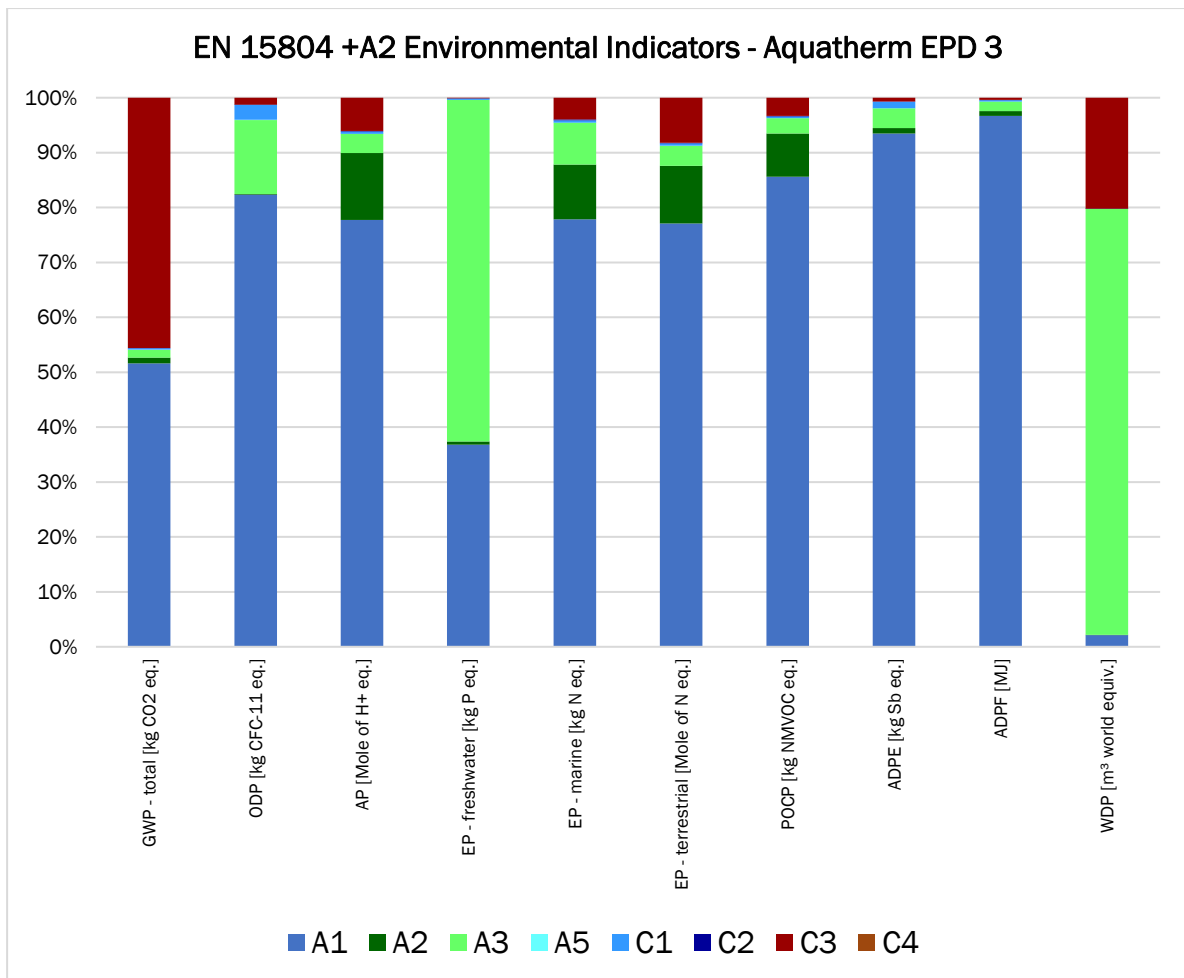
## Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
A4 – Transport to the building site	Transport to the construction site		
	Fuel type / Vehicle type	Vehicle type	Truck-trailer, Euro 6, 34 - 40t gross weight / 27t payload. Diesel
	Distance:	km	100
	Capacity utilisation (incl. empty returns)	%	61%
	Mass of transported piping system	kg	1.765
A5 – Installation in the building	Packaging EoL treatment		
	PE Film to recycling	kg/m	0.0023
	Cardboard to landfill	kg/m	0.0004
C1 to C4 End of life,	Wood to incineration	kg/m	0.0023
	Piping system to incineration, recycling		
	Polypropylene incineration	kg/m	1.4265
C1 to C4 End of life,	Oxygen barrier layer incineration	kg/m	0.3403
	Module D Credits for module A5. Credits for module C3 from energy substitution.		

## Summary, comments and additional information

### Interpretation

The Aquatherm black system (specific product) has impacts dominated by module A1 which is the main contributor to impact indicators ODP, AP, EP marine, EP terrestrial, POCP, ADPE and ADPF. Module A3 has significant relative contributions for EP freshwater and WDP and both modules A1 and C3 showed comparable impacts for GWP.



**Figure 1:** Relative contribution of declared modules to EN 15804 +A2 environmental indicators, excluding module D.

## References

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