

ENVIRONMENTAL PRODUCT DECLARATION

according to ISO 14025 and EN 15804

Declaration owner	Hydro Building Systems Germany GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-K.DefaultMM.24/07/2019.10.03.55
Date of issue	19.05.2022
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K/yltrr; 11:
WICSTYLE 65 evo
WICLINE 65 / WICSTYLE 65
HYDRO

www.ibu-epd.com / <https://epd-online.com>



WICONA[®]
TECHNIK FÜR IDEEN



1. General information

HYDRO

Programme holder

IBU - Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Deutschland

Declaration number

EPD-K.DefaultMM.24/07/2019.10.03.55-EN

This declaration is based on the product category rules:

Windows and doors, 11.2017
(PCR tested and approved by the independent committee of experts)

Date of issue

19/05/22

Valid until

18.05.27

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of the Institut Bauen und Umwelt e.V.)

Hans Peters
(Managing director IBU)

WICLINE 65 / WICSTYLE 65

Owner of the declaration

Hydro Building Systems Germany GmbH
Einsteinstrasse 61
89077 Ulm
Deutschland

Declared product/declared unit

Window of the series WICLINE 65 / WICSTYLE 65, with the dimensions
(width x height) 1950 mm x 2200 mm.

Scope of application:

This declaration is a company EPD and refers to the aluminium construction product described, which is manufactured using the profile system described in a given dimension and with standard glazing. The product declared is specified by the profile series, product name, product properties and view as shown in this EPD document. This EPD is based on software created by Hydro Building Systems Germany GmbH and provided to the creator via WICTOP. The data entry is performed by the creator responsible for the specifications described in this EPD and the manufacture of the window. The production location of the declared window is the location of the creator.

The owner of the declaration is liable for the underlying information and proof, liability of IBU with regard to manufacturer information, LCA data and proof is excluded.

Verification

The CEN standard /EN 15804/ serves as the core PCR

Verification of the EPD by an independent third party according to /ISO 14025/

internal

external

Matthias Schulz
(Independent auditor appointed by the SVA)

2. Product

2.1. Product description / product definition

Profile technology:

The aluminium window system of the WICLINE series is designed as a thermally insulated multi-chamber composite system. The window system consists of construction depths from 65 mm to 215 mm and is characterised by the specification of the construction depth behind the series name WICLINE.

The surface treatment takes place optionally by means of anodizing, wet and powder coating.

Sealing concept:

The centre seal frame, the inner stop seal and the outer glazing seal run all round and are made of EPDM or EPDM foam.

Fittings:

Fittings are available for either inward or outward opening windows.

Fittings for single-leaf or double-leaf windows are also possible, as well as overlying or concealed hinges. Available opening options are turn/turn-tilt

/tilt/casement windows, skylights, pivoting/swing windows, concealed sash, hinged windows opening inwards/outwards, parallel-sliding-tilt, lowered hinged window, barrier-free window door.

Heat protection:

The insulation area is designed as a multi-chamber system. By means of continuous heat insulating strips made of fibre reinforced plastic Uw values of less than 0.8 W/(m²K) are achieved, depending on the type of opening and glazing.

Infill thickness:

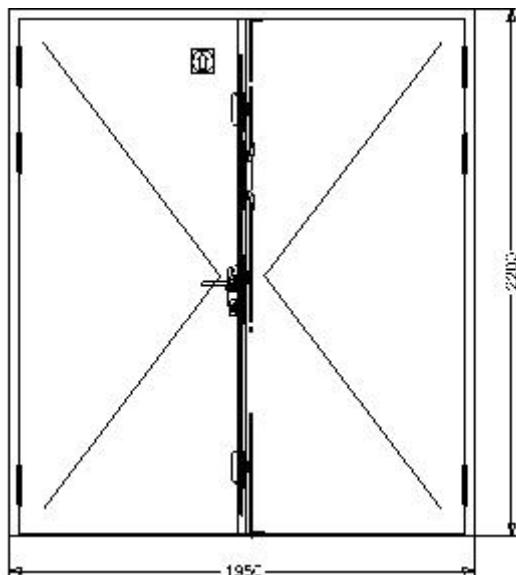
Infill thickness up to 69 mm

Burglar prevention:

Burglar prevention according to /DIN EN 1627/ up to RC3.

