ZEITRAUM

FURNITURE FOOTPRINT

Material library

FURNITURE FOOTPRINT
Material library

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1 Furniture Footprint

The *Furniture Footprint* is a new form of communication between us and our customers. It is an interactive sustainability rating system of products that makes it possible to immediately grasp their sustainability and offers the opportunity to learn everything about the materials used. In addition to the greatest possible transparency, our customers can thus make their own responsible and conscious decisions. Important information, such as the origin and where and under what social conditions production took place, can be tracked.

To this purpose, the materials are first rated on the basis of defined sustainability criteria with scores from 0 to 10. The 6 criteria are based on the *17 Sustainable Development Goals* of the United Nations and on specific life cycle assessment data of the *Ökobaudat* of the *BMI* (Federal Ministry of the Interior, for Construction and Home Affairs).

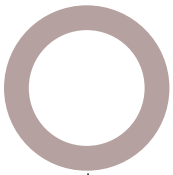
The 6 parameters

1. Life cycle assessment, production
2. Life cycle assessment, transport
3. Longevity
4. Biological reproduction/recycling material
5. Circulation potential
6. Social compatibility

The material ratings then lead to the respective product ratings. The ratings are graded using a corresponding rating key. All material ratings are initially indicated in % of 10, just like the product ratings. The percentage ratings are marked with the help of colors and are to be evaluated as follows:

100 - 76 %

75 - 51 %


50 - 0 %

1.1 Material datasheet

The basis for the evaluation are *Furniture Footprint* material data sheets, which are created in this material library and, in addition to a detailed overview, form the basis for substantiated material selection and product evaluations.

A *Furniture Footprint* Material Data Sheet contains important information about the material. At the outset, basic data on the material group, designation, occurrence, origin and use are described. This data first provides a general overview. The materials are then described more specifically in terms of their external appearance, processing options, mechanical, chemical and physical properties, and the available certificates are named. Life cycle assessment data and transport routes are also shown. These material properties are then used to produce point ratings relevant to the Furniture Footprint.

1.2 Evaluation key

1.2.1 Life cycle assessment data, construction materials (e.g. wood, wood-based materials, steel, etc.)

Materials with the same function/group of materials are rated in a graded manner.
(maximum rating - minimum rating) : 10 - 0

Tab. 1.2.1: Life cycle assessment data, construction material per kg

Parameter	Unit	from	to	Rating
PENRT	MJ	0	5	10
		5,1	6	9
		6,1	7	8
		7,1	8	7
		8,1	9	6
		9,1	10	5
		10,1	11	4
		11,1	12	3
		12,1	13	2
		13,1	14	1
		14,1	> 15	0
FW	m^3	0	0,0005	10
		0,00051	0,0009	9
		0,0010	0,0013	8
		0,0014	0,0017	7
		0,0018	0,0021	6
		0,0022	0,0025	5
		0,0026	0,0029	4
		0,003	0,0033	3
		0,0034	0,0037	2
		0,0038	0,0041	1
		0,0042	> 0,0051	0
		< 0	0	10
		> 0	0,86	9
		0,87	1,72	8

GWP	Kg CO_2-eqv.	1,73	2,58	7
		2,59	3,44	6
		3,45	4,3	5
		4,31	5,16	4
		5,17	6,02	3
		6,03	6,88	2
		6,89	7,74	1
		7,75	> 8,6	0

1.2.2 Life cycle assessment data, fabric

Materials with the same function/group of materials are rated in a graded manner.

(maximum rating - minimum rating) : 10 - 0

Tab. 1.2.2: Life cycle assessment data, fabric per m²

Parameter	Unit	from	to	Rating
PENRT	MJ	0	54	10
		54	67,1	9
		67,1	80,2	8
		80,2	93,3	7
		93,3	106,4	6
		106,4	119,5	5
		119,5	132,6	4
		132,6	145,7	3
		145,7	158,8	2
		158,8	171,9	1
		171,9	185	0
FW	m^3	0	0,049	10
		0,05	0,098	9
		0,099	0,147	8
		0,148	0,196	7
		0,197	0,245	6
		0,246	0,294	5
		0,295	0,343	4
		0,344	0,392	3
		0,393	0,441	2
		0,442	0,49	1
		0,491	> 0,491	0
GWP	Kg CO_2-eqv.	0	2,19	10
		2,19	3,361	9
		3,361	4,532	8
		4,532	5,703	7
		5,703	6,874	6
		6,874	8,045	5
		8,045	9,216	4

9,216	10,387	3
10,387	12,558	2
12,558	13,729	1
13,729	> 13,729	0

1.2.3 Life Cycle Assessment Data, Upholstery

Materials with the same function/group of materials are rated in a graded manner.

