CONSORZIO LEGNOLEGNO
Laboratorio tecnologico per serramentisti
Centro formazione impresa

FINNOVA

MAPPATURA CAM

Mappatura CAM cod. 04CAM/2024
Azienda: Finnova srl
Prodotto: MINIMA

Finnova srl
Via dei Prai 4 M/N
31033 Castelfranco Veneto

Req.	Requisito CAM – Decreto MASE 23/06/2022	CAM CRITERI AMBIENTALI MINIMI
2.5.1 3.2.8	Inquinamento indoor – Limiti di emissione VOC di prodotti vernicianti	CONFORME
2.5.6	Materiali legnosi – Certificazione Catena di Custodia FSC	CONFORME
2.5.13	Pitture e vernici - Utilizzo di vernici prive di addittivi e sostanze pericolosi	CONFORME

Data emissione,
Correggio, 17-05-2024

Stefano Mora - Direttore Generale

+ sostenibile
+ finestra

CONSORZIO LEGNOLEGNO
Consorzio Nazionale Serramentisti
Via Pio La Torre,11 - 42015 Correggio (RE)
Tel: 0522 733011 Fax: 0522 732836
Email: legnolegno@legnolegno.it
C.F P.IVA e Iscr.Reg.Impr. RE 01244480354
REA 170723 – n. albo artigiani 900037
n. albo coop.ve A106083

CERTIFICATO
CERTIFICATE

CSQA-COC-083878

Si dichiara che il sistema di gestione della catena di custodia attuato da /
We hereby certify that the management system of chain of custody operated by

Finnova S.r.l.

Via dei Prai, 4 M/N - 31033 CASTELFRANCO VENETO (TV)
Unità operative/*Operative units*
Via dei Prai, 4 M/N - 31033 CASTELFRANCO VENETO (TV)

È conforme ai seguenti Standards /
Is in compliance with the following Standards

FSC-STD-40-004 V 3-1

Per le seguenti attività e prodotti /
For the following activities and products

Acquisto di tavole, tavole in legno massiccio, pannelli in legno massiccio, legno lamellare, legno giuntato a pettine, legno massiccio, spine, tranciati, FSC 100%, FSC Misto.
Produzione di finestre, porte e infissi FSC 100% e FSC Misto.
Purchase of boards, solid wood boards, solid wood panels, laminated wood, finger-jointed wood, solid wood, dowels, veneer, FSC 100%, FSC Mix.
Production of windows, doors and window frames FSC 100% and FSC Mix.

Livello di Certificazione / *Level of Certification*
Singolo / Single

L'elenco completo dei gruppi di prodotti inclusi nell'ambito di applicazione del certificato è disponibile sul database FSC all'indirizzo http://info.fsc.org/. Il presente certificato non costituisce di per sé evidenza che un particolare prodotto fornito dal titolare della certificazione sia certificato FSC (o FSC CONTROLLED WOOD). I prodotti offerti, spediti o venduti dal titolare del certificato possono essere considerati inclusi nel campo di applicazione del presente certificato solo quando chiaramente indicato sulle fatture e sui documenti di trasporto. La validità di questo certificato deve essere verificata sul sito http://info.fsc.org/. Questo certificato rimane di proprietà di CSQA. Il certificato e tutte le sue copie, se richiesto da CSQA, devono essere restituite o distrutte.
For the full list of product groups covered by the certification see the FSC certification database on http://info.fsc.org/. This certificate itself does not constitute evidence that a particular product supplied by the certificate holder is FSC certified (or FSC Controlled Wood). Products offered, shipped or sold by the certificate holder can only be considered covered by the scope of this certificate when the required FSC claim is clearly stated on sales and delivery documents. The validity of this certificate shall be verified on http://info.fsc.org/.This certificate remains the property of CSQA and all copies or Reproductions of the certificate shall be returned or destroyed if requested by CSQA.

Prima emissione: *First Issue*	03/05/2024
Emissione corrente: *Current Issue*	03/05/2024
Data di scadenza: *Expiring Date*	02/05/2029
Numero emissione: *Issue Number*	01

L'Amministratore Delegato
The Chief Executive Officer
Dr. Pietro Bonato

CSQA Certificazioni S.r.l.
Via S. Gaetano, 74 – 36016 Thiene (VI)

Il marchio della gestione forestale responsabile
FSC® A000534

Gemeinschaft Emissionskontrollierte Verlegewerkstoffe, Klebstoffe und Bauprodukte e.V.
Association for the Control of Emissions from Products for Flooring Installation, Adhesives and Building Materials

GEV EMICODE®

Awarding of licence for the use of EMICODE

Licence Number:	2207/26.05.09
For the product	Dicht Kleber 640
Of company	Ramsauer GmbH & Co. KG
Due to application date	March 7, 2016

With reference to the classification in accordance with the directives as stipulated in § 10 of the GEV trademark constitution

on behalf of the GEV for the above mentioned product as per § 5, section 4 of the GEV trademark constitution is awarded the licence for the use of the GEV trademark

This product meets with the guidelines for the criteria of use listed reverse.
The company is ordinary member of the GEV.

OM 058 **March 10, 2021**
valid until March 10, 2026

The Secretary General
Association for the Control of Emissions in Products for Flooring Installation, Adhesives and Building Materials (GEV)
Völklinger Straße 4 · D-40219 Düsseldorf

Requirement guidelines for the awarding of the EMICODE licence

The product mentioned on the front side of the licence has to fulfil among others the following criteria in accordance with the Constitution and the guidelines of the Technical Advisory Board of the GEV:

- The product meets all the legal requirements, especially the chemical laws and their specifications.
- The product is solvent free as specified in clause 2.4 of the “GEV Classification Criteria”, except if it is a surface treatment product. If the product is assigned to a GISCODE product group then this can be labelled.
- A safety data sheet (SDS) according to local law in its respectively valid version is issued for the product.
- Carcinogenic, mutagenic, reprotoxic substances of the categories 1A or 1B are not added during the manufacture of the product.
- The testing of the product is performed in accordance with the GEV Testing Method. VOC determination is performed in a test chamber followed by the Tenax / thermal desorption procedures with subsequent GC/MS analysis.
- The assignment of an EMICODE class is performed according to the following criteria and TVOC/TSVOC concentration levels. The corresponding EMICODE class shall be used to label the product:

1) Installation products, adhesives and construction products

Parameter	EC 1 PLUS	EC 1	EC 2
	max. allowed concentration [µg/m³]		
TVOC after 3 days	≤ 750	≤ 1000	≤ 3000
TVOC after 28 days	≤ 60	≤ 100	≤ 300
TSVOC after 28 days	≤ 40	≤ 50	≤ 100
R value based on German AgBB LCI (NIK) after 28 days	1	-	-
Sum of non-assessable VOC	≤ 40	-	-
Formaldehyde after 3 days	≤ 50	≤ 50	≤ 50
Acetaldehyde after 3 days	≤ 50	≤ 50	≤ 50
Sum of form- and acetaldehyde	≤ 0.05 ppm	≤ 0.05 ppm	≤ 0.05 ppm
Sum of volatile C1A/C1B after 3 days	≤ 10	≤ 10	≤ 10
Any volatile C1A/C1B after 28 days	≤ 1	≤ 1	≤ 1

2) Products for floor surface treatments for parquet, mineral floors and resilient floorings

Parameter	EC 1 PLUS	EC 1	EC 2
	max. allowed concentration [µg/m³]		
Sum TVOC + TSVOC after 28 days	≤ 100 thereof max. 40 SVOC	≤ 150 thereof max. 50 SVOC	≤ 450 thereof max. 100 SVOC
Formaldehyde after 3 days	≤ 50	≤ 50	≤ 50
Acetaldehyde after 3 days	≤ 50	≤ 50	≤ 50
Any volatile C1A/C1B after 3 days	≤ 10	≤ 10	≤ 10
Any volatile C1A/C1B after 28 days	≤ 1	≤ 1	≤ 1

Minerbio, 06/05/2024

Alla cortese attenzione
della persona di competenza

Oggetto: Conformità dei prodotti vernicianti a Criteri ambientali minimi (CAM) del servizio di progettazione ed esecuzione dei lavori di interventi edilizi

Gentile Cliente,

In accordo con le informazioni ricevute dai nostri fornitori di materie prime e sulla base delle attuali formulazioni dei nostri prodotti, con la presente siamo a dichiarare che i seguenti prodotti Renner Italia:

YM---M040/--T22
YM---M040/--T28
YO-30C380/--T13
YC---M410/-----
YL---M275/--T13
YL---M258/--C02
YL---S255/--C02
YO-15M380/R9010

non contengono:

1. Additivi a base di cadmio, piombo, cromo VI, mercurio, arsenico o selenio in concentrazioni superiori allo 0,01% in peso, per ciascun metallo.

Restiamo a disposizione.

Distinti saluti

RENNER ITALIA S.p.A.
Luigi Benni
(R&D Manager)

Dichiarazione di non responsabilità. Questa dichiarazione è stata preparata ed emessa sulla base delle informazioni fornite dai nostri fornitori di materie prime, delle leggi e dei regolamenti attualmente applicabili e al meglio delle nostre conoscenze e competenze attualmente disponibili. Questo documento non deve essere interpretato come una garanzia.