Bullet resistance:

Bullet resistance according to /DIN EN 1522/ up to FB4 S/FB4 NS and combinable with burglar prevention.



Product: WICLINE 65 / WICSTYLE 65

Opening type: npd

Area: 0.00 m²

Transparent area: npd m²

Surface treatment: powder coating / anodized

For marketing in the EU/EFTA, /Regulation (EU) No 305/2011/ applies. The product requires performance specifications taking into account the harmonised product standard /DIN EN 14351 -1/, window and external doors and the CE marking.

For use, the respective national regulations apply.

2.2. Application

The WICLINE window series is used as a casement window, window strip, window door, window façade, composite window, all-glass window or insert window in curtain walling.

2.3. Technical data

Structural data

Designation	Value	Unit
Heat transfer coefficient glass according to /DIN EN 673/	1.00	W/(m ² K)
Heat transfer coefficient profile frame according to /DIN EN 10077-2/	-nan(ind)	W/(m ² K)
Heat transfer coefficient window according to /DIN EN 10077-1/	0.00	W/(m ² K)
Joint permeability coefficient according to /DIN EN 1026/	-*)	m ³ /h
Driving rain proof according to /DIN EN 12208/	npd	Class
Sound insulation index against outside noise according to /DIN EN ISO10140/ and /DIN EN ISO717/	-*)	dB
Deflection due to wind loads according to /EN 12210/	npd	mm
Deflection due to vertical loads according to /EN 947/	-*)	mm
Fire resistance class for fire doors and windows according to /DIN EN 13501/	-*)	Class

Air permeability according to /DIN EN 12207/	npd	Class
Radiation properties according to /DIN EN 410/ Total energy transmittance g according /DIN EN 13363-1/ and /DIN EN 13363-2/	npd	%
Radiation properties according to /DIN EN 410/ Light transmission Tl according /DIN EN 13363-1/ and /DIN EN 13363-2/	npd	%
Fittings type	-*)	-
Opening type	-*)	-
Sound insulation class (SSK1-SSK6),	-*)	Class
Sound reduction index, Rw (c, ctr),	-*)	dB
Burglar prevention class RC1-RC4,	-*)	Class

*) omitted, as not a mandated property according to product regulation /DIN EN 14351/.

Product according to /CPR with hEN/:

Performance values of the product according to the performance specifications with regard to its essential characteristics according to /DIN EN 14351-1/.

2.4. Delivery condition

All details about the present window series are order specific.

The balanced window element is delivered to the installation site ready for installation as described in chapter 2.1.

Number of pieces: 1 piece

Width: 1950 mm

Height: 2200 mm

2.5. Raw materials/auxiliary materials

The aluminium window considered consists of the following materials:

Designation	Value	Unit
Stainless steel screw	1.06	kg
EPDM foam	0.01	kg
Polyamid 66 GF	5.02	kg
EPDM	2.67	kg
Aluminium-cast alloy	2.32	kg
Stainless steel	0.07	kg
Aluminium	0.02	kg
Polyamid 6	0.20	kg
Hardware components	5.83	kg
ABS	1.80	kg
CIRCAL 75	34.95	kg
Powder coating	0.84	kg
Glas, Float	92.72	kg
Anodizing	0.00	kg
Total Weight	147.51	kg

The product/article/at least a partial product contains substances from the candidate list (15.01.2018) above 0.1 by mass-%: no

The product/at least one partial product contains further CMR substances of category 1A or 1B above 0.1 % by mass in at least one partial product which are not included in the candidate list: no

Biocidal products have been added to this construction product or it was treated with biocidal products (this is a treated product within the Biocidal Products Ordinance (EU) no. 528/2012): no

2.6. Manufacturing

Before the actual processing, the surface treatment of the aluminium profiles is carried out by anodizing or powder coating.