(maximum rating - minimum rating) : 10 - 0

Tab. 1.2.3: Life cycle assessment data, upholstery per kg

Parameter	Unit	from	to	Rating
PENRT	MJ	0	3,474	10
		3,474	12,9766	9
		12,9766	22,4766	8
		22,4766	31,9766	7
		31,9766	41,4766	6
		41,4766	50,9766	5
		50,9766	60,4766	4
		60,4766	69,9766	3
		69,9766	79,4766	2
		79,4766	88,9766	1
		88,9766	> 88,9766	0
FW	m^3	0	0,00252	10
		0,00252	0,11052	9
		0,11052	0,21852	8
		0,21852	0,32652	7
		0,32652	0,43452	6
		0,43452	0,54252	5
		0,54252	0,65052	4
		0,65052	0,75852	3
		0,75852	0,86652	2
		0,86652	0,97452	1
		0,97452	1,081	0
GWP	Kg CO_2-eqv.	< -1,476	-1,476	10
		-1,477	-0,881	9
		-0,881	-0,285	8
		-0,285	0,311	7
		0,311	0,907	6
		0,907	1,503	5
		1,503	2,099	4

2,099	2,695	3
2,695	3,291	2
3,291	3,881	1
3,881	> 3,881	0

1.2.4 Transport distance

All materials are rated in a graded manner.

(maximum rating - minimum rating) : 10 - 0

If the transport is carried out by airplane, the rating is 0 P.

Tab. 1.2.4 A: Transport distance in km from the main raw material origin/manufacturing site

Parameter	Unit	from	to	Rating
Transport	km	0	1000	10
		1001	2000	9
		2001	3000	8
		3001	4000	7
		4001	5000	6
		5001	6000	5
		6001	7000	4
		7001	8000	3
		8001	9000	2
		9001	10000	1
		> 10.000		0

Tab. 1.2.4 B: Transport distance in km from place of production to ZEITRAUM

Parameter	Unit	from	to	Rating
Transport	km	0	500	10
		501	1000	9
		1001	1500	8
		1501	2000	7
		2001	2500	6
		2501	3000	5
		3001	3500	4
		3501	4000	3
		4001	4500	2
		4501	5000	1
		> 5000		0

1.2.5 Longevity

All materials are rated on a graduated basis

Tab. 1.2.5: Longevity

Description	Minimum service life (use in private spaces)	Rating
Very durable/repairable	> 20 years	10
Very durable/moderately repairable		9
Very durable		8
Durable/repairable	10 - 20 years	7
Durable/moderately repairable		6
Durable		5
Moderately durable/repairable	< 10 years	4
Moderately durable/moderately repairable		3
Moderately durable		2
Not durable/repairable	< 3 years	1
Not durable		0

Description	*Martindale* (for the classification of upholstery fabrics)
Very durable (public spaces)	> 40.000
Durable (office spaces)	> 15.000 bis < 40.000
Not durable (private spaces)	< 15.000

1.2.6 Biological reproduction/recycling material

All materials are rated on a graduated basis.

Tab. 1.2.6: Biological reproduction/recycled material in %

Parameter	Unit	from	to	Rating
Biological reproduction/ recycling material	%	91	100	10
		81	90	9
		71	80	8
		61	70	7
		51	60	6
		41	50	5
		31	40	4
		21	30	3
		11	20	2
		1	10	1
		0	> 1	0

1.2.7 Circulation potential

All materials are rated on a graduated basis.

Tab. 1.2.7: Circulation potential

Description	Unit	from	to	Rating
Biological o. technological	%	100		10
Technological/ upcycling		70	99	9
Technological/ recycling		70	99	8
Technological/ downcycling		70	99	7
Technological/ upcycling		40	70	6
Technological/ recycling		40	70	5
Technological/ downcycling		40	70	4
Only thermally recyclable		100		
Technological/ upcycling		10	40	2
Technological/ recycling		10	40	1
Technological/ downcycling		10	40	0
Technological		< 10		
Hazardous waste				

1.2.8 Social compatibility

All materials are rated on a graduated basis.

Tab. 1.2.8: Social compatibility

Description	Rating
Socially fair/fair/healthy/environmentally friendly work/ commitment of the company + certificates	10
Socially fair/fair/healthy/environmentally friendly work + certificates	9
Socially fair/fair/healthy/environmentally friendly work	8
Sourcing from countries with minimum wage etc. Within the EU + certificates	7
Sourcing of the materials with minimum wage, etc., within the EU	6
Sourcing of materials with fair payment and high transparency + certificates	5
Sourcing of materials with fair payment + certificates	4
Sourcing of materials with fair payment	3
No transparency	1
Proven unfair/unhealthy/socially intolerable working conditions	0

2 Life cycle assessment data

Life cycle assessment data of the estimated transport routes are added to the environmental impacts of the materials. To reduce complexity, only the most common environmental data are used: *total non-renewable primary energy* (PENRT), *freshwater resource use* (FW) and *Global warming potential* (GWP).