Renner Italia S.p.A.
via Ronchi Inferiore, 34 40061 Minerbio (Bo) Italia
tel +39.051.6618211 fax +39.051.6606312 www.renneritalia.com
info@renneritalia.com ufficioamministrazione@pec.renneritalia.com
Capitale sociale: euro 5.250.000,00 I.V. - Società con socio unico - Reg. Imp. BO
C.F./P.IVA 02433001209 - R.E.A. 439235 - Cod. Mecc. BO052481

ADLER-WERK LACKFABRIK

Color Service s.r.l.
alla c.a. del Sig. Elia Zanetti
Via Noalese 41/C/D
I-31055 Quinto di Treviso (TV)
ITALIA

E-Mail: eliazanetti@colorservicezanetti.com

Schwaz, 2.05.2024

ADLER-WERK Lackfabrik
Johann Berghofer GmbH & Co KG

A-6130 Schwaz
Bergwerkstraße 22, PF 126

fon: +43 52 42 / 69 22 - 0
fax: +43 52 42 / 69 22 - 999
office@adler-lacke.com
www.adler-lacke.com

Dichiarazione del produttore sui criteri ambientali minimi (CAM) edilizia

Confermiamo che i prodotti

- **Bluefin Terra-Diamond** (2962)
- **Bluefin Unistar** (2965)
- **Bluefin Pigmocryl NG** (3200 - 3205)
- **Legno-Hartwachsöl** (7002)
- **Legno-Öl** (7006)
- **Legnopur** (2513)
- **Pigmopur** (2406)
- **ADLER Varicolor** (4117)
- **Pullex Aqua-Terra** (5347)
- **Terra Wax Oil** (7036)

sono conforme ai seguenti requisiti del catalogo dei "Criteri ambientali minimi per l'affidamento del servizio di progettazione di interventi edilizi, per l'affidamento dei lavori per interventi edilizi e per l'affidamento congiunto di progettazione e lavori per interventi edilizi" (Gazzetta Ufficiale della Repubblica Italiana, serie generale - n. 183 del 6-8-2022):

- 2.5.1 Emissioni negli ambienti confinati
  (vedi rapporto di prova secondo lo schema AgBB)

- 2.5.13 Pitture e vernici
  - b) Non contiene additivi a base di cadmio, piombo, cromo esavalente, mercurio, arsenico o selenio superiori allo 0,01%.
    (vedi scheda di sicurezza, sezione 3.2)
  - c) Il prodotto non è classificato come pericoloso per l'ambiente acquatico di categoria 1 e 2 con i seguenti codici: H400, H410, H411
    (vedi scheda di sicurezza, sezione 2.2)

- 3.2.8 Emissioni indoor
  (vedi rapporto di prova secondo lo schema AgBB)

Speriamo di essere stato in grado di aiutarvi con queste informazioni.
Distinti saluti

Peter Passler, MSc
Direzione Salute, Sicurezza e Ambiente

Remmers Baustofftechnik GmbH
Bernhard-Remmers Str. 13
49624 Löningen
GERMANY

Eurofins Product Testing A/S
Smedeskovvej 38
8464 Galten
Denmark

CustomerSupport@eurofins.com
www.eurofins.com/VOC-testing

VOC EMISSION TEST REPORT
French VOC Regulation

6 March 2019

1 Sample Information

Sample name	Induline ZW-400
Batch no.	0030975888
Production date	01/08/2018
Product type	Coating
Sample reception	16/01/2019

2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
French VOC Regulation	A+	Regulation of March and May 2011 (DEVL1101903D and DEVL1104875A)
French CMR components	Pass	Regulation of April and May 2009 (DEVP0908633A and DEVP0910046A)

Full details based on the testing and direct comparison with limit values are available in the following pages

Trine Kristensen
Analytical Service Manager

Janne R Norup
Janne Rothmann Norup
Analytical Service Manager

Table of contents

3 Applied Test Methods

3.1 General Test References

Regulation, protocol or standard	Version	Reporting limit VOC [µg/m³]	Calculation of TVOC	Combined uncertainty¤ [RSD(%)]
EN 16516	October 2017	5	Toluene equivalents	22%
ISO 16000 -3 -6 -9 -11	2006-2011 depending on part	2	Toluene equivalents	22%
ASTM D5116-10	2010	-	-	-
French VOC Classes	Regulation of March and May 2011 (DEVL1101903D and DEVL1104875A)	2	Toluene equivalents	22%
French CMR	Regulation of April and May 2009 (DEVP0908633A and DEVP0910046A)	1	Toluene equivalents	22%

3.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal SOP	Quantification limit / sampling volume	Analytical principle	Uncertainty¤ [RSD(%)]
Sample preparation	ISO 16000-11:2006, EN16402:2013, CDPH, AgBB, EMICODE	71M549810	-	-	-
Emission chamber testing	ISO 16000-9:2006, EN 16516:2017	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2011, EN 16516:2017	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2011, EN 16516:2017	71M542808B	1 µg/m³	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2011, EN 16516:2017	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2011, EN 717-1, EN 16516:2017	71M548400	3-6 µg/m³	HPLC-UV	10%
Sampling of phthalates*	ISO 16000-33:2017, MEL-09:2003	71M546060	60 L	XAD-2	-
Analysis of phthalates*	ISO 16000-33:2017	71M546060	0.6 µg/m³	GC/MS	10%

4 Test Parameters, Sample Preparation and Deviations

4.1 VOC Emission Chamber Test Parameters

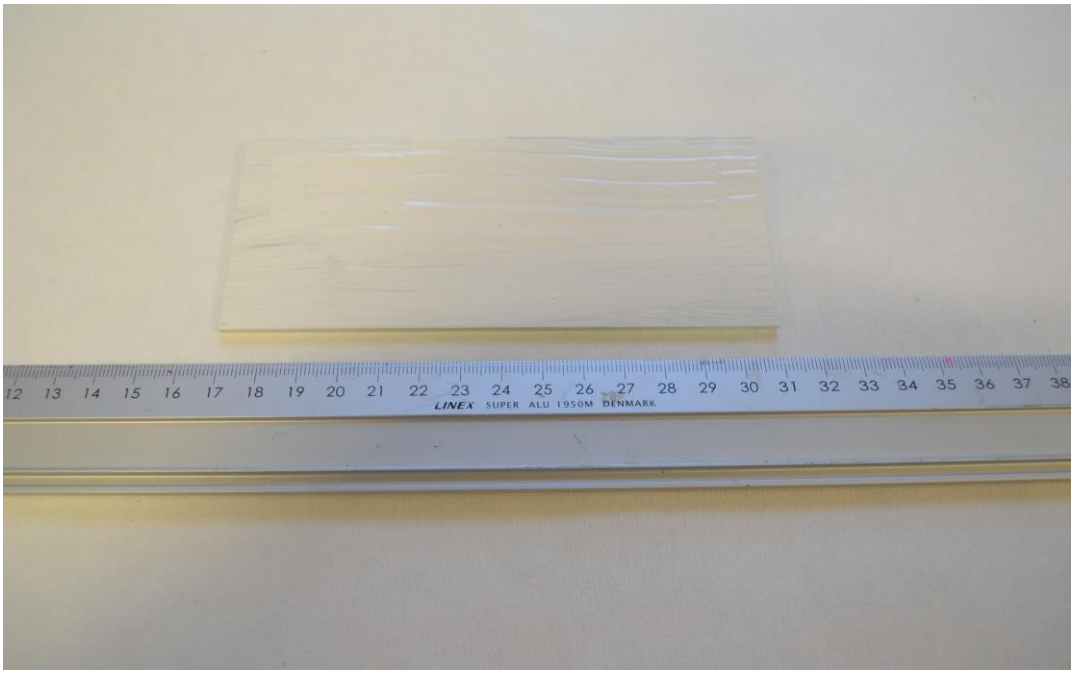
Parameter	Value	Parameter	Value
Chamber volume, V[L]	119	Preconditioning period	-
Air Change rate, n[h^{-1}]	0.5	Test period	30/01/2019 - 27/02/2019
Relative humidity of supply air, RH [%]	50 ± 3	Area specific ventilation rate, q [m/h or $m^3/m^2/h$]	7.14
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m^2/m^3]	0.07
		Test scenario	Small area

4.2 Preparation of the Test Specimen

The sample was homogenised and applied onto a glass plate.

Number of Layers	Application amount per layer, g/m^2	Drying time, h
1	140	-

4.3 Picture of Sample



4.4 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed.