The extruded and thermally separated aluminium profiles are processed by sawing, milling, drilling and punching on corresponding semi or fully automatic machines. Scrap from processing (profile sections, chips) is collected sorted and recycled as secondary materials.

Subsequently, the profiles are connected to frames of high construction component strength.

The permanently elastic seals are matched to the respective receiving area in the aluminium profile and are removed automatically or by hand.

The fittings and other components are matched to the WICLINE product series. They are positively and/or frictionally connected to the profile system.

The glazing, panels or other fillings are used and secured depending on the overall construction (weight, dimensions, etc.) in the manufacturing of the metalwork shop or directly during assembly on the site.

2.7. Environment and health during production

Measures that go beyond national regulations for environmental protection and occupational safety are not required during the entire manufacturing process.

2.8. Product processing/installation

The bases for the processing and installation of the WICLINE product series are the currently applicable processing guidelines of Hydro Building Systems Germany GmbH and the notes detailed here. There are also recommendations for suitable aids contained therein.

In addition, standards and guidelines for the planning, execution and installation of windows and doors must be observed.

Particular attention is drawn to the /Guidelines for the design and installation of windows and entrance doors/ from RAL Gütegemeinschaft Fenster und Haustüren e.V. In this document explanations for training and the execution of the building connection are provided.

2.9. Packaging

The window elements are stacked on transport racks. A proper securing of the window elements is achieved by tie rods and straps. Elastic intermediate bearings between the individual elements prevent damage.

When transporting on an open loading surface, the transport unit can be wrapped with PE film to protect it from dirt and moisture.

PE foil, PE foam moulded parts, cardboard and spruce wood are used as packaging materials. These are taken to the regional waste sorting system or reused in the recycling process.

2.10. State of use

Windows of the WICLINE product range are installed in a thermally separated design as a building closing component and are exposed to weather conditions.

As a thermally not separate construction, the product can also be installed in the building interior.

Depending on the type of opening and the installed fitting or other attachments, the maintenance instructions of the hardware manufacturer must be observed.

Additional information can be found in the brochure /Maintenance and operating instructions/ from WICONA/Hydro Building Systems Germany GmbH.

Maintenance or care of the profile surface is not required.

2.11. Environment & health during use

The window element is stable in the wall opening to fasten or build in as a building closure.

According to research report /Emissions from building elements/, ift Rosenheim, there is no danger to the environment .

Under normal conditions of use and regular maintenance, there is no danger to the health of the user.

2.12. Reference service life

According to the /Sustainable Building Assessment System/ exterior windows comply with Code 334.211 with a service life of more than 50 years.

2.13. Extraordinary influences

Fire

According to the /DIN EN 14351-1/ window and door product standard, windows are without properties regarding fire protection and smoke proofing.

If this product has properties, these are listed under chapter 2.3 Technical data.

A classification of the individual components according to /DIN EN 13501-1/ resulted in:

Fire protection

Designation	Value
Building material class	E
Burning dripping	d0
Smoke development	s1

Water

Due to the unforeseen effects of water no substances are released.

It is unlikely that there will be any impact on the environment.

Mechanical destruction

Mechanical destruction can cause sharp edges at the break points.

Negative impacts on the environment are not to be expected in case of unforeseen mechanical destruction.

2.14. End of life phase

The theoretical service life of the actual window frame exceeds the service life of, for example, the glazing or the permanently elastic seals. If individual components of the window are renewed, the window frame can be used again according to the original purpose. This corresponds to a so-called "re-use" of the window frame.

The aluminium profiles are 100% recyclable. Primary and secondary aluminium have identical product quality. Scrap from demolition, conversion or refurbishment can easily be separated and recycled (via the recycling industry). The process waste produced in the production and further processing of

the profile is completely recorded in the factory and processed into new input material in a recycling process in the re-melting plant. Press studs can be made with reused extruded profiles as the starting material.