2.1 Transport

The following tables provide an overview of the resource consumption and environmental impacts of the respective modes of transportation:[1]

Tab. 2.1 A: Life cycle assessment data, truck transport (GER), 1000.0 kgkm; material transport; A4 (transport)

Use of resources			
Indicator	Direction	Unit	A4
Total non-renewable primary energy (PENRT)	Input	MJ	1,208
Use of freshwater resources (FW)	Ouput	m^3	0,00006388
Environmental impact			
Global Warming Potential (GWP)	Ouput	Kg CO_2-eqv.	0,08969

Tab. 2.1 B: Life cycle assessment data, train transport (GER), 1000.0 kgkm; material transport; A4 (transport)

Use of resources			
Indicator	Direction	Unit	A4
Total non-renewable primary energy (PENRT)	Input	MJ	0,2372
Use of freshwater resources (FW)	Ouput	m^3	0,00007346
Environmental impact			
Global Warming Potential (GWP)	Ouput	Kg CO_2-eqv.	0,01883

[1] BMI 2021: Ökobaudat. database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/21

Tab. 2.1 C: Life cycle assessment data, barge transport (GER), 1000.0 kgkm; material transport; A4 (transport)

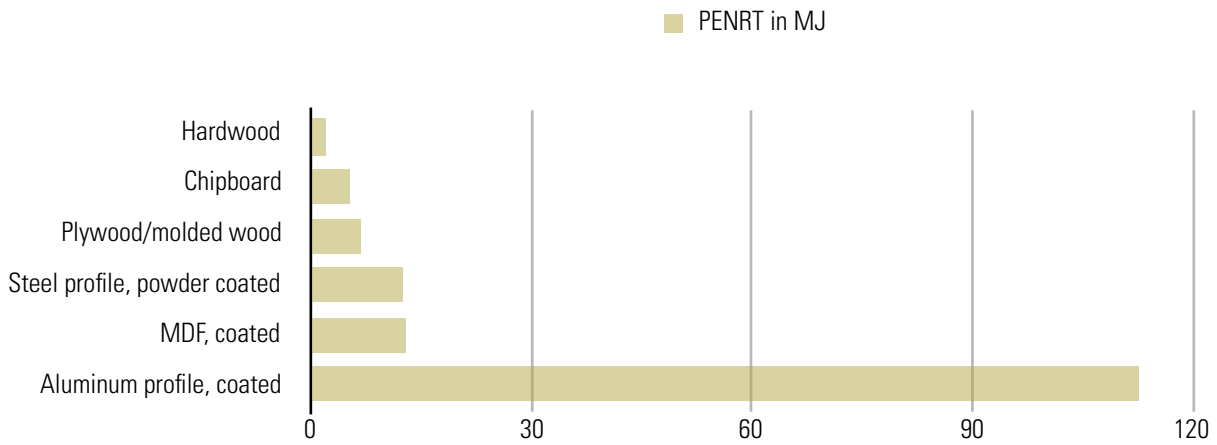
Use of resources			
Indicator	Direction	Unit	A4
Total non-renewable primary energy (PENRT)	Input	MJ	0,2615
Use of freshwater resources (FW)	Ouput	m^3	0,000017
Environmental impact			
Global Warming Potential (GWP)	Output	Kg CO_2-eqv.	0,01902

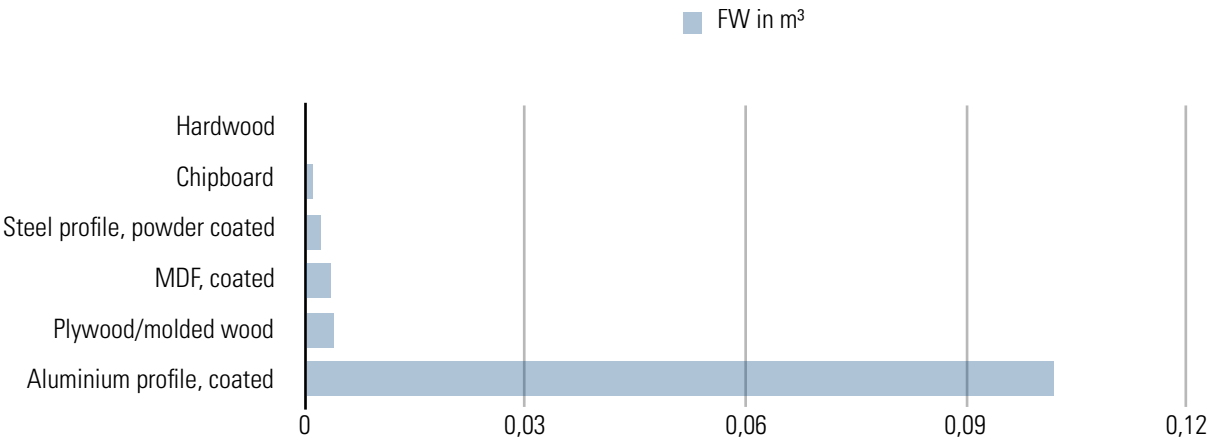
Tab. 2.1 D: Life cycle assessment data, container ship transport (GER), 1000.0 kgkm; material transport; A4 (transport)

