

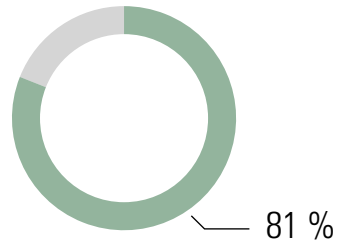
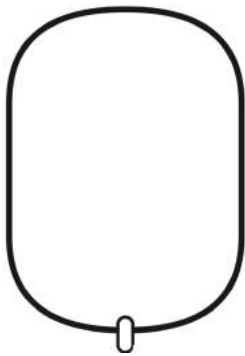
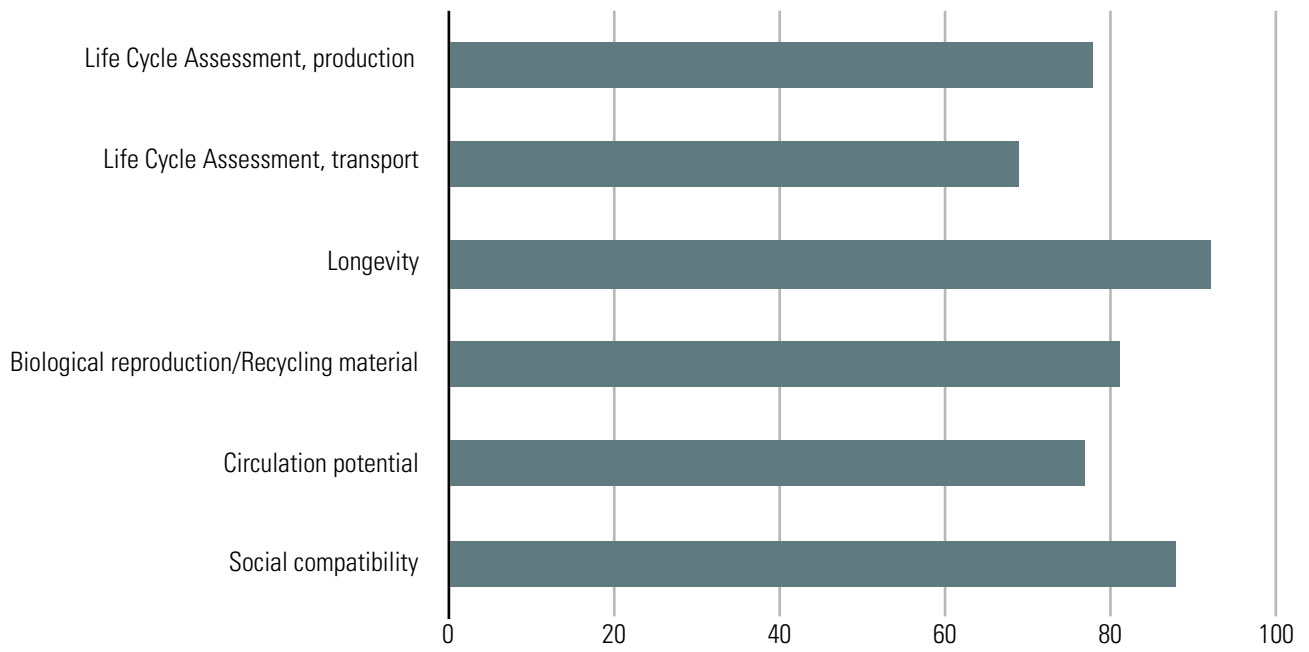
ZEITRAUM