2.15. Disposal

Aluminium

Due to its high value, aluminium scrap is not disposed of as a raw material but is recycled in an established cycle for reuse or recycling.

Old aluminium windows are collected regionally, shredded in shredders and cleaned from foreign bodies. Recycling companies separate metals and non-metallic materials with specially developed processes, so that aluminium is sorted and separated from fractions such as stainless steel, iron, other non-ferrous metals, plastics and other materials. Today, separation processes guarantee that aluminium scrap, once processed, can be re-melted in aluminium foundries to Al-Mg-Si-0.5 press studs and pressed into profiles in press factories.

/EAK/ 170402 Aluminium

Metals

Low and high alloy steels and other non-ferrous metals are separated from the aluminium fraction by separation during recycling and are recycled separately.

/EAK/ 170403 lead

/EAK/ 170404 zinc

/EAK/ 170405 iron and steel

/EAK/ 170406 tin

/EAK/ 170407 mixed metals

Flat glass

Production scrap of flat glass during the production is directly taken for local recycling. When dismantling or renovating the window, the glazing is removed from the window frame on location at the construction site and taken separately to the glass industry return system/collection circuit. Architectural glass is collected, separated from foreign substances, granulated and reused as raw materials or disposed of.

/EAK/ 170202 Glass

Plastics/permanent elastic sealants

Plastics and sealants can be recycled materially or thermally.

/EAK/ 170203

Insulation materials

Insulating materials made of panels or attachments are not soiled and can be recycled. Soiled insulation materials are deposited on a construction material landfill. For details on the current take back and recycling recommendations refer to the insulation industry.

/EAK/ 170604

2.16. Further information

On the WICONA homepage you will find more information about the products.

www.wicona.de

3. LCA: Calculation rules

3.1 Declared unit

The declared unit is a window WICLINE 65 / WICSTYLE 65 in specific dimensions 1950 mm x 2200 mm with a frame proportion of -nan(ind) %

Declared unit

Designation	Value	Unit
Declared unit window 1950 mm x 2200 mm	1	Piece
Conversion factor to 1kg	1/147.51	-
Conversion factor to the reference window 1.23 m x 1.48 m	4.24E-01	-

3.2 System limit

This EPD is an EPD of the cradle-to-gate type - with options.

The stage of production (module A1-A3 raw material supply, transport to the factory and production), the stage of construction of the structure (module A4 transport to the construction site), parts of the end of life cycle (modules C3 and C4 waste treatment and disposal) are taken into account. In addition, the credits and charges are considered outside the system limits (module D).

3.3 Estimates and assumptions

For the transport of the raw materials to the factory (module A2) a distance of 500 km is assumed.

The packaging materials are not considered in this study due to their minor influence on the results.

For the disposal of metals, material recycling (module D) is modelled (e.g. aluminium profiles). If necessary, a collection rate of 96% is taken into account. For the remainder, landfill is accepted (module C4).

Plastic parts are thermally recycled (module C3), whereby energy is gained. Credits from the substitution or saved expenses for electricity and steam are allocated to module D.

For glass, a sink is modelled. It can be assumed that recycling takes place. However, this is not included in the LCA, as no data are available.

3.4 Truncation rules

All materials that are included in the parts list from WICTOP are taken into account in the calculation of the life cycle assessment. Packaging is neglected due to different options and the minimal effect on the results.

3.5 Background data

All background data are taken from the databases of /GaBi ts software/. The version underlying this EPD is stated at the end of the bibliographic references. The consistent records contained in the GaBi ts database are documented in the online /GaBi documentation/. For some precursors existing EPDs are used, if available, which were created in accordance with the current standard /DIN EN 15804/.

3.6 Data quality

The last revision of the GaBi ts background data was performed in 2018.

