Environmental Product Declaration (EPD)

Declaration code: EPD-APG-GB-21.0

AGC Glass Europe

Fire-resistant glass

PYROBEL and PYROBELite

Basis:

DIN EN ISO 14025
EN15804

Company-EPD
Environmental
Product **D**eclaration

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Notified Body **0757**
PÜZ-Stelle: **BAY 18**

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LCA specialist	AGC Glass Europe Avenue Jean Monnet 4 BE 1348 Louvain-la-Neuve
Declaration holder	AGC Glass Europe Avenue Jean Monnet 4 BE 1348 Louvain-la-Neuve
Declaration code	EPD-APG-GB-21.0
Designation of the declared product	PYROBEL and PYROBELite
scope	Use in internal areas or in combination with insulating glass units in external areas.
Basis	This EPD was prepared on the basis of EN ISO 14025:2011 and EN 15804:2012+A1:2013. In addition the "General guideline for elaboration of type III environmental product declarations" applies. This Declaration is based on the PCR Document "*Flachglas im Bauwesen*" (Glass in Building) PCR-FG-1.1 : 2011.
Validity	date of issue: 09.12.2015 / last revision: 07.08.2019 / next revision 01.12.2020 This verified company Environmental Product Declaration applies solely to the specified products and is valid for a period of 5 years from the date of issue according to EN 15804.
LCA basis	The LCA was prepared in accordance with EN ISO 14040 and EN ISO 14044. The base data include both data collected at AGC Glass Europe and generic data from the "GaBi 6" and “ecoinvent integrated database”database. LCA calculations were based on the "cradle to gate with options" life cycle (e.g. raw materials production).
Notes on publication	The "Conditions and Guidance on the Use of ift Test Documents" apply. The declaration holder assumes full liability for the underlying data, certificates and verifications.

Prof. Ulrich Sieberath
Director of Institute

Patrick Wortner, MBA and Eng., Dipl.-Ing. (FH)
External Verifier

1 General Product Information

Product definition

This EPD applies to the product group Glass and is valid for:

PYROBEL and PYROBELite of the company AGC Glass Europe

The LCA was prepared using the declared unit:

1 m² area

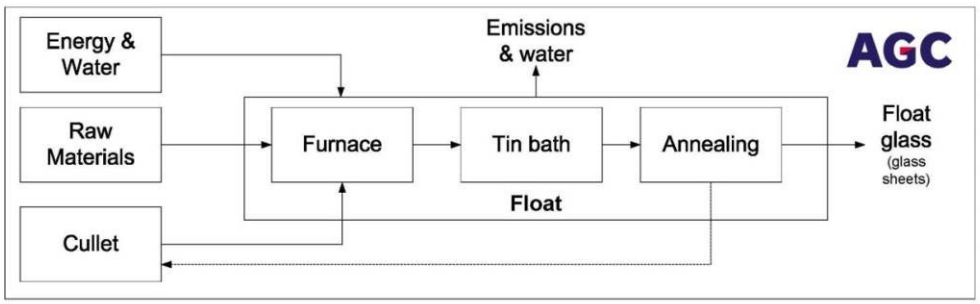
The functional unit is declared as follows:
Directly used material flows are allocated to the functional unit. All further In- and Outputs used to produce PYROBEL and PYROBELite in 2014 were scaled to the declared unit, as these cannot be assigned to the typical functional unit due to the high number of variations.