AD ORE

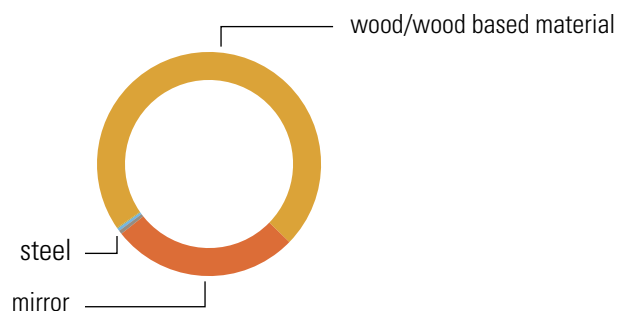
Design by Mathias Hahn, 2022



AD ORE; walnut



- wood/wood based material
- mirror
- steel
- natural oil
- PVAC adhesive

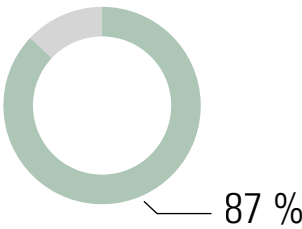


Flat pack

AD ORE; walnut	Material/Product rating						
	Walnut	Mirror	Plywood	Steel	Natural oil, Osmo	PVAC	Weighted rating, %
Life Cycle Assessment, production	10	5	6,33	4,33	5	10	77,95288 %
Life Cycle Assessment, transport	5	9	8,5	5	9	6,5	68,612 %
Longevity	10	8	9	10	10	9	92,368 %
Biological reproduction/ Recycling material	10	4	9	9	6	0	81,216 %
Circulation potential	8	10	4	10	10	4	76,772 %
Social compatibility	9	9	8	8	10	9	87,776 %
Average rating, ø	8,666	7,5	7,471	7,721	8,333	6,416	Total weight
Share in kg	1,88	1,015	0,82	0,02	0,015	0,006	3,756
Share in %	50,05 %	27,02 %	21,83 %	0,53 %	0,39 %	0,15 %	
Weighted rating	4,337	2,026	1,63	0,04	0,032	0,009	
Product rating in %	80,74						



1 American walnut



Tab. 1 A: Material data sheet, American walnut, general¹²

Material group	Natural material; wood; hardwood
Botanical name	<i>Juglans nigra</i> L. (<i>Juglandaceae</i>)
Name	American Walnut (GB); Black Walnut (US); Amerikanischer Nussbaum, Schwarznuss, Schwarze Walnuss (D); Noyer Noir (F)
Material Norm. Ref.	DIN EN 13556: JGNG
Origin	Missouri
Occurrence	Midwestern and northeastern U.S.; Ontario to Florida, Minnesota to Texas; southeastern Canada. Prefers deep, loose fresh loam soils and mild climate; fairly winter hardy
Use	Solid and veneer, furniture and interior finishing; turning; marine interiors; small and seating furniture; piano making; musical instruments; buttons; inlays; etc.

¹ WAGENFUEHR, R. (2007) - Wood Atlas. (6) Leipzig: Hanser Wirtschaft, Fachbuchverlag Leipzig, pp. 551-554

² LOHMANN, U. (2010) - Wood encyclopedia. The standard work for wood and forestry. (4) Hamburg: Nikol-Verlag, page 859

Tab. 1 B: Material data sheet, American walnut, specific³**General description**

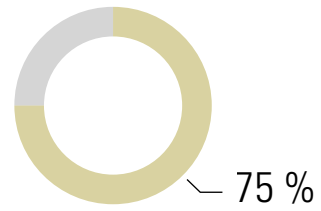
Certifications/Information	The Evergreen Initiative; NHLA; FSC on request	
Life cycle assessment data hardwood, average (GER)		10
Resource input per kg	A1-A3	
Total non-renewable primary energy (PENRT)	2,18 MJ	10
Use of freshwater resources (FW)	0,00048 m ³	10
Environmental impact per m³	A1-A3	
Global Warming Potential (GWP)	-1,74 Kg CO ₂ -eqv.	10
Environmental impact Transport, per 1000 kgkm (580 kg/m³)		5
Production site: Germany/ZEITRAUM		
Truck - ca. 300 km	A4	10
Total non-renewable primary energy (PENRT)	362,4 MJ	
Use of freshwater resources (FW)	0,019164 m ³	
Global Warming Potential (GWP)	26,907 Kg CO ₂ -eqv.	
Main raw material origin: Missouri/Production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m ³	
Global Warming Potential (GWP)	179,38 Kg CO ₂ -eqv.	
Container ship - ca. 10000 km	A4	
Total non-renewable primary energy (PENRT)	1094 MJ	
Use of freshwater resources (FW)	0,005636 m ³	
Global Warming Potential (GWP)	90,11 Kg CO ₂ -eqv.	
Sustainability Assessment		
Longevity	Very durable/repairable (> 20 years)	10
Biological reproduction/ Recycled material	100 %	10
Circulation potential	70 % - 99 % (technological/recycling)	8
Socially compatible	Yes	9

³ BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

Total average rating		8,66
Processing		
Mechanical	Very good; can be cut and peeled, suitable for turning and carving; low tendency to crack and warp	
Drying	good; but slow; low tendency to tear and shed; good stability	
Adhesion	good; alkalis can cause stains	
Surface finishing	Very good; can be stained and excellently varnished; tinting of the wood color by smoking	
Natural durability DIN EN 350-2 (with weathering)	Moderately durable; sapwood low; heartwood fairly good; resistant to fungi and insects; durability class 3	
Physical properties		
Kiln density (0 % wood moisture content)	560... 610 kg/m ³	
Bulk density (12 - 15 % wood moisture)	580... 640... 810 kg/m ³	
Pore ratio	ca. 63 %	
Shrinkage rate at 1 % moisture reduction	radial - 0.19 %; tangetial - 0.26 %; volume - 0.40 %	
Mechanical properties		
Compressive strength (σ_{dB})	44... 53 N/mm ²	
Flexural strength (σ_{bB})	90... 103 N/mm ²	
Tensile strength ($\sigma_{zB \perp}$)	ca. 4,7 N/mm ²	
Shear strength (τ_{aB})	8,8... 9,6 N/mm ²	
Hardness (HB)	ca. 50 N/mm ²	
Hardness (HB $\perp$)	ca. 26 N/mm ²	
E-modulus (E_b)	11000... 13500 N/mm ²	



2 Float glass, mirror glass



Tab. 2 A: Material data sheet, float glass; mirror glass in general⁴

Material group	Synthetic material; silver coated float glass
Name	Mirror (GB, US); Spiegel (D)
Manufactured in	Belgium

⁴ KALWEIT A. (2012) - Handbook of technical product design - materials and manufacturing. Berlin: Springer Verlag

Tab. 2 B: Material data sheet, float glass; mirror glass, specific⁵⁶⁷**General description**

Certifications/Information	CE (EN 1036-2)	
Surface	smooth, hard	

Basic materials

Silver coated float glass

Life cycle assessment data		5
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Resource input per kg	A1-A3	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	

Environmental impact per kg	A1-A3	
Global Warming Potential (GWP)	n.a.	

Environmental impact Transport, per 1000 kgkm		9
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Production site: Belgium/ZEITRAUM		
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Truck - ca. 800 km	A4	9
Total non-renewable primary energy (PENRT)	688,48 MJ	
Use of freshwater resources (FW)	0,048424 m ³	
Global Warming Potential (GWP)	51,288 Kg CO ₂ -eqv.	

Main raw material origin: n.a./production site		
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n.a. - ø 1500 km	A4	9
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m ³	
Global Warming Potential (GWP)	134,535 Kg CO ₂ -eqv.	

Sustainability Assessment

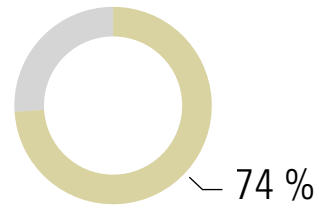
Longevity	Very durable (> 20 years)	8
Biological reproduction/ recycled material	31-40 %	4
Circulation potential	100 % (technological)	10
Socially compatible	Yes	9
Total average rating		7,5

⁵ BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021⁶ MATERIALARCHIV (2019) - Materialarchiv <<http://www.materialarchiv.ch/app-tablet/#search>> Accessed, on 03/01/2019⁷ HILLEBRANDT, A., et al. (2018) - ATLAS, RECYCLING - Building as a material resource (1) Munich: Detail Business Information GmbH, p. 97