The quality and representativeness of data from WICTOP can be considered high.

3.7 The period under consideration

This declaration was created on 19.05.2022.

3.8 Allocation

The life cycle assessment takes into account the recycling potential of the metal parts used. Of the metal scrap produced in the system from the production and end of life of the metal parts, the required amount of secondary aluminium for the production is first returned or saturated ("closed loop"), followed by the awarding of a credit for the remaining net scrap quantity.

Environmental impacts of the combustion of plastic parts in the EoL scenario are attributed to module (C3);

resulting credits for thermal and electrical energy are declared in module D.

The credits are based on European average data for the environmental burden of the production of electrical energy and thermal energy from natural gas.

3.9 Comparability

In principle, a comparison or evaluation of EPD data is only possible if all records to be compared were compiled in accordance with /DIN EN 15804/ and the building context or product specific specifications are taken into account.

4. LCA: Scenarios and other technical information

The following technical information is the basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment, if modules are not declared (MND).

Transport to construction site (A4)

Designation	Value	Unit
Liters of fuel		
Train (electric)	0.01158	l / 100 km
Plane (kerosine)	0.42164	l / 100 km
40 t truck (Diesel)	0.00165	l / 100 km
7,5 t truck (Diesel)	0.00591	l / 100 km
22 t truck (Diesel)	0.00231	l / 100 km
Ship (heavy heating oil)	0.00040	l / 100 km
Transport distance		
Train	0.00	km
Plane	0.00	km
40 t truck	0.00	km
7,5 t truck	0.00	km
22 t truck	2000.00	km
Ship	0.00	km
Utilisation (including empty runs)		
Train	51	%
Plane	61	%
40 t truck	55	%
7,5 t truck	40	%
22 t truck	66	%
Ship	48	%
Volume utilisation factor	1	-

Reference useful life

Designation	Value	Unit
Reference service life	50	a

End of life (C1-C4)

Designation	Value	Unit
Separately collected waste type	112.55	kg
Collected as mixed construction waste	33.56	kg
For reuse	0.00	kg
For recycling (D)	134.35	kg
For energy recovery (C3)	10.83	kg
For landfilling (C4)	2.33	kg
For thermal utilisation (C4)	0.00	kg

5. LCA: Results

In the following, the results of the indicators of the impact assessment, resource use as well as waste and other output flows related to 1 piece window WICLINE 65 / WICSTYLE 65 in specific dimension 1950 mm x 2200 mm are shown.

For the conversion to the unit declared see chapter 3.1

LCA results are based on the characterisation method CML

SPECIFICATION OF THE SYSTEM LIMITS (X = INCLUDED IN LIFE CYCLE ASSESSMENT, MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement ¹⁾	Refurbishment ¹⁾	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X

RESULTS OF THE LIFE CYCLE ASSESSMENT ENVIRONMENTAL IMPACT:

WICLINE 65 / WICSTYLE 65 1950 mm x 2200 mm

Parameter	Parameter	Unit	A1-A3	A4	C3	C4	D
GWP	Global warming potential	[kg CO ₂ -Eq.]	288.54	23.81	28.62	2.89E-03	-50.93
ODP	Depleting the stratospheric ozone layer	[kg CFC ₁₁ -Eq.]	4.38E-06	6.52E-13	3.40E-07	6.55E-16	-1.72E-06
AP	Acidification potential of soil and water	[kg SO ₂ -Eq.]	1.76	6.05E-02	3.98E-02	1.71E-05	-2.39E-01
EP	Eutrophication	[kg (PO ₄) ³⁻ -Eq.]	1.64E-01	1.53E-02	9.14E-03	2.36E-06	-1.45E-02
POCP	Forming potential for tropospheric ozone	[kg Ethen-Eq.]	-4.02E-02	-2.13E-02	1.90E-03	1.33E-06	-1.75E-02
ADPE	Potential for the abiotic degradation of non-fossil resources	[kg Sb-Eq.]	1.34E-02	1.96E-06	5.84E-05	1.11E-09	-1.06E-02
ADPF	Potential for the abiotic degradation of fossil fuels	[MJ]	4546.94	324.51	53.79	3.73E-02	-565.51