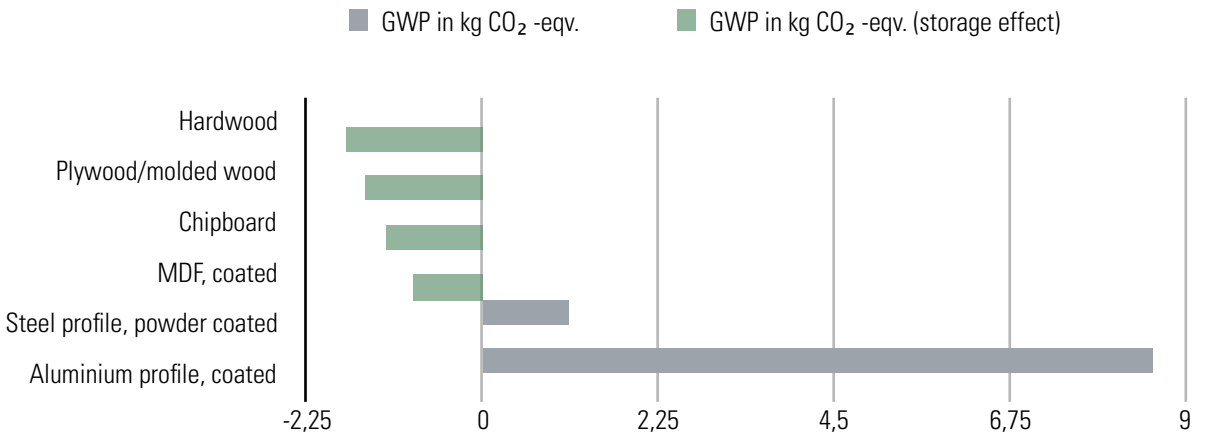
Use of resources			
Indicator	Direction	Unit	A4
Total non-renewable primary energy (PENRT)	Input	MJ	0,1094
Use of freshwater resources (FW)	Ouput	m^3	5,636E-07
Environmental impact			
Global Warming Potential (GWP)	Output	Kg CO_2-eqv.	0,009011

2.2 Construction materials comparison

Environmental impacts of construction materials per kilogram:[2]







[2] BMI 2021: Ökobaudat. database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/21

3 Certificates

The materials and processes required for value creation are fundamental to sustainable furniture construction. With the help of certifications, not only ecological but also social sustainability for products, companies and processes can be ensured to the greatest possible extent. They can guarantee consistent quality and make it easier for us and ultimately also for our customers to comprehend the abundance of offers on the market.

Tab. 3 A: Explanations of important certificates

	Blue Angel: The Blue Angel guarantees compliance with the highest standards for environmental, health and usage properties. The entire life cycle of the product is taken into account.
	CE: With the CE label, the manufacturing company, distributor or EU authorized representative ensures, in accordance with EU Regulation 765/2008, that the product complies with the applicable requirements.
	Émissions Dans L'Air Intérieur: The French VOC label has been mandatory for products entering the French market since January 1, 2012, and classifies them according to emission classes from A+ to C. The basis of the test corresponds to ISO 16000, which is the basis of the methodology for the Committee for Health-related Evaluation of Building Products (AgBB) and the German Institute for Building Technology (DIBt).
	EU Ecolabel: The EU Ecolabel is a certification for environmentally friendly products and services. It aims to reduce global pollution and is a recognized EU ecolabel in all member states of the European Union as well as in Norway, Liechtenstein and Iceland.
	FSC: The Forest Stewardship Council (FSC) was founded in 1993, one year after the Environment and Development conference in Rio de Janeiro. FSC is a certificate for responsible and sustainable forest management and applies not only to wood but also to many other forest products, such as resin, brushwood, berries and mushrooms.
	GOLS: GOLS stands for Global Organic Latex Standard and is a certification program of the internationally active Control Union Certifications foundation. It recognizes latex products that consist of more than 95 % certified organic material and comply with defined limits for harmful substances, emissions, polymers and fillers. For certified products, the entire value chain must comply with strict ecological and social standards.
	GOTS ("organic"): GOTS stands for Global Organic Textile Standard and is a certification program that identifies environmentally friendly and socially responsible products made from textile fibers. To receive the GOTS "organic" certificate, the respective product must consist of at least 95% organically produced fibers. Organic and socially responsible production means farming without the use of permanent/toxic pesticides, avoiding genetically modified seeds, maintaining soil fertility without critical fertilizers, respecting species-appropriate animal husbandry and complying with minimum social standards.
	GREENGUARD Certification: The GREENGUARD certificate is an environmental certification from the environmental organization UL Environment for products of various kinds. It ensures that certified products meet strict requirements for the emission of volatile organic compounds (VOCs) into indoor atmosphere.
	ISO 9001: The international certification according to ISO 9001 independently defines a worldwide recognized standard for the requirements of an effective quality management.
	ISO 14001: The international certification ISO 14001 defines requirements for an environmental management system for products and services.
	ISO 50001: ISO 50001 is a global standard and defines requirements for effective energy management. Key objectives of the ISO 50001 standard are energy efficiency, reduction of CO_2 emissions, and other environmental impacts resulting from energy consumption.