Durability	Heat resistant, corrosion and heat resistant, chemical moisture resistant and aging resistant	
General properties		
Compressive strength	700 to 900 N/mm ²	
Notes	The life cycle assessment of glass improves the more often the material has been recycled or the proportion of recycled material increases	



3 Plywood, back panels



Tab. 3 A: Material data sheet, Plywood, back panels, general⁸

Material group	Natural-synthetic material; wood-based materials; plywood; veneer panels
Name	Plywood (GB, US);Furnierplatten; Schichtholz; Kunstharzpressholz; Brettsperrholz; etc. (D)
Short name	FU
Manufactured in	Slovakia
Origin of the wood	Europe (international)
Version	Plywood, 4-19 mm
Use	Back panels

⁸ KALWEIT, A., a.o. (2012) - Handbook of Technical Product Design, Materials and Manufacturing - Decision Bases for Designers and Engineers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

Tab. 3 B: Material data sheet, Plywood, back panels, specific⁹¹⁰**General description** (manufacturer spec.)

Certifications/Information	FSC 100 %, FSC Mix, FSC Controlled Wood	
Emission class	n.a.	
Fire resistance	Fire behavior: B1	

General description (general)

Length	2540 mm	
Wide	1840 mm	
Thickness	4 - 19 mm	
Texture	Plain, figured, smooth (top view), structure of several layers of veneer, smooth (cross section)	

Life cycle assessment data plywood, average (GER)

6,33

Resource input per kg	A1-A3	
Total non-renewable primary energy (PENRT)	6,8 MJ	8
Use of freshwater resources (FW)	0,004 m ³	1
Environmental impact per m³	A1-A3	
Global Warming Potential (GWP)	-1,5 Kg CO ₂ -eqv.	10

Environmental impact Transport, per 1000 kgkm (590-600 kg/m³)

8,5

Production site: Slovakia/ZEITRAUM

Truck - ca. 1000 km	A4	9
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m ³	
Global Warming Potential (GWP)	89,69 CO ₂ -eqv.	

Main raw material origin: Europe/Production site

Truck - ca. 3000 km	A4	8
Total non-renewable primary energy (PENRT)	3624 MJ	
Use of freshwater resources (FW)	0,19164 m ³	
Global Warming Potential (GWP)	269,07 CO ₂ -eqv.	

Sustainability Assessment

⁹ BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

¹⁰ WEZEL, O. (2019) - Strength properties of wood-based materials according to DIN EN 622 <<http://www.tischler-ole-welzel.de/Holzwerkstoffe/Faserplatten%20nach%20DIN%20EN%2013986.pdf>> Accessed, on 09/03/2019

Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	8
Total average rating		7,47

Processing

Mechanical	Very good; can be sawed, drilled and milled with common machines	
Adhesion	Very good	
Surface finishing	good; varnishable; coating possible	

Durability

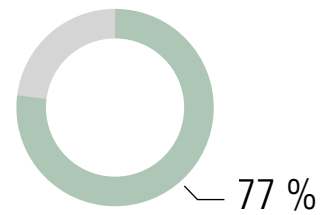
	By changing the synthetic binder or adding further additives, an increase in fire resistance, resistance to fungi and insects and moisture resistance can be achieved (see manufacturer's instructions)	
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Physical properties

Bulk density	450 kg/m ³	
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4 Steel



Tab. 4 A: Material data sheet, steel, general¹¹

Material group	Natural material; metals; transition metals
Parts origin	n.a.
Occurrence	Worldwide; South America, Western Australia, China and Eastern Europe, Canada
Use	According to application: building structural and tool steel, structural steel for machinery, vehicle and shipbuilding or mechanical engineering; line pipe, pressure vessel, etc.; handicraft and design; furniture making

¹¹ KALWEIT, A., a.o. (2012) - Handbook of Technical Product Design, Materials and Manufacturing - Decision Bases for Designers and Engineers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