RESULTS OF THE LIFE CYCLE ASSESSMENT RESOURCE ACCOUNT:

WICLINE 65 / WICSTYLE 65 1950 mm x 2200 mm

Parameter	Parameter	Unit	A1-A3	A4	C3	C4	D
PERE	Renewable primary energy as an energy source	[MJ]	574.53	17.94	6.05	0.00	-97.17
PERM	Renewable primary energy to the material use	[MJ]	0.00	0.00	0.00	0.00	0.00
PERT	Total renewable primary energy	[MJ]	574.53	17.94	6.92	4.80E-03	-229.55
PENRE	Non-renewable primary energy as an energy source	[MJ]	3650.33	324.51	363.47	0.00	-242.58
PENRM	Non-renewable primary energy to the material use	[MJ]	301.93	0.00	-301.93	0.00	0.00
PENRT	Total non-renewable primary energy	[MJ]	3952.25	324.51	61.54	3.87E-02	-708.60
SM	Use of secondary materials	[kg]	55.84	0.00	0.00	0.00	0.00
RSF	Renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00
NRSF	Non-renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00
FW	Use of freshwater resources	[m ³]	1.27	3.30E-02	7.77E-02	7.40E-06	-5.00E-01

RESULTS OF LIFE CYCLE ASSESSMENT OUTPUT RIVERS AND WASTE CATEGORIES:

WICLINE 65 / WICSTYLE 65 1950 mm x 2200 mm

Parameter	Parameter	Unit	A1-A3	A4	C3	C4	D
HWD	Hazardous waste for landfill	[kg]	3.19E-02	1.88E-05	2.16E-01	6.67E-10	2.08E-02
NHWD	Discarded non-hazardous waste	[kg]	52.99	2.72E-02	41.91	1.58	-13.22
RWD	Discarded radioactive waste	[kg]	8.93E-02	4.45E-04	4.73E-04	5.63E-07	-4.12E-02
CRU	Components for reuse	[kg]	0.00	0.00	0.00	0.00	0.00
MFR	Materials for recycling	[kg]	0.00	0.00	32.61	0.00	104.79
MER	Materials for the energy recovery	[kg]	0.00	0.00	9.44E-01	0.00	0.00
EEE	Exported electrical energy	[MJ]	0.00	0.00	39.41	0.00	0.00
EET	Exported thermal energy	[MJ]	0.00	0.00	71.25	0.00	0.00

6. LCA: Interpretation

The LCA results in the production phase (modules A1-A3) are dominated by the materials used. The two main drivers are the material fractions of aluminium and glass. Other materials such as plastics or other metal components are less relevant in terms of mass as well as life cycle assessment. Transport (module A2) plays a significantly subordinate role compared to the materials used.

In Module C3, the costs of thermal utilisation of the plastics used are to be considered as a low contribution.

The recycling of aluminium is shown in Module D and includes both the costs of the remelting process and the credits for the expenses saved (substitution of primary aluminium). The credits are higher than the charges, which leads to negative LCA results in module D. The recycled aluminium, as well as the other metal parts used in the product, can be re-used in the next product system.

7. Proof

Proof regarding formaldehyde and MDI emissions, toxicity of the combustion gases, as well as the testing for pretreatment of the input materials (wood preservatives, heavy metals, etc.) are not relevant for the declared product, since no wood-based materials are used.

The proof of VOC emissions is also classified as not relevant with reference to the final report /Emissions from building elements/, ift Rosenheim and therefore not declared

In the above mentioned independent study, representative metal components (e.g. metal windows) were tested for VOC emissions. The chamber test was terminated after 7 days due to a clear shortfall of the termination criteria, i.e. the decision criteria of the AgBB scheme were fulfilled.