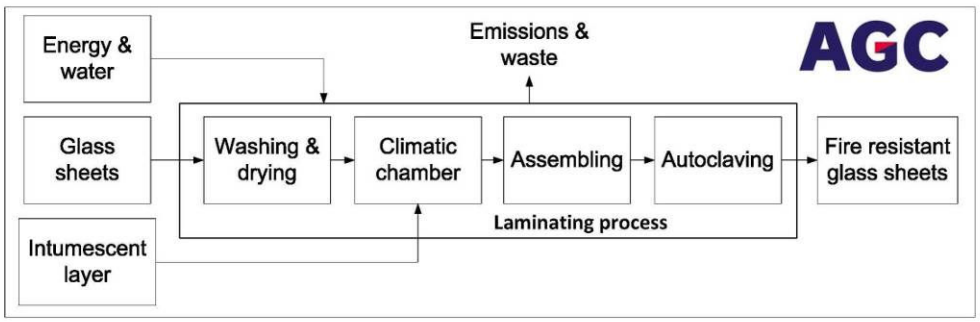
Product description

PYROBEL and PYROBELite are resistant glass laminated glazing units assembled with clear intumescent interlayer that meet the integrity and low radiation criteria (EW) or the integrity and insulation criteria (EI). In the event of a fire, the interlayers will expand and transform themselves into a rigid, opaque and heat absorbing fire shield.

For detailed product descriptions and performance specifications please refer to the manufacturer specifications at www.agc-glass.eu or product descriptions for the respective product.

Product manufacturing





Application

Use in internal areas or in combination with insulating glass units in external areas.

Management systems

The following management systems are in place:

- Quality management system (ISO 9001:2008)
- Environmental management system (ISO 14001:2014)

Additional information

For detailed structural characteristics refer to the CE mark and documents accompanying the product.

PYROBEL and PYROBELite meet the following physical building performance criteria:

- Resistance to fire according to EN 13501-2 EW and/or EI 15, 30, 45, 60, 90 and 120 min;
- - Light transmission according to EN 410: max 89%;
- - Light reflection according to EN 410: 6 – 8%;

Furthermore, the product complies with EN 14449:2005.

The applicable brand names and specific data are available on www.yourglass.com.

2 Materials used

Primary products

The primary materials used are listed in the LCA (see Section 7).

Declarable materials

In accordance with the REACH candidate list, no substances of very high concern are contained. (Declaration from 24th of February 2015)
All relevant safety data sheets can be obtained at AGC Glass Europe

3 construction stage

Processing recommendations, installation

Please consider the instructions and recommendation for the assembly, operation, maintenance and disassembly From the manufacturer on www.yourglass.com

4 utilization stage

Emissions to the environment

Emisssions to air, water and soil are not known. VOC emissions may arise, however PYROBEL and PYROBELite are in category A+ according to French scheme *„Emissions dans l'air interieur“* . For further information, please visit www.yourglass.com.

For maintenance at average 15 litres over the reference life time, i.e. 30 years are considered to be consumed and released as wastewater.

Reference service life (RSL)

RSL information to be declared in an EPD covering the use stage shall be provided by the manufacturer. The RSL shall refer to the declared technical and functional performance of the product within a building. It shall be established in accordance with any specific rules given in European product standards and shall take into account ISO 15686-1, -2, -7 and -8. Where European product standards provide guidance on deriving the RSL, such guidance shall have priority. If the reference service life can´t be determined acoording to ISO 15686, the BBSR table „Nutzungsdauern von Bauteilen zur Lebenszyklusanalyse nach BNB“ can be used. For further information visit

www.nachhaltigesbauen.de

Relevant for this EPD is:
For a “Cradle to Gate with Options” EPD the declaration of the RSL is possible only if all scenarios for the modules A1-A3 and B1-B5 are given;
The service life of the PYROBEL and PYROBELite from AGC Glass Europe is specified with 30 years according to the manufacturer.

For this EPD no specicfication of RSL is needed. Nevertheless, the LCA report specifies a service life, because it is required for the French Declaration „Fiches de Déclarations Environnementales et Sanitaires“ (FDES).

The RSL depends on the characteristics of the product and the reference terms. Look at he features below:

- Declared product characterisitcs: see chapter 1: general product information: product definition:
- Application parameters for the construction: see chapter 3: construction – processing recommendations and general product information chapter 1
- Accepted execution quality: see chapter 3: construction stage: processing recommendations and chapter 1 general product information:
- external conditions: see chapter 1 general product information:
- nominal conditions: There are no influences are known which have a negative impact on the reference service life
- conditions of use: see chapter 9: annex The refernce service life applies to the terms of use
- maintenance: see chapter 9: annex B2 maintenance

The reference service life is for the properties, which are reported in this EPD or the relevant references for this purpose.