5 Summary and Evaluation of the Results

5.1 Comparison with Limit Values of the French VOC Regulation

	CAS No.	Conc. 28 days µg/m³	C µg/m³	B µg/m³	A µg/m³	A+ µg/m³
TVOC	-	5.6	>2000	<2000	<1500	<1000
Formaldehyde	50-00-0	< 3	>120	<120	<60	<10
Acetaldehyde	75-07-0	< 3	>400	<400	<300	<200
Toluene	108-88-3	3.0	>600	<600	<450	<300
Tetrachloroethylene	127-18-4	< 2	>500	<500	<350	<250
Ethylbenzene	100-41-4	< 2	>1500	<1500	<1000	<750
Xylene	1330-20-7	< 2	>400	<400	<300	<200
Styrene	100-42-5	< 2	>500	<500	<350	<250
2-Butoxyethanol	111-76-2	< 2	>2000	<2000	<1500	<1000
1,2,4-Trimethylbenzene	95-63-6	< 2	>2000	<2000	<1500	<1000
1,4-Dichlorobenzene	106-46-7	< 2	>120	<120	<90	<60

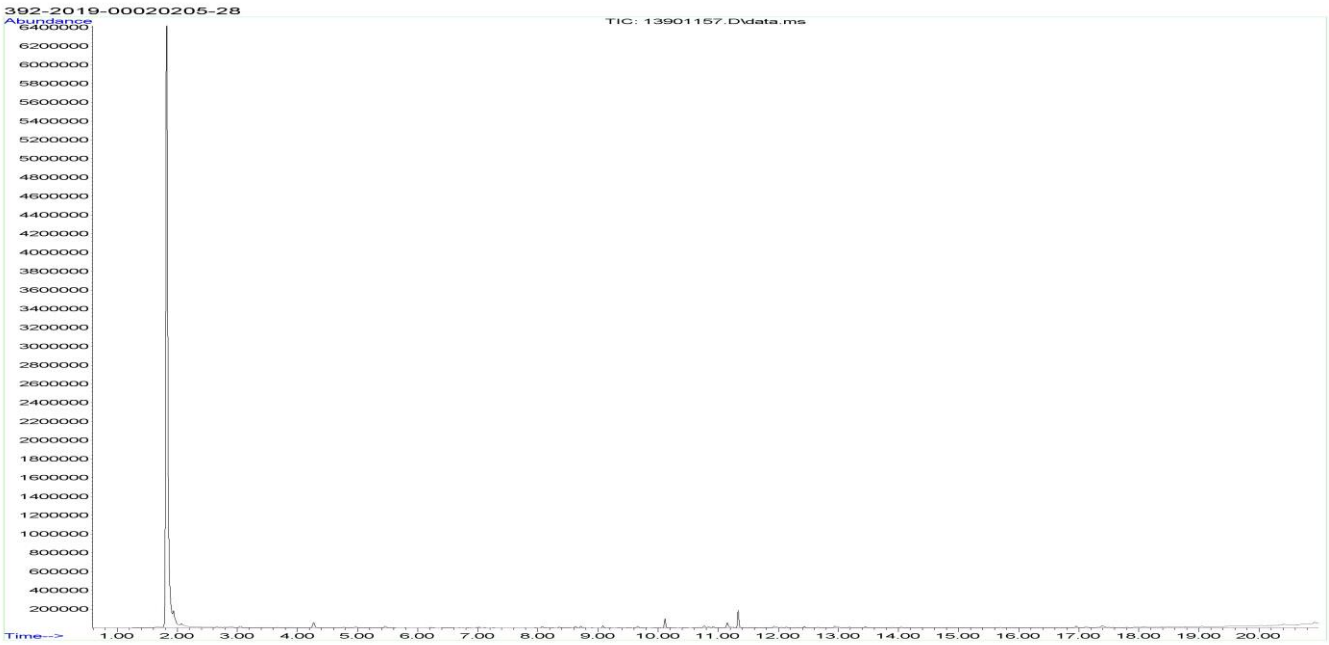
The product was assigned a VOC emission class without taking into account the measurement uncertainty associated with the result. As specified in French Decree no. 2011-321 of March 23 2011, correct assignment of the VOC emission class is the sole responsibility of the party responsible for distribution of the product in the French market.

5.2 Comparison with Limit Values of the CMR Components

CMR substances	CAS No.	Conc. 28 days µg/m³	Max. allowed air concentration µg/m³
Benzene	71-43-2	< 1	< 1
Trichloroethylene	79-01-6	< 1	< 1
Dibutylphthalate (DBP)*	84-74-2	< 1	< 1
Diethylhexylphthalate (DEHP)*	117-81-7	< 1	< 1

6 Appendices

6.1 Chromatogram of VOC Emissions after 28 Days



6.2 How to Understand the Results

6.2.1 Acronyms Used in the Report

< Means less than

> Means bigger than

* Not a part of our accreditation

¤ Please see section regarding uncertainty in the Appendices.

§ Deviation from method. Please see deviation section

a The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out.

b The component originates from the wooden panels and is thus removed.

c The results have been corrected by the emission from wooden panels.

d Very polar organic compounds are not suitable for reliable quantification using tenax TA adsorbent and HP-5 GC column. A high degree of uncertainty must be expected.

e The component may be overestimated due to contribution from the system

SER Specific Emission Rate.

6.3 Description of VOC Emission Test

6.3.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed.
The chamber operation parameters are as described in the test method section. (EN 16516, ISO 16000-9, internal method no.: 71M549811).

6.3.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

6.3.3 Testing of VOC

The emissions of volatile organic compounds are tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS using HP-5 column (30 m, 0.25mm ID, 0.25µm film).

All eight substances are identified if present. Quantification above 2 µg/m³ is done using the TIC signal and authentic response factors.

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs with a concentration ≥ 2 µg/m³. The TVOC is expressed in toluene equivalents as defined in EN 16516 and similar to ISO 16000-6.

6.3.4 Testing of Aldehydes

The presence of aldehydes is tested by drawing air samples from the test chamber outlet through DNPH-coated silicagel tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HPLC and UV-/diode array detection.

The absence of formaldehyde and other aldehydes is stated if UV detector response at the specific wavelength is lacking at the specific retention time in the chromatogram. Otherwise it is checked whether the reporting limit is exceeded. In this case the identity is finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

6.3.5 Testing of Phthalates

The presence of phthalates is tested by drawing air samples from the test chamber outlet through tube with XAD-II adsorbent after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by GC/MS. Analysis of phthalates is not currently covered by the accreditation (Internal methods no.: 71M549812 / 71M546060).

6.4 Quality Assurance

Before loading the test chamber, a blank check of the empty chamber is performed and compliance with background concentrations in accordance with EN 16516 / ISO 16000-9 is determined.

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

The stability of the analytical system is checked by a general function test of device and column, and by use of control charts for monitoring the response of individual substances prior to each analytical sequence.

6.5 Accreditation

The testing methods described above are accredited on line with EN ISO/IEC 17025 by DANAK (no. 522). This accreditation is valid worldwide due to mutual approvals of the national accreditation bodies (ILAC/IAF, see also www.eurofins.com/galten.aspx#accreditation).

Not all parameters are covered by this accreditation. The accreditation does not cover parameters marked with an asterisk (*), however analysis of these parameters is conducted at the same level of quality as for the accredited parameters.

6.6 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty Um equals 2 x RSD. For further information please visit www.eurofins.dk/uncertainty.

Remmers Baustofftechnik GmbH
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49624 Löningen
GERMANY

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8464 Galten
Denmark

CustomerSupport@eurofins.com
www.eurofins.com/VOC-testing

VOC EMISSION TEST REPORT
French VOC Regulation

6 March 2019

1 Sample Information

Sample name	Induline ZW-425 weiß
Batch no.	0031113540
Production date	01/12/2018
Product type	Coating
Sample reception	16/01/2019

2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
French VOC Regulation	A+	Regulation of March and May 2011 (DEVL1101903D and DEVL1104875A)
French CMR components	Pass	Regulation of April and May 2009 (DEVP0908633A and DEVP0910046A)

Full details based on the testing and direct comparison with limit values are available in the following pages

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ISO 16000 -3 -6 -9 -11	2006-2011 depending on part	2	Toluene equivalents	22%
ASTM D5116-10	2010	-	-	-
French VOC Classes	Regulation of March and May 2011 (DEVL1101903D and DEVL1104875A)	2	Toluene equivalents	22%
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3.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal SOP	Quantification limit / sampling volume	Analytical principle	Uncertainty¤ [RSD(%)]
Sample preparation	ISO 16000-11:2006, EN16402:2013, CDPH, AgBB, EMICODE	71M549810	-	-	-
Emission chamber testing	ISO 16000-9:2006, EN 16516:2017	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2011, EN 16516:2017	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2011, EN 16516:2017	71M542808B	1 µg/m³	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2011, EN 16516:2017	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2011, EN 717-1, EN 16516:2017	71M548400	3-6 µg/m³	HPLC-UV	10%
Sampling of phthalates*	ISO 16000-33:2017, MEL-09:2003	71M546060	60 L	XAD-2	-
Analysis of phthalates*	ISO 16000-33:2017	71M546060	0.6 µg/m³	GC/MS	10%