	NHLA: The NHLA, National Hardwood Lumber Association has developed a Sustainability Verification Certificate which, similar to the FSC certificate, specifically addresses environmental issues and sets requirements for sustainable forest management.
	Nordic swan: The Nordic Swan is an eco-label similar to the Blue Angel for particularly environmentally friendly products. It was launched in 1989 by the Nordic Council of Ministers and is a Type 1 eco-label according to ISO 14024.
	OEKO-TEX 100: OEKO-Tex® 100 is a globally recognized, independent assessment and certification system for textile raw materials, intermediate and end products at all stages of processing, as well as for accessory materials used. The test criteria and limit values refer to important legal regulations on banned azo dyes, formaldehydes, nickel, etc. as well as the European chemicals regulation REACH and numerous other environmentally relevant substance classes.
	PEFC: The Program for Endorsement of Forest Certification Schemes (PEFC) originates from an initiative of the European Forest Owners Association. It was founded in Helsinki in 1999 to protect European forests and covers around 69 % of the certified forest area in Germany.
	Qualitätsverband Umweltverträgliche Latexmatratzen e.V.: QUL testing stands for pollutant-free natural latex products of the highest quality. Certified mattresses meet the most stringent requirements in terms of pollutant emissions and chemical components - the tests ensure that the products of member companies do not contain critical ingredients such as pesticides, harmful heavy metals, PCPs or other VOCs in concentrations of concern. In addition, mechanical properties are also tested. The chemical test for all natural products is carried out once a year, the mechanical test every three years.
	REACH: Regulation (EC) No. 1907/2006 (REACH Regulation) is a chemicals regulation of the European Union. It became valid on June 1, 2007 and is used for the registration, evaluation, authorization and restriction of chemicals. REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals.
	Responsible Down Standard: The Responsible Down Standard (RDS) is a certification of Control Union Certifications Germany GmbH for down and feather products. The accompanying requirements cover the entire supply chain. The RDS certification guarantees the renunciation of force-feeding as well as live plucking and enables a gapless traceability of the raw materials from the producer to the processing plants. An inspection of the certified farms is carried out annually.

The following table shows the affiliation of the certificates to the respective materials/products:

Tab. 3 B: Certifications affiliations

Product/ material	Certificates						
European hardwood	FSC	PEFC					
US American hardwood		The Evergreen Initiative					
Wood based materials	FSC	PEFC	REACH	ISO 50001			
Oil	ISO 14001	ISO 9001					
Varnish	ISO 14001	ISO 50001	ISO 9001	EMISSIONS DANS L'AIR INTÉRIEUR A+			
Stain	ISO 14001	ISO 50001	ISO 9001	EMISSIONS DANS L'AIR INTÉRIEUR A+			
Adhesive	ISO 9001	REACH					
Fabric, kvadrat	EU Ecolabel	UL		ISO 14001			
Fabric, rohi	ISO 9001						
Leather, Elmo	ISO 14001	ISO 9001					
Leather, Reinhardt							
Upholstery material		REACH					
Cotton, organic	GLOBAL ORGANIC TEXTILE STANDARD GOTS						
Down		R·D·S					

Natural latex, organic							
Polyester fiber sticks							
Sheep wool fleece							
Molded fleece							
Cardboard packaging							
Ceramics							
NOON-Screens							
Slatted frame							
Linoleum							
Metal							

4 Materials

Tab. 4: Materials; Overview

4.1 Wood	- American cherry - American walnut - Beech - Oak - Ash	
4.2 Wood-based materials	- Medium density fiberboard (MDF) - Plywood (moulded wood)	
4.3 Metals	- Aluminium - Steel	
4.4 Textiles	Cover material	- Kvadrat fabric
		- Rohi fabric
4.5 Leather	- Elmo leather	
	- Reinhardt leather	
4.6 Upholstery material (Fibrous materials)	Upholstery filling material	- Cotton - Kapok - Coconut fiber - Horsehair - Virgin wool
(Non-fibrous materials)	Natural	- Down - Natural latex
	Synthetic	- PUR foam - Polyester wadding
4.7 Plastics	- Bio-plastic - Polyamide	
4.8 Adhesives	- PUR adhesive - PVAc adhesive	
4.9 Surfaces	- Linseed oil varnish - Stain - Varnish	
4.10 Linoleum		