The RSL does not reflect the actual life time , which is usually determined by the reference service life and the rehabilitation of a building. It represents no statement about service life , ensuring to power properties or guarantee commitment.

5 End of life stage

Possible end-of-life stages

Glass is recyclable as well as sorted glazing units. It could be assumed nowadays about 5 - 20 % of end-of-life flat glass units are dismantled, collected separately and recycled for glass manufacturing (post-consumer cullet); about 80 – 95 % ends up in demolition waste. Nevertheless, we model the end-of-life stage in a conservative manner (due to lack of accurate data) and therefore, assume 100% goes landfilled as inert/demolition waste.

Disposal methods

The average disposal methods were considered in the assessment.

The description of additional life cycle scenarios is presented in detail in the Annex

6 Life Cycle Assesment (LCA)

Environmental product declarations are based on life cycle analyses (LCAs) which use material and energy flows for the calculation and subsequent representation of environmental impacts.

As the basis for this, an LCA was prepared for PYROBEL and PYROBELite The LCA was developed in accordance with EN 15804 and the requirements set out by the international standards EN ISO 14040, EN ISO 14044, ISO 21930 and EN ISO 14025.

The LCA is representative of the products presented in the declaration and the specified reference period.

6.1 Definition of goal and scope

Goal

The goal of the LCA is to demonstrate the environmental impacts of the PYROBEL and PYROBELite. The environmental impacts are presented as basic information for this environmental product declaration throughout the entire life cycle in accordance with EN 15804.

Data quality and data availability, also geographical and time-related system boundaries

The specific data refer to the fiscal year 2014. These were recorded at the plant in Seneffe and Olovi. They originate partly from company records and partly from direct measurements. The validity of the data was checked by ift.

Generic data come from the Professional database and building database software GaBi 6. Both databases were last updated in 2015. Older data are also from this database and are not older than four years. There were no other generic data used for the calculation.

Data gaps were either filled with comparable data or conservative assumptions, or the data were cut off in compliance with the 1% rule.

To model the life cycle of the software system “GaBi 6” was used for the all in all balancing.

Scope and system boundaries

The system boundaries refer to the procurement of raw materials and purchased parts, the production, the use and reuse of the PYROBEL and PYROBELite (cradle to gate with options).

No additional data from suppliers and other locations were considered.

Cut-off criteria

All data from the operational data logging were considered – all used input and output materials, the thermal energy and the current drain.

The boundaries are limited to the production-relevant data. Building parts and plant parts which are not relevant for the production stage were excluded.

An average transport of 150 km (Truck) for raw materials and pre-products is considered.

The criteria for a non-viewing of inputs and outputs in accordance with EN 15804 are complied. It can be assumed that the neglected processes per life cycle stage don't exceed 1 percent of the mass or the primary energy. In total, 5 percent of the use of energy and the use of mass are used for the neglected processes. The life cycle calculation also includes material and energy flows that account for less than 1 percent.

6.2 Life cycle inventory analysis

Goal

All material flows and energy flows are described below. The processes covered are presented as input and output parameters and refer to the declared / functional units.

The models of the unit processes used for the LCA have been documented in a transparent manner.

Life cycle stages

The entire life cycle of the PYROBEL and PYROBELite is shown in the appendix - Product stage A1-A3, Construction process stage A4-A5, Use stage B1-B7 and the End of life stage C1-C4.

Benefits

Benefits according to EN 15804 are not given:

Allocation of co-products

No allocations are produced by the manufacture of PYROBEL and PYROBELite.

Allocations for reuse, recovery and recycling

Glass is recyclable as well as sorted glazing units. It could be assumed nowadays about 5 – 20 % of end-of-life flat glass units are dismantled, collected separately and recycled for glass manufacturing (post-consumer cullet); about 80 – 95 % ends up in demolition waste. Nevertheless, we model the end-of-life stage in a conservative manner (due to lack of accurate data) and therefore, assume 100 % goes landfilled as inert/demolition waste.

The system boundaries of the PYROBEL and PYROBELite were set after the disposal, in which the limits of their waste characteristics were reached.