4 Test Parameters, Sample Preparation and Deviations

4.1 VOC Emission Chamber Test Parameters

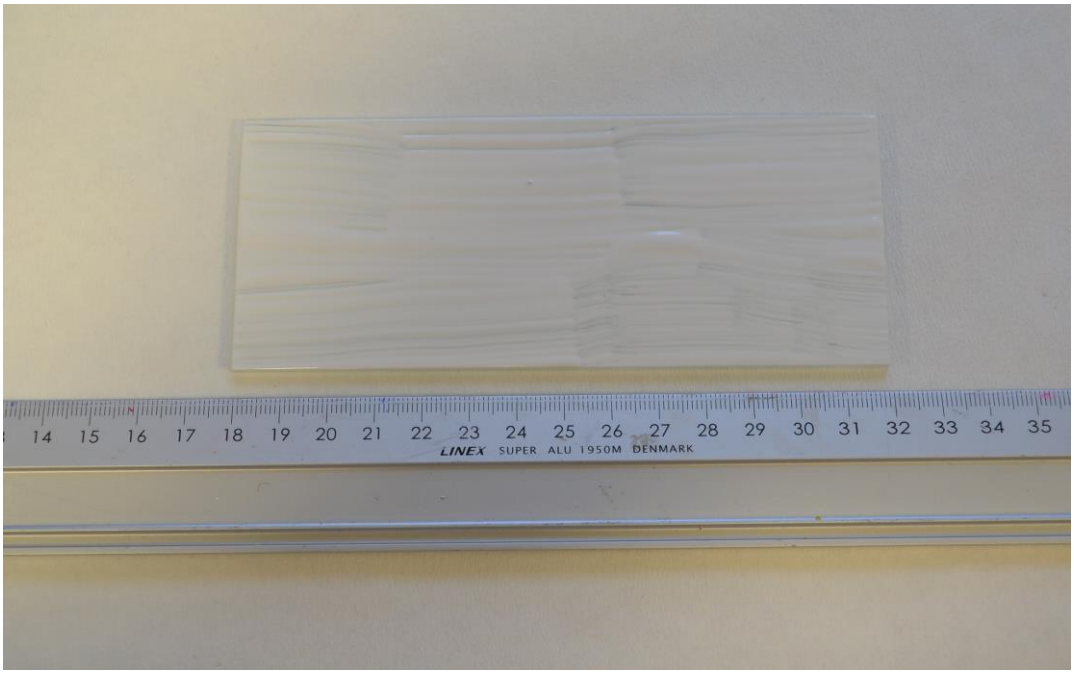
Parameter	Value	Parameter	Value
Chamber volume, V[L]	119	Preconditioning period	-
Air Change rate, n[h^{-1}]	0.5	Test period	30/01/2019 - 27/02/2019
Relative humidity of supply air, RH [%]	50 ± 3	Area specific ventilation rate, q [m/h or $m^3/m^2/h$]	7.14
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m^2/m^3]	0.07
		Test scenario	Small area

4.2 Preparation of the Test Specimen

The sample was homogenised and applied onto a glass plate.

Number of Layers	Application amount per layer, g/m^2	Drying time, h
1	140	-

4.3 Picture of Sample



4.4 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed.

5 Summary and Evaluation of the Results

5.1 Comparison with Limit Values of the French VOC Regulation

	CAS No.	Conc. 28 days µg/m³	C µg/m³	B µg/m³	A µg/m³	A+ µg/m³
TVOC	-	< 2	>2000	<2000	<1500	<1000
Formaldehyde	50-00-0	< 3	>120	<120	<60	<10
Acetaldehyde	75-07-0	< 3	>400	<400	<300	<200
Toluene	108-88-3	< 2	>600	<600	<450	<300
Tetrachloroethylene	127-18-4	< 2	>500	<500	<350	<250
Ethylbenzene	100-41-4	< 2	>1500	<1500	<1000	<750
Xylene	1330-20-7	< 2	>400	<400	<300	<200
Styrene	100-42-5	< 2	>500	<500	<350	<250
2-Butoxyethanol	111-76-2	< 2	>2000	<2000	<1500	<1000
1,2,4-Trimethylbenzene	95-63-6	< 2	>2000	<2000	<1500	<1000
1,4-Dichlorobenzene	106-46-7	< 2	>120	<120	<90	<60

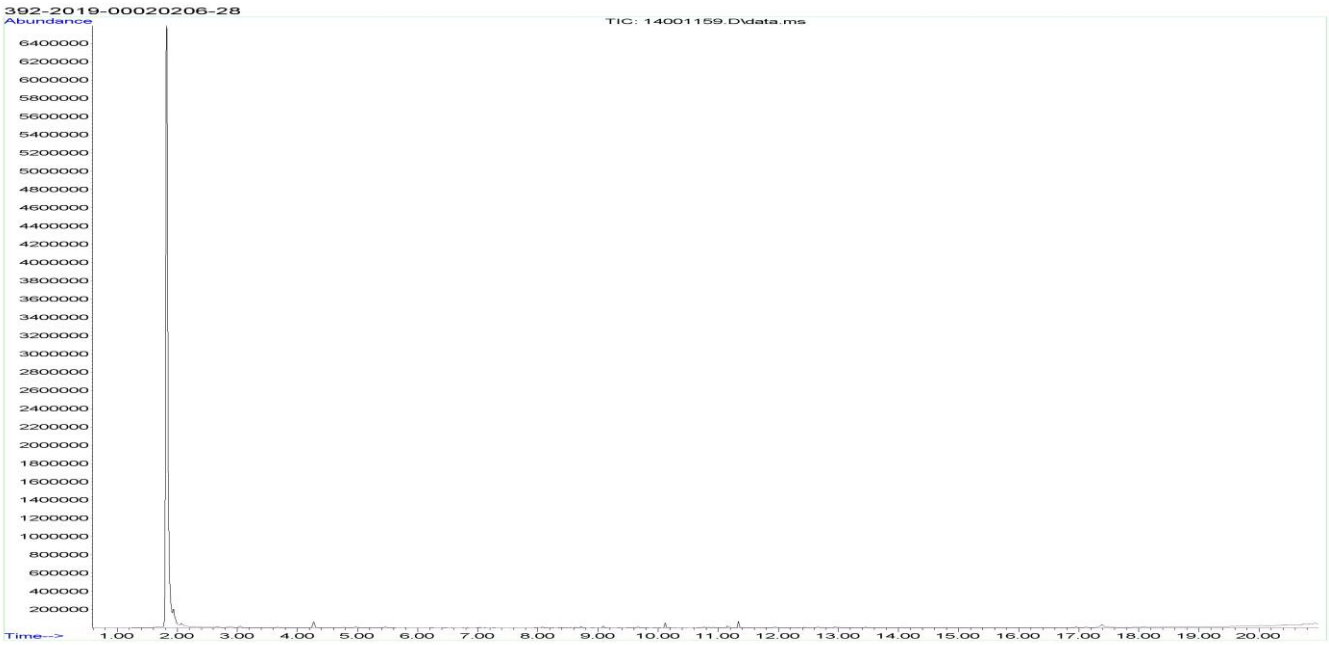
The product was assigned a VOC emission class without taking into account the measurement uncertainty associated with the result. As specified in French Decree no. 2011-321 of March 23 2011, correct assignment of the VOC emission class is the sole responsibility of the party responsible for distribution of the product in the French market.

5.2 Comparison with Limit Values of the CMR Components

CMR substances	CAS No.	Conc. 28 days µg/m³	Max. allowed air concentration µg/m³
Benzene	71-43-2	< 1	< 1
Trichloroethylene	79-01-6	< 1	< 1
Dibutylphthalate (DBP)*	84-74-2	< 1	< 1
Diethylhexylphthalate (DEHP)*	117-81-7	< 1	< 1

6 Appendices

6.1 Chromatogram of VOC Emissions after 28 Days



6.2 How to Understand the Results

6.2.1 Acronyms Used in the Report

< Means less than

> Means bigger than

* Not a part of our accreditation

¤ Please see section regarding uncertainty in the Appendices.

§ Deviation from method. Please see deviation section

a The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out.

b The component originates from the wooden panels and is thus removed.

c The results have been corrected by the emission from wooden panels.

d Very polar organic compounds are not suitable for reliable quantification using tenax TA adsorbent and HP-5 GC column. A high degree of uncertainty must be expected.

e The component may be overestimated due to contribution from the system

SER Specific Emission Rate.

6.3 Description of VOC Emission Test

6.3.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed.
The chamber operation parameters are as described in the test method section. (EN 16516, ISO 16000-9, internal method no.: 71M549811).

6.3.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

6.3.3 Testing of VOC

The emissions of volatile organic compounds are tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS using HP-5 column (30 m, 0.25mm ID, 0.25µm film).

All eight substances are identified if present. Quantification above 2 µg/m³ is done using the TIC signal and authentic response factors.

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs with a concentration ≥ 2 µg/m³. The TVOC is expressed in toluene equivalents as defined in EN 16516 and similar to ISO 16000-6.

6.3.4 Testing of Aldehydes

The presence of aldehydes is tested by drawing air samples from the test chamber outlet through DNPH-coated silicagel tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HPLC and UV-/diode array detection.

The absence of formaldehyde and other aldehydes is stated if UV detector response at the specific wavelength is lacking at the specific retention time in the chromatogram. Otherwise it is checked whether the reporting limit is exceeded. In this case the identity is finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

6.3.5 Testing of Phthalates

The presence of phthalates is tested by drawing air samples from the test chamber outlet through tube with XAD-II adsorbent after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by GC/MS. Analysis of phthalates is not currently covered by the accreditation (Internal methods no.: 71M549812 / 71M546060).