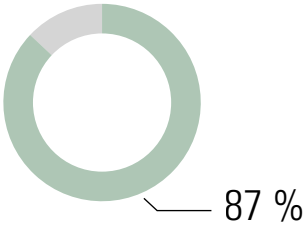
4.1 Wood

Tab. 4.1: Classification of wood or wood-based materials according to their particle size

Particle size	Products	Abbreviation
Solid wood	- Solid wood panels - Slatted frames - Construction timber - Solid structural timber - Laminated timber - Laminated timber panels	 KVH BSH
Veneer	- Veneer - Laminated veneer lumber - Plywood	 LVL FU
Wood chips	- Chipboard - Oriented Strand Board	P1 - P7 OSB
Wood fibers	- High density fiberboard - Medium density fiberboard - Wood fiber insulation board	HDF MDF HFD
Composite systems	- Rod plywood - Rod plywood	ST STAE

Chemical components (cellulose, lignin)	- Wood Plastic Composites
	- Liquid wood
	- Chemical pulp (paper)
	- Cellulosic synthetic fibers:
	
	  - Viskose
	  - Modal
	  - Lyocell
	  - Cupro
	  - Acetat
	  - Triacetat
		WPC
		
		CV
		CMD
		CLY
		CUP
		CA
		CTA

4.1.1 American cherry



Tab. 4.1.1 A: Material data sheet, American cherry, general[34]

Material group	Natural material; wood; hardwood
Botanical name	*Prunus serotina Ehrh. (Rosaceae)*
Name	American Cherry (GB); Amerikanischer Kirschbaum (D); Merisier d'Amerique (F); Black Cherry (US)
Material Norm. Ref.	DIN EN 13556: PRSR
Origin	Pennsylvania
Occurrence	America; widest distribution Pennsylvania, Tennessee, Ohio, West Virginia
Use	Such as European cherry; solid and veneer, furniture and interior finishes; turning; marine interiors; small and seating furniture; woodwind instruments; wall and ceiling paneling; knife handles; etc.

[3] WAGENFUEHR, R. (2007) - Wood Atlas. (6) Leipzig: Hanser Wirtschaft, Fachbuchverlag Leipzig, pp. 395-398

[4] LOHMANN, U. (2010) - Wood encyclopedia. The standard work for wood and forestry. (4) Hamburg: Nikol-Verlag, pp. 679-680

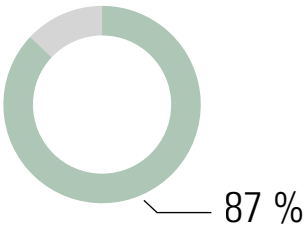
Tab. 4.1.1 B: Material data sheet, American cherry, specific[5]

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 m³	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 m³	
Global Warming Potential (GWP)	26,907 Kg CO_2-eqv.	
Main raw material origin: Pennsylvania/Production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
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

[5] 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	Good; can be cut and peeled, suitable for turning and carving	
Drying	Good; chamber drying 50 ... 70 °C, otherwise tendency to cracking and warping; good durability	
Adhesion	Good	
Surface finishing	Good; can be stained and varnished	
Natural durability DIN EN 350-2 (with weathering)	Moderately durable; sapwood susceptible to fungus and insects; durability class 3	
Physical properties		
Kiln density (0 % wood moisture content)	490… 545… 580 kg/m³	
Bulk density (12 - 15 % wood moisture)	525… 580… 615 kg/m³	
Pore ratio	ca. 64 %	
Shrinkage rate at 1 % moisture reduction	radial - 0.13 %; tangetial - 0.27 %; volume - 0.25 %	
Mechanical properties		
Compressive strength (σ_{dB})	33… 49… 59 N/mm²	
Flexural strength (σ_{bB})	59… 83… 98 N/mm²	
Shear strength (τ_{aB})	ca. 15 N/mm²	
Hardness (HB ‖)	39… 47… 53 N/mm²	
Hardness (HB ⊥)	20… 24… 30 N/mm²	
E-modulus (E_b ‖)	ca. 11000 N/mm²	

4.1.2 American walnut



Tab. 4.1.2 A: Material data sheet, American walnut, general[6][7]

Material group	Natural material; wood; hardwood
Botanical name	*Juglans nigra L. (Juglandaceae)*
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.

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

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

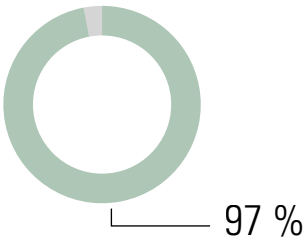
Tab. 4.1.2 B: Material data sheet, American walnut, specific[8]

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 m³	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 m³	
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 m³	
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 m³	
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

[8] 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/m³	
Bulk density (12 - 15 % wood moisture)	580… 640… 810 kg/m³	
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/mm²	
Flexural strength (σ_{bB})	90… 103 N/mm²	
Tensile strength ($\sigma_{zB} \perp$)	ca. 4,7 N/mm²	
Shear strength (τ_{aB})	8,8… 9,6 N/mm²	
Hardness (HB ‖)	ca. 50 N/mm²	
Hardness (HB ⊥)	ca. 26 N/mm²	
E-modulus (E_b ‖)	11000… 13500 N/mm²	