Allocations based on life cycle boundaries

No recycling materials in th the product stage are considered.

Secondary materials

The use of secondary materials in the module A3 was not considered by the company secondary materials were not used.

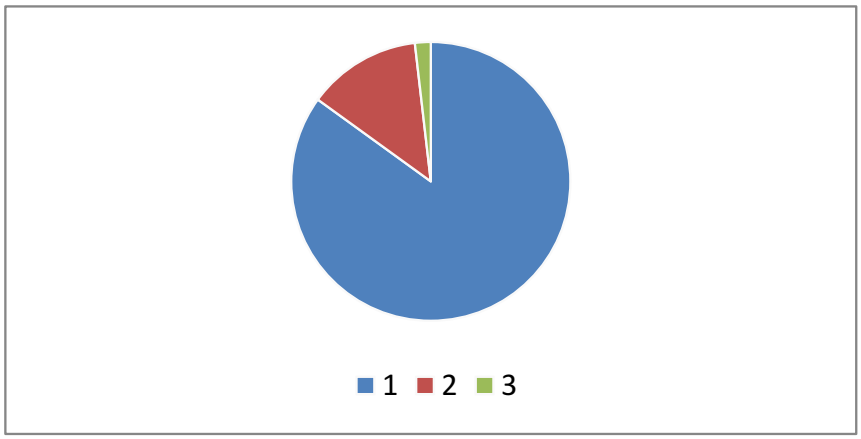
Inputs

The LCA includes the following production-relevant inputs:

Energy
The electricity mix is based on "electricity mix-EU-27".
For gas the less favourable data record was adopted "natural gas EU-27".

Water
Water is consumed during the individual production steps for the manufacture of the PYROBEL and PYROBELite of about 76.73 l per m^2 element.
The consumption of fresh water specified in Section 7.3 originates (among others) from the upstream processes of the primary products/pre-products.

Raw material / primary products:
The following chart shows the use of raw materials/pre-products share in %.



No.	material	mass in %
1	Float glass	85
2	Intumescent layer	13
3	Lamination	2

Operating supplies
For the production of PYROBEL and PYROBELite accumulate raw materials and supplies. These are not reported separately in the LCA.

Outputs

The LCA includes the production-relevant outputs per m² PYROBEL and PYROBELite

Waste
Secondary raw materials were included in the benefits.
See Section 6.3 - Impact assessment

Waste water
72.7 l waste water is produced for the manufacture of 1 m² PYROBEL and PYROBELite.

6.3 Impact assessment

Goal

Impact assessment covers inputs and outputs. The impact categories applied are set out below:

Impact categories

The models for impact assessment were applied as described in EN 15804-A1.

The following impact categories are presented in the EPD:

- Global warming potential (GWP)
- Ozone depletion potential (ODP)
- Acidification potential of soil and water (AP)
- Eutrophication potential (EP)

- Photochemical ozone creation potential (POCP)
- Abiotic depletion potential - non-fossil resources (ADP - elements)

Waste

The waste generated during the production of m² PYROBEL and PYROBELite is evaluated and shown separately for each of the three main fractions, namely trade wastes, special wastes and radioactive wastes. Since waste handling is modelled within the system boundaries, the amounts shown refer to the deposited wastes. A portion of the waste indicated is generated during the manufacture of the primary products/pre-products. Radioactive waste results from the generation of electricity. The wastes presented are generated throughout the entire product life cycle.