8. Bibliographic references

/Institut Bauen und Umwelt e.V./, Berlin (ed.):
Creation of environmental product declarations (EPDs)

/General programme guide/

For the creation of EPD at the Institut Bauen und Umwelt e.V.(IBU), 10/2015
www.ibu-epd.com

/PCR Part A/

Institut Bauen und Umwelt e.V., Königswinter (ed.)
Product Category Rules PCR for Construction products Part A
Calculation rules for the life cycle assessment and requirements for the background report 2017-04
www.bau-umwelt.de

/PCR Part B/

Institut Bauen und Umwelt e.V., Königswinter (ed.)
Product Category Rules PCR for Construction products Part B
Guidance texts for building related products and services of the window and door component group 2015-11
www.bau-umwelt.de

/Regulation (EU) No. 305/2011/

also EU Construction Products Regulation (EU CPR) of the European Parliament and of the Council of 9 March 2011 establishing harmonised conditions for the marketing of construction products.
It replaces Directive 89/106/EEC.

/Sustainable Building Assessment System/

Service lives of components for life cycle analysis according to the Sustainable Building Assessment System
Revision: 22.02.2017.
www.nachhaltigesbauen.de

/Guidelines for planning and the execution of the installation of windows and entrance doors/

Guidelines for assembly, issue March 2010,
RAL-Gütegemeinschaft Fenster und Haustüren e.V.

/REACH/

Candidate list from 15.01.2018

/Maintenance and operating Instructions/

Hydro Building Systems Germany GmbH

/CPR with hEN/

Construction Products Regulations with harmonised European standard
Please refer to: /Regulation (EU) No. 305/2011/

/EAK/

European waste catalogue

/DIN EN 410/

Glass in building - Determination of photometric and radiation physical parameters of glazing;
German version DIN EN 410:2011-04.

/DIN EN 673/

Glass in building - Determination of thermal transmittance (U-value) - Method of calculation;
German version DIN EN 673:2011-04.

/DIN EN 717/

Acoustics - Assessment of sound insulation in buildings and building components - Part 1: Airborne sound insulation (ISO 7171:2013);
German version DIN EN ISO 717-1: 2013-06.

/GaBi ts Software/

GaBi ts 8.5 (Service Pack 35): Software and database for comprehensive accounting, thinkstep , 2018.

/GaBi documentation/

Documentation of the GaBi ts records of the comprehensive accounting database, thinkstep, <http://www.gabi-software.com/support/gabi/gabi-database-2018-lci-documentation>

/Emissions from building elements/

Examination of the emissions of windows and exterior doors to evaluate the behaviour of building elements in terms of hygiene, environmental protection and health, Final report 2010, ift Rosenheim

/DIN EN 1522/

Windows, doors, shutters - bullet resistant Requirements and classification;
German version DIN EN 1522:1999-02.

/DIN EN 1627/

Draft - doors, windows, curtain walling, grilles and shutters - Burglar prevention - Requirements and classification;
German version DIN EN 1627:2011-09.

/DIN EN 10077-1/

Thermal performance of windows, doors and shutters - Calculation of thermal transmittance coefficient - Part 1: General (ISO 10077-1: 2017);
German version DIN EN ISO 10077-1: 2018-01.

/DIN EN 10077-2/

Thermal performance of windows, doors and shutters - Calculation of thermal transmittance coefficient - Part 2: Numerical method for frames (ISO 10077-2: 2017);
German version DIN EN ISO 10077-2: 2018-01.

/DIN EN 10140-1/

Acoustics - Measurement of the sound insulation of components in a test bench - Part 1: Application rules for specific products (ISO 10140-1: 2016)
German version DIN EN 10140:2016-12.

/DIN EN 12207/

Windows and doors - air permeability - classification;
German version DIN EN 12207:2017-03.

/DIN EN 12208/

Windows and doors - driving rain proof - classification;
German version DIN EN 12208:2000-06.

/DIN EN 12210/

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