6.4 Quality Assurance

Before loading the test chamber, a blank check of the empty chamber is performed and compliance with background concentrations in accordance with EN 16516 / ISO 16000-9 is determined.

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

The stability of the analytical system is checked by a general function test of device and column, and by use of control charts for monitoring the response of individual substances prior to each analytical sequence.

6.5 Accreditation

The testing methods described above are accredited on line with EN ISO/IEC 17025 by DANAK (no. 522). This accreditation is valid worldwide due to mutual approvals of the national accreditation bodies (ILAC/IAF, see also www.eurofins.com/galten.aspx#accreditation).

Not all parameters are covered by this accreditation. The accreditation does not cover parameters marked with an asterisk (*), however analysis of these parameters is conducted at the same level of quality as for the accredited parameters.

6.6 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty Um equals 2 x RSD. For further information please visit www.eurofins.dk/uncertainty.

MPA | Eberswalde

TEST CERTIFICATE

No.2020-02FR

CERTIFICATE HOLDER:

Remmers GmbH
Bernhard-Remmers-Strasse 13
49624 Löningen
Germany

The coating system Induline SW-900 / Induline GW-360 / Induline ZW-507i / Induline LW-715E was tested as product for small surfaces (e.g. windows and doors; loading factor: 0,05 m²/m³) according to EN 16516 "Construction products: Assessment of release of dangerous substances – Determination of emissions into indoor air" resp. EN 16402 "Paints and varnishes – Assessment of emissions of substances from coatings into indoor air – Sampling, conditioning and testing" and assed according to requirements of french VOC-regulation "decret n° 2011-321 du 23 mars 2011" and "arrête du 19 avril 2011":

Parameter	Analytical results (**28 days**) [µg/m³]	Emission class
TVOC	83	A+
Formaldehyde	<1	A+
Acetaldehyde	7	A+
Toluene	<1	A+
Tetrachloroethylene	<1	A+
Xylene	<1	A+
1,2,4-Trichlorobenzene	<1	A+
1,4-Dichlorobenzene	<1	A+
Ethylbenzene	<1	A+
2-Butoxyethanol	<1	A+
Styrene	<1	A+

The coating system
Induline SW-900 / Induline GW-360 / Induline ZW-507i / Induline LW-715E
complies with emission class **A+**.

MPA Eberswalde
Materialprüfanstalt Brandenburg GmbH
23.12.2020

Dr. Peter Schumacher
Head of Institute

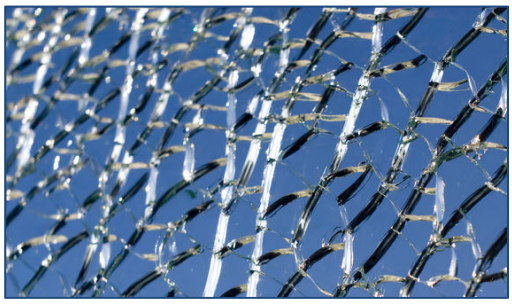
Dr. Robby Wegner
Head of Chemical Testing

Details of testing:
MPA test report 31/20/4001/01 of 04.09.2020: emission chamber test (DIN EN 16516)

Environmental Product Declaration (EPD)

Declaration code: M-EPD-FEV-GB-002005

Note: This EPD is based on the model EPD Glass.



EUROGLAS GmbH

Glass

Flat glass, toughened safety glass and laminated safety glass

Basis:

DIN EN ISO 14025
EN15804

Model EPD
Environmental Product
Declaration

Publication date:
18.12.2017

Next revision:
18.12.2022

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Environmental Product Declaration (EPD)

Declaration code: M-EPD-FEV-GB-002005

Programme operator	ift Rosenheim GmbH Theodor Gietl Straße 7-9 D-83026 Rosenheim
Practitioner of the LCA	ift Rosenheim GmbH Theodor Gietl Straße 7-9 83026 Rosenheim
Declaration holder	EUROGLAS GmbH Dammühlenweg 60 39340 Haldensleben Note: additional Declaration holders can be found on page 3.
Declaration code	M-EPD-FEV-GB-002005
Designation of declared product	Flat glass, toughened safety glass and laminated safety glass FG, TSG, LSG
Scope	Flat glass (FG), toughened safety glass (TSG) and laminated safety glass (LSG) for processing into insulating glass units and for use as glass for buildings (in the building envelope and for finishing of works / structures).
Basis	This model EPD was prepared on the basis of EN ISO 14025:2011 and EN 15804:2012+A1:2013. In addition, the “Allgemeiner Leitfaden zur Erstellung von Typ II Umweltproduktdeklarationen” (Guidance on preparing Type III Environmental Product Declarations) applies. The Declaration is based on the PCR Documents “Flachglas” (Flat Glass) PCR-FG-1.3:2016 and “PCR Teil A” (Part A) PCR-A-0.1:2018.
Validity	Publication date: 18.12.2017 / Last revision: 12.02.2019 / Next revision: 18.12.2022 This verified Environmental Product Declaration applies solely to the specified products and is valid for a period of 5 years from the date of publication in accordance with DIN EN 15804.
LCA basis	The LCA was prepared in accordance with DIN EN ISO 14040 and DIN EN ISO 14044. The base data include both the data collected at the EUROGLAS GmbH production site and the generic data derived from the “Gabi ts” database. LCA calculations were based on the “cradle to gate with options” life cycle including all upstream processes (e.g. raw material extraction, etc.).
Notes	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 External verifier

Additional declaration holder

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1 General product information

Product definition

The EPD relates to the product group “flat glass” and applies to:

1 m² area and 1 mm glass thickness

Flat glass, toughened safety glass and laminated safety glass

The declared unit relates to the product and end-of-life stages of 1 m² area and 1 mm thickness of flat glass (FG), toughened safety glass (TSG) or laminated safety glass (LSG).

The average unit is declared as follows:
Directly used material flows are determined using average area (1 m²) or produced masses (kg) and assigned to the declared unit. All other inputs and outputs in the manufacture were scaled to the declared unit as a whole, since no direct assignment to the average size is possible. The reference period is 2016.

Product description

Flat glass (FG) refers to both uncoated and coated float glass. Float glass is a clear, flat soda lime silicate glass with parallel, fire-polished surfaces, in some cases bearing metal-oxide-based coatings to modify the radiation (thermal insulation and/or solar control) properties of the glass.

Toughened safety glass (TSG) consists of a single pane that has been specially heat-treated to give the glass increased impact resistance. If the glass breaks under exposure to a high load, it disintegrates into very small fragments without forming sharp edges.

Laminated safety glass (LSG) consists of at least two glass panes lying one on top of the other, with one or several layers of a tear-resistant, viscoelastic film positioned between the panes, which consist of polyvinyl butyral (PVB).

Cutting/characteristics: Flat glass is generally supplied in stock sizes of 600 x 321 cm. It is cut and processed into toughened safety glass or laminated safety glass on a project-specific basis.

For a detailed product description refer to the manufacturer specifications at www.glas-ist-gut.de or the product specifications of the respective offer/quotation.

Product manufacture

Soda lime silicate glass (float glass):

The raw materials are introduced as a mixture into the furnace where they are melted at a temperature of approx. 1,560 ℃, genera lly using gas as an energy resource.

The glass is shaped by distributing the mass of liquid glass over a bath of molten tin. The glass sheet is then cooled evenly and cut to size.

Coated glass is float glass that has been coated with a metal-oxide-based coating using various processes (sputtering, evaporation, pyrolytic processes). The coating is a few atom layers thick.

In the manufacture of ESG, float glass is heated to its transition temperature (min. 640 ℃) and then rapidly cooled. This causes the su rfaces of the glass to cool and contract faster than the remaining material. This creates additional compressive strength in the surfaces that makes the resulting glass tougher.

For the manufacture of VSG, a PVB film is placed between the panes of glass and these are pressed together in an autoclave under the action of heat and pressure

The manufacturing processes described are applicable to all manufacturing sites of all manufacturers in Europe, because no production processes are used for the manufacture of FG, ESG and VSG that differ significantly from the above.

Application

Flat glass, toughened safety glass and laminated safety glass for processing into insulating glass units and for use as glass for buildings (in the building envelope and for finishing of works / structures).

Additional information

For detailed structural characteristics refer to the CE marking, declaration of performance, documents accompanying the product or the product data sheets.

	Flat glass	Toughened safety glass	Laminated safety glass
Strength	EN 572	EN 12150	EN 14449
Failure pattern	---	EN 12150	EN 14449
Residual loadbearing capacity	no	no	yes

2 Materials used

Primary materials

The main components of float glass are the naturally occurring raw materials sand (silicon carbonate, 58%), soda (sodium carbonate, 18%), dolomite (15%), lime (calcium carbonate, 5%) and sulphate (1%).

Further base materials used can be found in the Life Cycle Assessment (see chapter 6).

Explanation of materials:

- Flat glass: Soda lime silicate glass
- Coated flat glass: Soda lime silica glass + metal oxide
- TSG: Soda lime silicate glass
- LSG: Soda lime silicate glass + PVB film

Declarable substances

The product contains no substances from the REACH candidate list (declaration dated 01. March 2018).