Results per m^2 PYROBEL and PYROBELite (Part 1)																
Environmental impacts	**unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D*)**
Global warming potential (GWP)	kg CO_2-Äqv.	7.16E+01	1.49E+00	4.08E-02	0.00	7.83E-02	-	-	-	-	-	-	7.25E-02	0.00	6.45E-01	-
Ozone depletion potential (ODP)	kg R11-Äqv.	5.33E-07	6.05E-12	4.85E-12	0.00	2.37E-12	-	-	-	-	-	-	3.47E-13	0.00	8.75E-12	-
Acidification potential of soil and water (AP)	kg SO_2-Äqv.	4.55E-01	6.75E-03	8.75E-06	0.00	1.00E-04	-	-	-	-	-	-	4.57E-04	0.00	4.10E-03	-
Eutrophication potential (EP)	kg PO_4^{3-}-Äqv.	5.76E-02	1.71E-03	4.04E-06	0.00	1.14E-04	-	-	-	-	-	-	1.09E-04	0.00	5.60E-04	-
Photochemical ozone creation potential (POCP)	kg C_2H_4-Äqv.	2.98E-02	0.00	9.10E-06	0.00	6.24E-06	-	-	-	-	-	-	0.00	0.00	3.84E-04	-
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb-Äqv.	1.97E-04	5.80E-08	3.31E-10	0.00	2.99E-08	-	-	-	-	-	-	2.73E-09	0.00	2.42E-07	-
Abiotic depletion potential - fossil resources (ADP – fossil fuels.)	MJ	1.00E+03	2.04E+01	2.37E-02	0.00	1.43E-01	-	-	-	-	-	-	1.00E+00	0.00	8.45E+00	-
Use of ressources	**unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D*)**
Use of renewable primary energy - excluding renewable primary energy resources used as raw materials	MJ	5.63E+01	0.00	1.16E+01	0.00	1.68E-02	-	-	-	-	-	-	3.94E-02	0.00	7.30E-01	-
Use of renewable primary energy resources used as raw materials (material use)	MJ	1.16E+01	0.00	-1.16E+01	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	6.79E+01	0.00	1.22E-03	0.00	1.68E-02	-	-	-	-	-	-	3.94E-02	0.00	7.30E-01	-
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials.	MJ	2.12E+03	2.04E+01	1.29E+00	0.00	1.72E-01	-	-	-	-	-	-	1.01E+00	0.00	4.54E+01	-
Use of non-renewable primary energy resources used as raw materials (material use)	MJ	3.78E+01	0.00E+00	-1.27E+00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	-3.65E+01	-
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy + material use)	MJ	2.16E+03	2.04E+01	2.48E-02	0.00	1.72E-01	-	-	-	-	-	-	1.01E+00	0.00	8.85E+00	-
Use of secondary materials	kg	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-

Results per m^2 PYROBEL and PYROBELite (Part 2)																
Use of ressources	**unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D*)**
Use of renewable secondary fuels	MJ	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-
Use of non-renewable secondary fuels	MJ	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-
Use of net fresh water	m^3	4.01E-01	4.08E-03	9.15E-06	0.00	5.69E-03	-	-	-	-	-	-	9.75E-05	0.00	1.62E-03	-
Waste categories	**unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D*)**
Hazardous waste disposed	kg	8.40E-04	9.70E-06	4.47E-09	0.00	6.03E-08	-	-	-	-	-	-	4.73E-07	0.00	2.78E-06	-
Non-hazardous waste disposed (municipal waste)	kg	4.30E-01	2.91E-03	1.34E-02	0.00	2.56E-02	-	-	-	-	-	-	1.42E-04	0.00	4.76E+01	-
Radioactive waste	kg	2.85E-02	2.79E-05	4.53E-07	0.00	1.13E-05	-	-	-	-	-	-	1.36E-06	0.00	1.34E-04	-
Output material flows	**unit**	**A1-A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D*)**
Components for re-use	kg	3.51E-01	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-
Materials for recycling	kg	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-
Materials for energy recovery	kg	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-
Exported energy (electricity)	MJ	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-
Exported energy (thermal energy)	MJ	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-	-	0.00	0.00	0.00	-

6.4 Interpretation, LCA presentation and critical verification

Interpretation

The declaration refers to the declared unit of 1 m² of fire resistant glass, with a intumescent layer and added safety layer. The reference structure considered is 21,1 mm of glazing unit (baseline scenario), whereas other glazing structures have been included by means of parameters.
The manufacturing process of the flat glass, the raw and auxiliary materials provision and the upstream processes for energy provision are the main contributors to the quantified environmental impacts of the construction product.
Glass manufacturing is an energy intensive process, which is reflected by impact indicators like Global Warming Potential (GWP) and Primary Energy Demand (PED). External grading the units for increased safety means a thermal process (calendaring) that adds CO_2 by consuming primary energy use. The curing process of the intumescent layer adds an additional amount to the previous, again mainly by means of energy use.