4.1.3 Beech



Tab. 4.1.3 A: Material data sheet, beech, general[9][10]

Material group	Natural material; wood; hardwood
Botanical name	*Fachs sylvatica L. (Fagaceae)*
Name	Beech (GB); Buche, Rotbuche (D); Hétre (F)
Material Norm. Ref.	DIN EN 13556: FASY
Origin	Northern Germany, Germany, (Central Europe)
Occurrence	Western, central and southern Europe; prefers loose, mineral-rich and well-watered soils; sensitive to low temperatures and late frosts
Use	Veneer; mainly as peeling lumber for plywood, composite panels, etc.; furniture making; paneling and parquet; structural lumber for medium duty, automotive and mechanical engineering, building construction and civil engineering; specialty lumber for particleboard and fiberboard, pulp and paper, sports equipment, workbenches, stairs; musical instruments, etc.

[9] WAGENFUEHR, R. (2007) - Wood Atlas. (6) Leipzig: Hanser Wirtschaft, Fachbuchverlag Leipzig, pp. 672-676

[10] LOHMANN, U. (2010) - Wood encyclopedia. The standard work for wood and forestry. (4) Hamburg: Nikol-Verlag, page 192

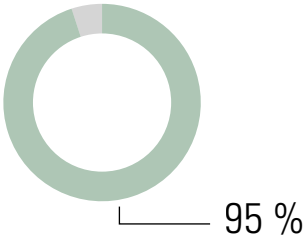
Tab. 4.1.3 B: Material data sheet, beech, specific[11]

General description		
Certifications/Information	FSC and PEFC 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 m^3	**A1-A3**	
Global Warming Potential (GWP)	-1,74 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (720 kg/m^3)		10
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: Germany, Central Europe/Production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m^3	
Global Warming Potential (GWP)	89,69 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	10
Total average rating		**9,66**
Processing		
Mechanical	Good for sawing, planing, turning, bending, carving; optimum cutting speed 30 m/s, can be cut and peeled	
Drying	Good; tendency to tear and warp; dry gently as it shrinks a lot	

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

Adhesion	Good	
Surface finishing	Good; can be stained and varnished	
Natural durability DIN EN 350-2 (with weathering)	Low; susceptible to fungus and insects; not weather resistant; protect carefully in outdoor areas; durability class 3 to 4	
Physical properties		
Kiln density (0 % wood moisture content)	490… 680… 880 kg/m³	
Bulk density (12 - 15 % wood moisture)	540… 720… 910 kg/m³	
Pore ratio	ca. 55 %	
Shrinkage rate at 1 % moisture reduction	radial - 0,20 %; tangetial - 0,40 %; volume - 0,46… 0,60 %	
Mechanical properties		
Compressive strength (σ_{dB})	41… 62… 99 N/mm²	
Flexural strength (σ_{bB})	74… 123… 210 N/mm²	
Tensile strength ($\sigma_{zB} \perp$)	7,0… 10,7 N/mm²	
Shear strength (τ_{aB})	6,5… 8,0… 19,0 N/mm²	
Hardness (HB ‖)	ca. 72 N/mm²	
Hardness (HB ⊥)	ca. 34 N/mm²	
E-modulus (E_b ‖)	10000… 16000… 18000 N/mm²	

4.1.4 Oak



Tab. 4.1.4 A: Material data sheet, oak, general[12][13]

Material group	Natural material; wood; hardwood
Botanical name	*Quercus robur L./Q. patrea Liebl. (Fagaceae)*
Name	European Oak (GB, US); Eiche (D), Sommereiche (D); Chêne (F)
Material Norm. Ref.	DIN EN 13556: QCXE
Origin	Germany, (Central Europe)
Occurrence	Europe to Asia Minor; North America; most common European occurrence in France
Use	Solid and veneer, mainly sliced veneer; furniture and interior fittings; paneling and parquet; structural timber, etc.

[12] WAGENFUEHR, R. (2007) - Wood Atlas. (6) Leipzig: Hanser Wirtschaft, Fachbuchverlag Leipzig, pp. 255-277

[13] LOHMANN, U. (2010) - Wood encyclopedia. The standard work for wood and forestry. (4) Hamburg: Nikol-Verlag, pp. 284-285

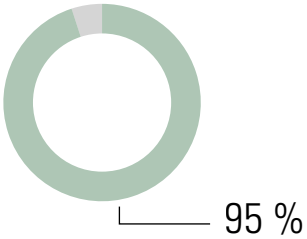
Tab. 4.1.4 B: Material data sheet, oak, specific[14]