All relevant safety data sheets are available from EUROGLAS GmbH.

3 Construction process stage

Processing recommendations, installation

Flat glass (i.e. uncoated and, in some cases, coated float glass) can be processed into toughened safety glass, laminated safety glass and insulating glass units. It can also be used separately; depending on the application, other processes such as cutting, polishing or drilling may be applied.

Toughened safety glass can be processed into laminated safety glass and insulating glass units. It can also be used separately; depending on the application, other processes such as cutting, polishing or drilling may be applied prior to the thermal toughening process

Laminated safety glass can be processed into insulating glass units. It can also be used separately; depending on the application, other processes such as cutting, polishing or drilling may be applied.

The instructions for installation, operation, maintenance and disassembly must be noted. See www.glas-ist-gut.de for more information.

4 Use stage

Emissions to the environment

No further emissions to water and soil are known. The emissions to indoor air are within the official limits. Sound emissions do not exceed the statutory limits. There are no known VOC emissions.

Due to the wide range of possible applications and designs, the use stage is not taken into account in the calculation.

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

The reference service life (RSL) can be determined for a "cradle to gate - with options" EPD only if all the modules A1- A3 and B1-B5 are specified;

The service life of the FG, TSG, LSG from EUROGLAS GmbH is optionally specified at 30 years according to BBSR-Tabelle (glazing).

The service life depends on the characteristics of the product and the terms of use. The features described in the EPD are applied, in particular the following:

- Outdoor conditions: Weather conditions can have a negative effect on the service life.
- Indoor conditions: There are no known impacts that have a negative effect on the service life.

The reference service life is for the features, 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 service life and the redevelopment of a building. It represents no statement about service life, guarantee of performance or promise of guarantee.

5 End-of-life stage

Possible end-of-life stages

FG, TSG and LSG are not specifically designed for reuse, although reuse is by all means possible.

Flat glass, if sorted into its original pure components, can be reintroduced into the manufacturing process. Offcuts from glass cutting can be sorted into their original pure components and reintroduced into the float glass process (as per VDI 2243).

According to prEN 17074, FG, TSG, LSG are collected up to 30%, shipped to central collection points and recycled, for example for the production of container glass, insulating wool, sandpaper or glass bricks, flat glass.

All production waste generated during production and manufacture is internally recycled.

The end-of-life stage depends on the site where the products are used and is therefore subject to local regulations. Observe the locally applicable regulatory requirements.

Disposal routes

The average disposal routes were taken into account in the LCA.
Approximately 70% of the glass share and 100% of the glass-free materials are disposed of at a construction waste landfill.

Waste code glass waste:

- 170202, 170204, 170902 for glass from construction and demolition waste
- 190401, 191205 for glass from waste treatment plants

All life cycle scenarios are detailed in the Annex.

6 Life Cycle Assessment (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 FG, TSG, LSG. The LCA was developed in accordance with EN 15804 and the requirements set out by the international standards DIN EN ISO 14040, DIN 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 FG, TSG, LSG. In accordance with EN 15804, the environmental impacts covered by this Environmental Product Declaration are presented for the entire product life cycle in the form of basic information. Apart from these, no other environmental impacts have been specified.

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

The specific data originate from the fiscal year 2013. The production-specific data of flat glass manufacture are taken form data collected at various typical, European manufacturer plants and statistics from 2013. In 2016, these data were verified for currentness by member companies of the Bundesverband Flachglas e.V. (German Flat Glass Association). The average values determined are based on the volumes produced by the plants. For the manufacture of TSG and LSG, typical industrial data were collected on the basis of an annual average (2016) for plants of members of the Bundesverband Flachglas e.V. The quantity data for raw materials, energy, ancillary materials used are annual averages. The data originates partly from company records and partly from values directly obtained by measurement. Data were additionally collected by the **ift** Rosenheim in 2017 to verify representativeness.

The generic data originates from the GaBi ts software, "Professional Datenbank und Baustoff Datenbank" (professional database and building materials database). The last update of both databases was in 2018. Data from before this date originate also from this databases and are not more than 4 years old. No other generic data were 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.

The life cycle was modelled using the sustainability software tool “GaBi 8” for the development of Life Cycle Assessments.

Scope / System boundaries

The system boundaries refer to the supply of raw materials and purchased parts, manufacture and end-of-life stage of FG, TSG, LSG (cradle to gate - with options). No additional data from pre-suppliers/subcontractors or other sites were taken into consideration.

Due to the wide range of possible applications and designs, the use stage is not taken into account in the calculation.

Cut-off criteria

All company data collected, i.e. all commodities/input and raw materials used, the thermal energy, the electricity consumption and all results of the available emission measurements from the plants were taken into consideration.

The boundaries cover only the product-relevant data. Building sections/parts of facilities that are not relevant to the manufacture of the products, were excluded.

The transport distances of the pre-products were taken into consideration as a function of 100% of the mass of the products. The transport mix is consisted as follows and is derived from the research project "EPDs for transparent components":

- Lorry, 26 - 28 t gross weight / 18.4 t payload, Euro 6, freight, 85% utilization, 100 km;
- Road train, 28 - 34 t gross weight / 22 t payload, Euro 6, 50% utilization, 50 km;
- Freight train, electric and diesel-operated, D 60%, E 51% utilization, 50 km;
- Sea ship consumption mix, 50 km

The criteria for the exclusion of inputs and outputs as set out in EN 15804 are fulfilled. It can be assumed that the total of negligible processes per life cycle stage does not exceed 1 percent of the mass/primary energy. This way the total of negligible processes does not exceed 5 percent of the energy and mass input. The life cycle calculation also includes material and energy flows that account for less than 1 percent.

6.2 Inventory analysis

Goal

All material 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 Annex shows the entire life cycle of FG, TSG, LSG. Product stage “A1 – A3”, end-of-life stage “C3 – C4” and benefits and loads beyond the system boundaries “D” are considered.

Benefits

The below benefits have been defined as per EN 15804:

- Benefits from recycling

Allocation procedures Allocation of co-products

During the manufacture of FG, TSG, LSG no allocations occur.

Allocations for re-use, recycling and recovery

Allocations for the use of recycled materials/secondary raw materials can be found in the GaBi database documentation.

Allocations beyond life cycle boundaries

If FG, TSG, LSG is reused / recycled during the product stage (rejects), the elements are shredded, as necessary, and then sorted into their original pure components. The system boundaries for the manufacture of FG, TSG, LSG were set following their disposal, with termination of their waste characteristics.

Secondary material

The use of secondary materials in Module A3 was considered. A small proportion of secondary material is used across industry boundaries.

Inputs

Energy:

The electricity mix is based on “Strommix Europa” (European electricity mix). Gas is based on “Erdgas Europa” (European natural gas).

A portion of the process heat is used for space heating. This can however not be quantified, hence a “worst case” figure was taken into account for the product.

Water:

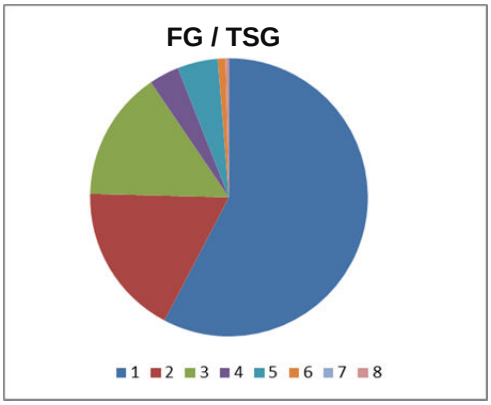
The water consumed by the individual process steps for the manufacture of FG, TSG, LSG is 3.6 l (FG) or 3.8 l (TSG) or 47.3 l (LSG) per m² element.

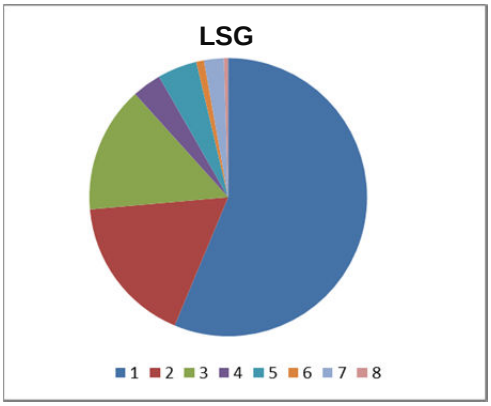
The consumption of fresh water specified in Section 6.3 originates (among others) from the upstream processes of the pre-products.

Raw material/Pre-products:

The main non-renewable material resources used are siliceous sand and waste rock.

The chart below shows the use of raw materials/pre-products per cent.





		Mass in %		
Nr.	Material	FG	TSG	LSG
1	Sand	57,7	57,7	56,3
2	Soda	17,7	17,7	17,3
3	Dolomite	15,1	15,1	14,7
4	Broken glass	3,5	3,5	3,4
5	Chalk	4,7	4,7	4,6
6	Sulphate	0,9	0,9	0,9
7	PVB-film	-	-	2,3
8	Other	< 1,0	< 1,0	< 1,0

Sand, dolomite and limestone are direct ingredients in the manufacture of the flat glass. Waste rock is the commercially worthless mass of stone obtained during the mining of ores and energy resources such as coal, etc.