The calculated environmetnal indicators can be used for building certification.

Report

The LCA underlying this EPD was developed according to the requirements of DIN EN ISO 14040 and DIN EN ISO 14044 as well as EN 15804 and EN ISO 14025. It is not addressed to third parties for confidentiality reasons. It is deposited with the ift Rosenheim. The results and conclusions reported to the target group are complete, correct, without bias and transparent. The results of the study are not designed to be used for comparative statements intended for publication.

Critical review

The LCA was critically verified by Mr. Frank Stöhr, an independent ift verifier. In addition to that, the report was reviewed in the course of the EPD verification by Patrick Wortner, MBA and Eng., Dipl.-Ing. (FH) , an external verifier.

7 General information regarding the EPD

Comparability

This EPD was prepared in accordance with EN 15804 and is therefore only comparable to those EPDs that that also comply with EN 15804.
Any comparison must be based on reference to the building context and the fact that the same boundary conditions were considered in the various life cycle stages.
For a comparison of EPDs for construction products the rules as per EN 15804 (Chapter 5.3) apply.

Communication

The communications format of this EPD meets the requirements of EN 15942:2011 and is therefore the basis for B2B communication. However the nomenclature has been changed according to EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the ift Guideline "Guidance on Preparing Type III Environmental Product Declarations" in accordance with the requirements set out in ISO 14025.

This declaration is based on the ift PCR document „Flachglas im Bauwesen“ – PCR-FG-1.1:2013.

The European standard EN 15804 serves as the core PCR[a].
Independent verification of the declaration according to EN ISO 14025:2010 ☐ internal ☒ external
Independent third party verifier Patrick Wortner
[a] Product category rules [b] Voluntary for the exchange of information within trade, obligatory for the exchange of information between trade and consumer (see ISO 14025:2010, 9.4)

Revisions of this document

No.	date	comment	reviser	verifier
1	26.10.2015	First release (internal verifcation)	Stich	Stöhr
2	09.12.2015	External verification	Stich	Wortner
3	07.08.2019	Review	Zwick	Wortner

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[19] EN 12457-4:2003-01
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[20] EN 13501-1:2010-01
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[21] DIN 4102-1:1998-09
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[22] OENORM S 5200:2009-04-01
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[23] CEN TS 14405:2004-09
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[24] VDI 2243:2002-07
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[25] Commission Directive 2009/2/EC
amending, for the purpose of its adaptation to technical progress, for the 31st time, Council Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances
(15 January 2009)

[26] ift Guideline NA-01/3
Allgemeiner Leitfaden zur Erstellung von Typ III Umweltproduktdeklarationen (Guidance on preparing Type III Environmental Product Declarations)
ift Rosenheim, April 2015

[27] Arbeitsschutzgesetz – ArbSchG (Safety at Work Law)
Gesetz über die Durchführung von Maßnahmen des Arbeitsschutzes zur Verbesserung der Sicherheit und des Gesundheitsschutzes der Beschäftigten bei der Arbeit (Law on the implementation of occupational health and safety measures to improve the safety and health protection of employees at work), 5 February 2009 (BGBl. I p. 160, 270)

[28] Bundesimmissionsschutzgesetz – BImSchG (Federal Immission Law)
Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnlichen Vorgängen (Law on harmful environmental impacts by air contamination, noise, vibrations and similar processes), 26 September 2002 (BGBl. I p. 3830)

[29] Chemikaliengesetz – ChemG (Chemicals Act)
Gesetz zum Schutz vor gefährlichen Stoffen (Law on protection against hazardous substances)
Unterteilt sich in Chemikaliengesetzt und eine Reihe von Verordnungen; hier relevant (subdivided into Chemicals Law and a series of regulations; of relevance here: Gesetz zum Schutz vor gefährlichen Stoffen [Law on protection against hazardous substances]), 2 July 2008 (BGBl. I p.1146)