Tab. 4 B: Material data sheet, steel,
specific¹²¹³

General description		
Certifications/Information	n.a.	
Emission class (formaldehyde)	Formaldehyde free	
Surface	smooth, hard	
Color	Grey	
Life cycle assessment data Steel profile, (GER)		5,33
Resource input per kg	A1-A3	
Total non-renewable primary energy (PENRT)	10,99 MJ	4
Use of freshwater resources (FW)	0,002314 m ³	4
Environmental impact per kg	A1-A3	
Global Warming Potential (GWP)	0,9944 Kg CO ₂ -eqv.	8
Environmental impact Transport, per 1000 kgkm (7850 kg/m³)		4
Production site: Europe/ZEITRAUM		
Truck ø - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m ³	
Global Warming Potential (GWP)	134 Kg CO ₂ -eqv.	
Main raw material origin: China/production location		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m ³	
Global Warming Potential (GWP)	179,38 Kg CO ₂ -eqv.	
Container ship - ca. 10000 km	A4	
Total non-renewable primary energy (PENRT)	1094 MJ	
Use of freshwater resources (FW)	0,005636 m ³	
Global Warming Potential (GWP)	90,11 Kg CO ₂ -eqv.	
Sustainability Assessment		

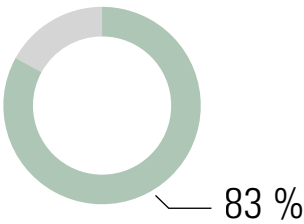
¹² BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

¹³ MATERIALARCHIV (2019) - Materialarchiv <<http://www.materialarchiv.ch/app-tablet/#search>> Accessed, on 03/01/2019

Longevity	Very durable/repairable (> 20 years)	10
Biological reproduction/ recycled material	80 - 90 %	9
Circulation potential	100 % (technological)	10
Socially compatible	Yes	8
Total average rating		7,72
Notes	The life cycle assessment of iron improves the more often the material has been recycled or the proportion of recycled material increases	



5 Osmo, hard wax oil



Tab. 5 A: Material data sheet, Osmo, hard wax oil, general¹⁴¹⁵

Material group	Coating materials; Oils
Name	Hard wax oil (GB, US); Hartwachsöl (D)
Manufacturer	Osmo Holz und Color GmbH & Co. KG
Manufactured in	Germany (GER)
Version	Osmo Hard Wax Oil 3032 satin, 3062 matt
Use	Furniture construction; for interior use; also suitable for parquet, cork and terracotta

¹⁴ KALWEIT A. (2012) - Handbook of technical product design - materials and manufacturing. Berlin: Springer Verlag

¹⁵ Osmo (2019) - Osmo Hard Wax Oil 3032 satin, 3062 matte <<https://www.osmo.de>> Accessed, on 03/02/2019

Tab. 5 B: Material data sheet, Osmo, hard wax oil, specific¹⁶¹⁷

General description		
Certifications/Information	ISO 9001, ISO 14001, ISO 18001	
Emission class (formaldehyde)	Formaldehyde-free	
VOC's	< 500 g/l (volatile components emit during curing)	
Delivery forms	Liquid	
Color	yellowish (transparent/yellowish in cured form)	
Texture	Glossy to matt (cured)	
Contents		
50 - 60 % solids	Natural oils and waxes (sunflower oil, soybean oil, safflower oil, carnauba and candellila wax) Paraffins	
Additives	Siccatives (desiccants) and water-repellent additives	
Solvent	Desaromatized white spirit (gasoline-free - according to the purity requirements of the European Pharmacopoeia)	
Life cycle assessment data hard wax oil (GER)		5
Resource input per kg	A1-A3	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per kg	A1-A3	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm		9
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	172,12 MJ	
Use of freshwater resources (FW)	0,012106 m ³	
Global Warming Potential (GWP)	12,822 Kg CO ₂ -eqv.	
Main raw material origin: n.a./production site		
n.a. - ø 3000 km	A4	8
Total non-renewable primary energy (PENRT)	3624 MJ	
Use of freshwater resources (FW)	0,19164 m ³	

¹⁶ BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

¹⁷ MATERIALARCHIV (2019) - Materialarchiv <<http://www.materialarchiv.ch/app-tablet/#search>> Accessed, on 03/01/2019