Outputs

The LCA includes the following production-relevant outputs per 1 m² FG, TSG, LSG:

Waste:
See Section 6.3 - Impact assessment.

Waste water
The manufacture of FG, TSG, LSG produces 1,9 l (FG) or 3,8 l (TSG) or 47,3 l (LSG) waste water per 1 m².

6.3 Impact assessment

Goal

The impact assessment covers inputs and outputs. The impact categories applied are named below:

Impact categories

The models for impact assessment were applied as described in EN 15804-A1.
The impact categories presented in the EPD are as follows:

- Depletion of abiotic resources (fossil fuels);
- Depletion of abiotic resources (elements);
- Acidification of soil and water;
- Ozone depletion;
- Global warming;
- Eutrophication;
- Photochemical ozone creation.

Waste

The waste generated during the production of 1 m² of FG, TSG, LSG 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 pre-products.

Results per 1 m² and 1 mm of FG, TSG, LSG (Part 1)		Flat glass				Toughened safety glass				Laminated safety glass			
Environmental impacts	**Unit**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**
Global warming potential (GWP)	kg CO_2 equiv.	2,43	4,32E-02	2,79E-02	-0,39	3,46	4,32E-02	2,79E-02	-0,39	7,93	4,28E-02	2,88E-02	-0,39
Depletion potential of stratospheric layer (ODP)	kg R11 equiv.	7,23E-13	1,92E-13	6,32E-15	-2,27E-13	5,12E-12	1,92E-13	6,32E-15	-2,27E-13	7,60E-09	1,90E-13	6,53E-15	-2,25E-13
Acidification potential of soil and water (AP)	kg CO_2 equiv.	1,43E-02	1,23E-04	1,65E-04	-2,13E-03	3,25E-02	1,23E-04	1,65E-04	-2,13E-03	4,91E-02	1,22E-04	1,70E-04	-2,11E-03
Eutrophication potential (EP)	kg PO_4^{3-} equiv.	1,49E-03	1,15E-05	2,28E-05	-2,74E-04	2,83E-03	1,15E-05	2,28E-05	-2,74E-04	4,26E-03	1,14E-05	2,35E-05	-2,71E-04
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 equiv.	8,18E-04	7,68E-06	1,28E-05	2,98E-04	1,70E-03	7,68E-06	1,28E-05	2,98E-04	2,93E-03	7,61E-06	1,32E-05	2,96E-04
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	2,24E-05	2,30E-08	1,07E-08	-8,43E-07	2,35E-05	2,30E-08	1,07E-08	-8,43E-07	6,08E-05	2,28E-08	1,10E-08	-8,36E-07
Abiotic depletion potential - fossil fuels (ADP - fossil resources)	MJ	44,37	0,46	0,36	-5,29	55,63	0,46	0,36	-5,29	106,95	0,46	0,37	-5,24
Use of resources	**Unit**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**
Use of renewable primary energy - excluding renewable primary energy resources used as raw materials	MJ	0,60	-	-	-	7,39	-	-	-	30,73	-	-	-
Use of renewable primary energy resources used as raw materials (material use)	MJ	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	0,60	0,30	4,63E-02	-0,38	7,39	0,30	4,63E-02	-0,38	30,73	0,29	4,78E-02	-0,38
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials.	MJ	44,80	-	-	-	63,59	-	-	-	139,77	-	-	-
Use of non-renewable primary energy resources used as raw materials (material use)	MJ	0,00	-	-	-	0,00	-	-	-	1,44	-	-	-
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy + material use)	MJ	44,80	0,79	0,37	-5,69	63,59	0,79	0,37	-5,69	141,21	0,78	3,86E-01	-5,64
Use of secondary materials	kg	0,10	0,00	0,00	0,00	0,10	0,00	0,00	0,00	0,12	0,00	0,00	0,00

Results per 1 m² and 1 mm of FG, TSG, LSG (Part 2)		Flat glass				Toughened safety glass				Laminated safety glass			
Use of resources	**Unit**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**
Use of renewable secondary fuels	MJ	2,39E-21	0,00	5,66E-24	-2,44E-22	2,45E-21	0,00	5,66E-24	-2,44E-22	2,84E-21	0,00	5,85E-24	-2,42E-22
Use of non-renewable secondary fuels	MJ	2,81E-20	1,17E-30	6,65E-23	-2,87E-21	2,88E-20	1,17E-30	6,65E-23	-2,87E-21	3,34E-20	1,16E-30	6,87E-23	-2,84E-21
Use of net fresh water	m^3	5,53E-03	4,04E-04	7,14E-05	-8,20E-04	1,69E-02	4,04E-04	7,14E-05	-8,20E-04	5,17E-02	4,01E-04	7,37E-05	-8,12E-04
Waste categories	**Unit**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	8,24E-08	3,70E-10	6,43E-09	-5,95E-09	9,28E-08	3,70E-10	6,43E-09	-5,95E-09	1,42E-07	3,67E-10	6,64E-09	-5,89E-09
Non-hazardous waste disposed (municipal waste)	kg	2,58	5,56E-04	1,75	-5,23E-02	2,66	5,56E-04	1,75	-5,23E-02	3,23	5,51E-04	1,81	-5,19E-02
Radioactive waste	kg	1,71E-04	1,31E-04	5,42E-06	-1,59E-04	3,16E-03	1,31E-04	5,42E-06	-1,59E-04	1,35E-02	1,30E-04	5,59E-06	-1,57E-04
Output material flows	**Unit**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**	**A1-A3**	**C3**	**C4**	**D**
Components for re-use	kg	0,00	0,00	0,00	-	0,00	0,00	0,00	-	0,00	0,00	0,00	-
Materials for recycling	kg	0,00	0,75	0,00	-	6,30E-02	0,75	0,00	-	0,38	0,74	0,00	-
Materials for energy recovery	kg	0,00	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	-	0,29	0,00	0,00	-
Exported energy (thermal energy)	MJ	0,00	0,00	0,00	-	0,00	0,00	0,00	-	0,53	0,00	0,00	-

6.4 Interpretation, LCA presentation and critical review

Evaluation

Some of the environmental effects differ considerably. The differences arise on the one hand from changed background data in the GaBi ts software and through the use of more suitable data sets. On the other hand, the reduced energy consumption in the manufacture of flat glass leads to differences between the assessments from 2012 and 2018. With regard to toughened safety glass and laminated safety glass, the increased quantity of flat glass also plays a role.

The environmental effects of FG, TSG, LSG arise in the range of production, mainly due to the discharging emissions as well as from the use of soda or its precursors in flat glass.

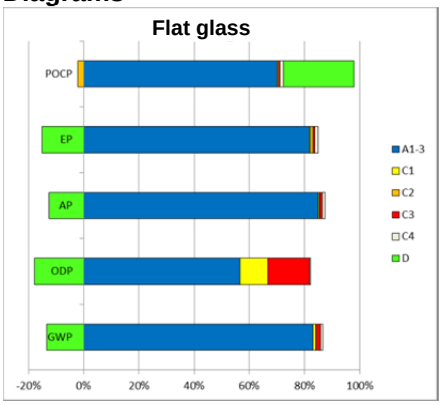
In scenario C4, only marginal expenditures for the physical pretreatment and the landfill operation are to be expected.

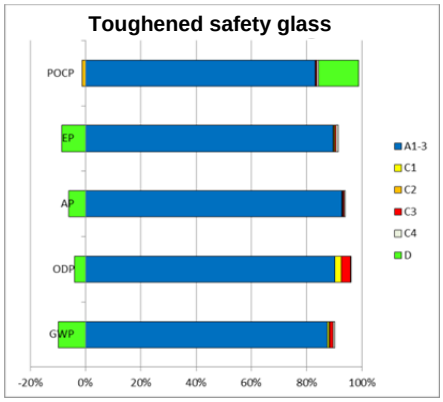
During the recycling of the glasses, approximately one-tenth of the environmental impact of manufacturing can be credited to Scenario D.

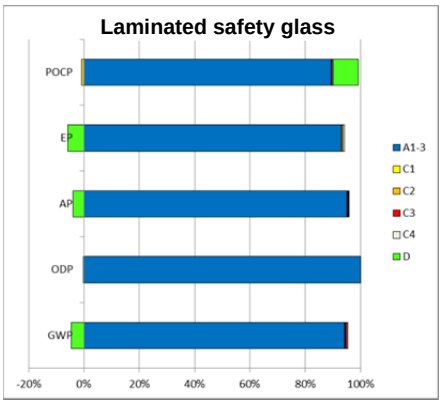
The breakdown of the major environmental impacts is shown in the diagram below.

The values obtained from the LCA calculation are suitable for the certification of buildings, as necessary.

Diagrams







Report

The LCA underlying this EPD was developed according to the requirements set out in 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 critical review of the LCA and the report took place in the course of verification of the EPD by the external verifier Patrick Wortner, MBA and Eng., Dipl.-Ing. (FH).

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 also comply with the requirements set out in EN 15804.
Any comparison must refer to the building context and the same boundary conditions of the various life cycle stages.
For comparing EPDs of construction products, the rules set out in EN 15804 (Clause 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. Only the nomenclature has been changed according to EN 15804.