[30] Chemikalien-Verbotsverordnung – ChemVerbotsV (Chemicals Prohibition Regulation)
Verordnung über Verbote und Beschränkungen des Inverkehrbringens gefährlicher Stoffe, Zubereitungen und Erzeugnisse nach dem Chemikaliengesetz (Regulation on bans and restrictions of the placing on the market of hazardous substances, formulations and products covered by the Chemicals Law), 21 July 2008 (BGBl. I p. 1328)

[31] Gefahrstoffverordnung – GefStoffV (Hazardous substances regulation)
Verordnung zum Schutz vor Gefahrstoffen (Regulation on protection against hazardous substances), 23 December 2004 (BGBl. I p. 3758)

[32] „PCR Flat glass. Product Category Rules according to ISO 14025 and EN 15804“.
ift Rosenheim, January 2013

[33] Research project "EPDs für transparente Bauelemente" (EPDs for transparent building components)
ift Rosenheim, 2011

8 Annex A: Overview results for the different fire resistant glasses products.

	A1-A3		A1-A3												
AGC Brandname	Pyrobel 16 EG		Pyrobelite 7	Pyrobelite 12	Pyrobel 16	Pyrobel 25	Pyrobel 35	Pyrobelite 7EG	Pyrobel 8EG	Pyrobel 25 EG	Pyrobel 35 EG	Pyrobel 16 EG2	Pyrobelite 16 EG2	Pyrobel 35 EG2		
Promat	Promaglas 30 type 2		Promaglas G30 type 1	Promaglas 15 type 1	Promaglas 30 type 1	Promaglas 60/25 type 1	Promaglas 90 type 1	Promaglas G30 type 2	Promaglas 15 type 2	Promaglas 60/25 type 2	Promaglas 90 type 2	SYS-TEMGLAS 30 type 20 (:3)	Promaglas 30 type 20 (:8)	Promaglas 90 type 20	SYS-TEMGLAS 90/43 type 1	SYS-TEMGLAS 90/43 type 10
Global warming potential (100 years)	7,16E+01		2,81E+01	4,00E+01	5,54E+01	8,02E+01	1,04E+02	4,38E+01	4,70E+01	9,64E+01	1,20E+02	8,78E+01	1,19E+02	1,36E+02	1,37E+02	1,69E+02
Ozone depletion potential – strato-spheric ozone layer	5,33E-07		3,03E-07	5,20E-07	5,27E-07	1,04E-06	1,86E-06	2,70E-07	5,20E-07	1,04E-06	1,86E-06	5,39E-07	5,54E-07	1,87E-06	1,56E-06	1,57E-06
Acidification poten-tial	4,55E-01		1,81E-01	2,61E-01	3,74E-01	5,39E-01	6,44E-01	2,60E-01	2,74E-01	6,20E-01	7,25E-01	5,36E-01	7,63E-01	8,06E-01	8,97E-01	1,06E+00
Eutrophication potential	5,76E-02		2,23E-02	3,23E-02	4,71E-02	6,76E-02	7,96E-02	3,26E-02	3,39E-02	7,81E-02	9,01E-02	6,81E-02	9,76E-02	1,01E-01	1,13E-01	1,34E-01
Photochemical ozone creation potential	2,98E-02		1,20E-02	1,73E-02	2,40E-02	3,52E-02	4,50E-02	1,76E-02	1,92E-02	4,10E-02	5,08E-02	3,57E-02	4,89E-02	5,67E-02	5,88E-02	7,05E-02
Abiotic depletion potential for non-fossil resources	1,97E-04		7,93E-05	1,22E-04	1,68E-04	2,57E-04	3,34E-04	1,06E-04	1,23E-04	2,87E-04	3,64E-04	2,26E-04	3,18E-04	3,93E-04	4,22E-04	4,81E-04
Abiotic depletion potential for fossil resources	1,00E+03		4,31E+02	5,96E+02	7,84E+02	1,13E+03	1,52E+03	6,38E+02	7,01E+02	1,35E+03	1,74E+03	1,22E+03	1,59E+03	1,95E+03	1,89E+03	2,32E+03
Primary energy resources, total renewable	6,79E+01		3,94E+01	4,67E+01	5,61E+01	7,13E+01	8,75E+01	5,09E+01	5,28E+01	8,31E+01	9,93E+01	7,97E+01	9,85E+01	1,11E+02	1,08E+02	1,31E+02
Primary energy resources, total non-renewable	2,16E+03		1,10E+03	1,73E+03	1,93E+03	3,37E+03	5,53E+03	1,24E+03	1,84E+03	3,60E+03	5,77E+03	2,40E+03	2,79E+03	6,00E+03	5,25E+03	5,71E+03
Fresh water use	4,01E-01		2,15E-01	3,21E-01	3,49E-01	5,92E-01	9,81E-01	2,51E-01	3,56E-01	6,44E-01	1,03E+00	4,53E-01	5,10E-01	1,08E+00	9,15E-01	1,02E+00
Hazardous waste disposed	8,40E-04		3,91E-04	5,64E-04	8,40E-04	1,19E-03	1,35E-03	5,78E-04	5,87E-04	1,38E-03	1,54E-03	1,22E-03	1,77E-03	1,73E-03	2,00E-03	2,38E-03
Non-hazardous waste disposed	4,30E-01		1,78E-01	2,72E-01	4,30E-01	6,17E-01	6,80E-01	2,76E-01	2,75E-01	7,14E-01	7,77E-01	6,25E-01	9,40E-01	8,75E-01	1,06E+00	1,25E+00
Radioactive waste disposed	2,85E-02		2,04E-02	2,39E-02	2,85E-02	3,57E-02	4,42E-02	2,68E-02	2,77E-02	4,22E-02	5,07E-02	4,15E-02	5,07E-02	5,72E-02	5,41E-02	6,71E-02