Global Warming Potential (GWP)	296,07 Kg CO ₂ -eqv.	
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Sustainability Assessment

Longevity	Very durable/repairable (> 20 years, with good care)	10
Biological reproduction/ recycled material	51 - 60 %	6
Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	10
Total average rating		8,33

Processing

Application	With brush, spatula or spray gun	
Storage	Can be stored up to 5 years with tight closure	

Properties

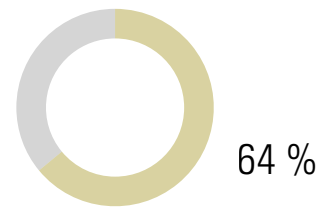
Density	0,89 g/cm ³	
Viscosity	Thixotropic, creamy	
Consistency	Medium viscosity	
Moisture resistance	Good	

Notes

Osmo Polyx®-Oil is based on natural vegetable oils and waxes; Osmo Polyx®-Oil contains neither biocides nor preservatives. It is harmless to humans, animals and plants when dry and complies with DIN 53160 (sweat- and saliva-proof) and EURO-NORM EN 71 (suitable for children's toys)



6 PVAc dispersion adhesive, D3



Tab. 6 A: Material data sheet, PVAc dispersion adhesive, D3, general¹⁸¹⁹

Material group	Synthetic material; adhesives; dispersion adhesives
Name	Dispersion Adhesive (GB, US); Dispersionsklebstoff, PVAc-(Polyvinylacetat) Klebstoffe, Weißleim (D)
Manufacturer	Kleiberit Klebstoffe GmbH
Manufactured in	Germany (GER)
Version	Kleiberit 303, D3-adhesive
Use	Furniture construction; especially for interiors; staircase construction, ship interior finishing; surface bonding of HWS; door and window production

¹⁸ KALWEIT A. (2012) - Handbook of technical product design - materials and manufacturing. Berlin: Springer Verlag

¹⁹ KEIBERIT (2019) - KLEIBERIT 303, D3, PVAC Adhesive <https://interior-construction.kleiberit.com/fileadmin/Content/Documents/DE/Infoblaetter/303_D3_Leim_D.pdf> Accessed, on 02/03/2019

Tab. 6 B: Material data sheet, PVAc dispersion adhesive, D3, specific²⁰²¹**General description**

Certifications/Information	ISO 9001, ISO 14001, ISO 50001	
Emission class (formaldehyde)	Formaldehyde-free	
Delivery forms	Liquid	
Color	Whitish (transparent in cured form)	
Texture	Glossy	

Life cycle assessment data Dispersion-based solvent-free adhesives, coatings and sealants (GER) 10

Resource input per kg	A1-A3	
Total non-renewable primary energy (PENRT)	26,7 MJ	10
Use of freshwater resources (FW)	0,00758 m ³	10
Environmental impact per kg	A1-A3	
Global Warming Potential (GWP)	0,955 Kg CO ₂ -eqv.	10

Environmental impact Transport, per 1000 kgkm 6,5**Production site: Germany/ZEITRAUM**

Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	172,12 MJ	
Use of freshwater resources (FW)	0,012106 m ³	
Global Warming Potential (GWP)	12,822 Kg CO ₂ -eqv.	

Main raw material origin: n.a./production site

n.a. - ø > 7000 km	A4	3
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m ³	
Global Warming Potential (GWP)	627,83 Kg CO ₂ -eqv.	

Sustainability Assessment

Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	0 %	0
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	9

²⁰ BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021²¹ MATERIALARCHIV (2019) - Materialarchiv <<http://www.materialarchiv.ch/app-tablet/#search>> Accessed, on 03/01/2019

Total average rating		6,41
Processing		
Adhesion	With brush, spatula or glue roller	
Properties		
Density	1,1 g/cm ³	
PH level	3	
Consistency	Medium viscosity	
Moisture resistance	D3	
Heat resistance	Up to 120 °C	
Notes	PVAc adhesive is available solvent-free and solvent-based	

Information on all materials used by ZEITRAUM
can be found in our material library at:

www.zeitraum-moebel.com

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