Verification

Verification of the Environmental Product Declaration is documented in accordance with the ift "Richtlinie zur Erstellung von Typ III Umweltproduktdeklarationen" (Guidance on preparing Type III Environmental Product Declarations) in accordance with the requirements set out in EN ISO 14025.
This Declaration is based on the ift PCR documents “PCR Teil A” (Part A) PCR-A-0.2:2018 and “Flachglas” (Flat glass) PCR-FG-1.3:2016.

The European standard EN 15804 serves as the core PCR [a)]
Independent verification of the Declaration and statement according to EN ISO 14025:2010 ☐ internal ☒ external
Independent third party verifier: [b)] Patrick Wortner
[a)] Product category rules [b)] Optional for business-to-business communication, mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Revisions of this document

No.	Date	Note:	Practitioner of the LCA	Verifier/s
1	18.12.2017	First internal verification and approval	Stich	Stöhr
2	06.08.2018	Review	Zwick	Stöhr
3	12.02.2019	External verification	Zwick	Wortner
4				

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8 Annex

Description of life cycle scenarios for FG, TSG, LSG

Product stage			Con-struction 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	Manufacture	Transport	Construction/Installation	Use	Inspection, maintenance, cleaning	Repair	Exchange / Replacement	Improvement / Modernisation	Operational energy use	Operational water use	Deconstruction	Transport	Waste management	Disposal	Re-use Recovery Recycling potential
✓	✓	✓	—	—	—	—	—	—	—	—	—	✓	✓	✓	✓	✓

The scenarios were based on information provided by the manufacturer. The scenarios were furthermore based on the research project “EPDs for transparent building components” [40].

Note: The standard scenarios selected are presented in bold type. They were also used for calculating the indicators in the summary table.

✓ Included in the LCA
— Not included in the LCA

C1 Deconstruction

No.	Scenario	Description
C1	Deconstruction	In dependence on prEN 17074 (9.8.4 Disposal phase (C1 to C4)). Residues (landfill) 70% for glass; Residues (landfill) glass-free materials 100%; Rest in the recovery. Further dismantling rates possible, appropriately substantiates

In case of deviating consumption the removal of the products forms part of the site management and is covered at the building level.

Results per 1 m² and 1 mm of FG, TSG, LSG		**FG**	**TSG**	**LSG**
Environmental impacts	**Unit**	**C1**	**C1**	**C1**
Global warming potential (GWP)	kg CO_2 equiv.	2,88E-02	2,88E-02	2,94E-02
Depletion potential of stratospheric layer (ODP)	kg R11 equiv.	1,28E-13	1,28E-13	1,31E-13
Acidification potential of soil and water (AP)	kg CO_2 equiv.	8,18E-05	8,18E-05	8,35E-05
Eutrophication potential (EP)	kg PO_4^{3-} equiv.	7,67E-06	7,67E-06	7,82E-06
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 equiv.	5,12E-06	5,12E-06	5,23E-06
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	1,53E-08	1,53E-08	1,56E-08
Abiotic depletion potential - fossil fuels (ADP - fossil resources)	MJ	0,31	0,31	0,31
Use of resources	**Unit**	**C1**	**C1**	**C1**
Use of renewable primary energy - excluding renewable primary energy resources used as raw materials	MJ	-	-	-
Use of renewable primary energy resources used as raw materials (material use)	MJ	-	-	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	0,20	0,20	0,20
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials.	MJ	-	-	-
Use of non-renewable primary energy resources used as raw materials (material use)	MJ	-	-	-
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy + material use)	MJ	0,53	0,53	0,54
Use of secondary materials	kg	0,00	0,00	0
Use of renewable secondary fuels	**Unit**	0,00	0,00	0,00E+00
Use of non-renewable secondary fuels	MJ	7,82E-31	7,82E-31	7,98E-31
Use of net fresh water	MJ	2,69E-04	2,69E-04	2,75E-04
Waste categories	m^3	**C1**	**C1**	**C1**
Hazardous waste disposed	**Unit**	2,47E-10	2,47E-10	2,52E-10
Non-hazardous waste disposed (municipal waste)	kg	3,71E-04	3,71E-04	3,78E-04
Radioactive waste	kg	8,72E-05	8,72E-05	8,89E-05
Output material flows	kg	**C1**	**C1**	**C1**

Components for re-use	**Unit**	0,00	0,00	0,00
Materials for recycling	kg	0,00	0,00	0,00
Materials for energy recovery	kg	0,00	0,00	0,00
Exported energy (electricity)	kg	0,00	0,00	0,00
Exported energy (thermal energy)	MJ	0,00	0,00	0,00

C2 Transport

No.	Scenario	Description
C2	Transport	Transport to collecting point using 28 - 34 t truck, 50 % capacity used, 50 km distance

Results per 1 m² and 1 mm of FG, TSG, LSG		FG	TSG:	LSG:
Environmental impacts	**Unit**	**C2**	**C2**	**C2**
Global warming potential (GWP)	kg CO_2 equiv.	9,45E-03	9,45E-03	9,63E-03
Depletion potential of stratospheric layer (ODP)	kg R11 equiv.	2,61E-16	2,61E-16	2,66E-16
Acidification potential of soil and water (AP)	kg CO_2 equiv.	5,54E-05	5,54E-05	5,65E-05
Eutrophication potential (EP)	kg PO_4^{3-} equiv.	1,42E-05	1,42E-05	1,45E-05
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 equiv.	-2,48E-05	-2,48E-05	-2,53E-05
Abiotic depletion potential - non-fossil resources (ADP - elements)	kg Sb equiv.	7,84E-10	7,84E-10	8,00E-10
Abiotic depletion potential - fossil fuels (ADP - fossil resources)	MJ	0,13	0,13	0,13
Use of resources	**Unit**	**C2**	**C2**	**C2**
Use of renewable primary energy - excluding renewable primary energy resources used as raw materials	MJ	-	-	-
Use of renewable primary energy resources used as raw materials (material use)	MJ	-	-	-
Total use of renewable primary energy resources (primary energy and renewable primary energy resources used as raw materials) (energy + material use)	MJ	7,19E-03	7,19E-03	7,34E-03
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials.	MJ	-	-	-
Use of non-renewable primary energy resources used as raw materials (material use)	MJ	-	-	-
Total use of non-renewable primary energy resources (primary energy and non-renewable primary energy resources used as raw materials) (energy + material use)	MJ	0,13	0,13	0,13
Use of secondary materials	kg	0,00	0,00	0,00
Use of renewable secondary fuels	MJ	7,04E-31	7,04E-31	7,18E-31
Use of non-renewable secondary fuels	MJ	1,07E-29	1,07E-29	1,09E-29
Use of net fresh water	m^3	1,33E-05	1,33E-05	1,35E-05
Waste categories	**Unit**	**C2**	**C2**	**C2**
Hazardous waste disposed	kg	7,54E-09	7,54E-09	7,69E-09
Non-hazardous waste disposed (municipal waste)	kg	1,09E-05	1,09E-05	1,11E-05

Radioactive waste	kg	1,78E-07	1,78E-07	1,82E-07
Output material flows	**Unit**	**C2**	**C2**	**C2**
Components for re-use	kg	0,00	0,00	0,00
Materials for recycling	kg	0,00	0,00	0,00
Materials for energy recovery	kg	0,00	0,00	0,00
Exported energy (electricity)	MJ	0,00	0,00	0,00
Exported energy (thermal energy)	MJ	0,00	0,00	0,00

C3 Waste management

No.	Scenario	Description
C3	Disposal	In dependence on prEN 17074 (9.8.4 Disposal phase (C1 to C4)). Share for the return of materials: Glass 100% in melting, glass-free materials 100% in landfill.

The below table presents the disposal processes and their percentage by mass/weight. The calculation is based on the above mentioned shares in percent related to the declared unit of the product system.
Since this is the only scenario, the results are shown in the overall table.

C3 Disposal		**C3.1**		
	Unit	**FG**	**ESG:**	**VSG:**
Collection process, collected separately	kg	0,75	0,75	0,74
Collection process, collected as mixed construction waste	kg	1,75	1,75	1,81
Recovery system, for re-use	kg	0,00	0,00	0,00
Recovery system, for recycling	kg	0,75	0,75	0,74
Recovery system, for energy recovery	kg	0,00	0,00	0,00
Disposal	kg	1,75	1,75	1,81

Values that cannot be shown or are inexistent or marginal are expressed as [-].

C4 Disposal

No.	Scenario	Description
C4	Disposal	The non-measurable quantities and losses of the re-use/recycling chain (C1 and C3) are modelled as “disposed”. The consumption is marginal and cannot be quantified.

The consumption of scenario C4 results from physical pre-treatment, waste recycling and management of the disposal site. The benefits obtained here from the substitution of primary material production are allocated to module D, e.g. electricity and heat from waste incineration.
Since this is the only scenario, the results are shown in the overall table.

D Benefits and loads beyond the system boundaries

No.	Scenario	Description
D	Recycling potential	Glass recyclate from C3 excluding the recyclate used in A3 replaces 60 % of container glass;
The values in module D result from de-construction at the end of service life.		

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Notes
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