9 Annex B

Description of life cycle scenarios for PYROBEL and PYROBELite

Production stage			Construction stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport	Construction / Installation	Use	Maintenance	Repair	Replacement	Modification / Refurbishment	Operational energy use	Operational water use	Dismantling	Transport	Waste management	Dispoasal	Re-Ulse Recovery Recycling potential
✓	✓	✓	✓	✓	✓	✓	—	—	—	—	—	—	✓	✓	✓	—

For the calculation of the scenarios a building life time of 30 years was considered (see RSL 4 utilization stage).

The scenarios were based on information provided by the manufacturer, furthermore the research project "EPDs for transparent building components" is basis [35].

Note:The selected and usual scenarios are highlighted in bold. These were used to calculate the indicators in the overall table.

- ✓ considered
- — not considered

A4 Transport to construction site

No.	Usage scenario	Description
A4	Direct delivery to site / branch	25 t truck Euro 4, 60 percent capacity, approx. 400 km to sites

A5 Construction / Installation

No.	Usage scenario	Description
A5	Construction / Installation	Packaging of PYROBEL and PYROBELite

For divergent expenditures the replacement / installation of products is recognized as part of the construction site progress at the building level.

Environmental impacts results from packaging in A5.

Benefits from A5 are not shown in A5.

Waste is specially treated. It is assumed that the packaging material will be used for waste treatment in the Installation module construction / installation. Some of the waste is utilised:
Wood on landfill; unsorted plastics thermally recycled.
For the waste treatment facilities, an average value for transport of 30 km, with standard GaBi capacity utilisation (85 %) is assumed.

B1 Use of the installed product

See chapter 5 Emissions to the environment. Emissions can't be quantified.

B2 Maintenance

No.	Usage scenario	Description
B2	Rare manually	For inspection, maintenance and cleaning 0,5 litre fresh water and waste water were taken in average. (For service life of 30 years 15 litre water)

Auxiliary, operating materials, the use of energy, waste material and transport routes can be neglected during the purification.

C2 Transport		
No.	**Usage scenario**	**Description**
C2	Transport	Transport to the collecting point with a 22-t-truck, 85 % engaged 30 km

C3 Waste management		
No.	**Usage scenario**	**Description**
C3	Fire resistant glass	100% on landfill

C4 Disposal		
No.	**Usage scenario**	**Description**
C4	Disposal	100% on landfill

Imprint

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notes
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