General description		
Certifications/Information	FSC and PEFC 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 m³	10
Environmental impact per m³	**A1-A3**	
Global Warming Potential (GWP)	-1,74 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (690 kg/m³)		9
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 m³	
Global Warming Potential (GWP)	26,907 Kg CO_2-eqv.	
Main raw material origin: Germany, Central Europe/Production site		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 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	10
Total average rating		**9,5**
Processing		
Mechanical	Good; can be cut and peeled, suitable for turning and carving; pre-drill thin wood for nailing	
Drying	Moderately good; slow; tendency to tear and warp; predrying outdoors favorable; good durability	

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

Adhesion	Good; alkalis can cause stains	
Surface finishing	Good; can be stained and varnished, if necessary use pore filler when varnishing; tinting of wood color by smoking	
Natural durability DIN EN 350-2	durable; sapwood low;heartwood durable; also in water; durability class 2	
Physical properties		
Kiln density (0 % wood moisture content)	390… 650… 930 kg/m³	
Bulk density (12 - 15 % wood moisture)	430… 690… 960 kg/m³	
Pore ratio	ca. 57 %	
Shrinkage rate at 1 % moisture reduction	radial - 0,20 %; tangetial - 0,32 %; volume - 0,45 %	
Mechanical properties		
Compressive strength (σ_{dB})	Q. robur: 54… 61… 67 N/mm² Q. petraea: 48… 65… 70 N/mm²	
Flexural strength (σ_{bB})	Q. robur: 74… 88… 105 N/mm² Q. petraea: 78… 110… 117 N/mm²	
Tensile strength (σ_{zB} ‖) Tensile strength (σ_{zB} ⊥)	50… 90… 180 N/mm² 2,6… 4,0… 9,6 N/mm²	
Shear strength (τ_{aB})	6,0… 11,0… 13,0 N/mm²	
Hardness (HB ‖)	50… 66 N/mm²	
Hardness (HB ⊥)	25… 34 N/mm²	
E-modulus (E_b ‖)	Q. robur: 10000… 11700… 13200 N/mm² Q. petraea: 9200… 13000… 13500 N/mm²	

4.1.5 Ash



Tab. 4.1.5 A: Material data sheet, ash, general[15][16]

Material group	Natural material; wood; hardwood
Botanical name	*Fraxinus excelsior (Oleaceae)*
Name	Common Ash (GB); Gemeine Esche (D); Frêne commun (F)
Material Norm. Ref.	DIN EN 13556: ACPL
Origin	Germany, (Central Europe)
Occurrence	Europe to central Russia, Near East Prefers fresh to moist soils, but also grows well on rocky terrain and dry limestone soils, as well as on plains and in mountainous areas
Use	Veneer; especially cut and peeled wood; furniture making; paneling; parquet and construction wood for medium demands, special construction for sports equipment, boat building, etc.

[15] WAGENFUEHR, R. (2007) - Wood Atlas. (6) Leipzig: Hanser Wirtschaft, Fachbuchverlag Leipzig, pp. 279-285

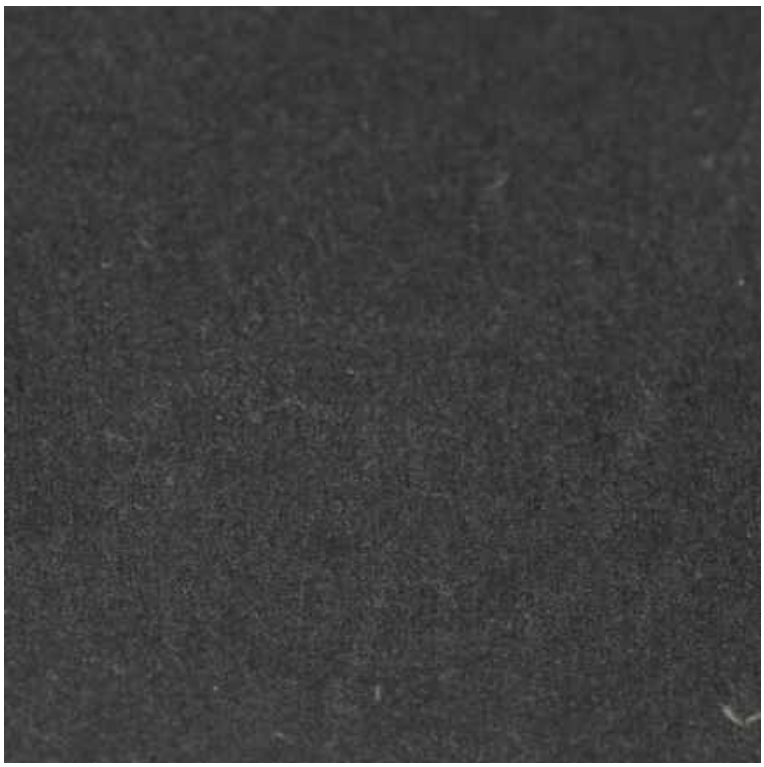
[16] LOHMANN, U. (2010) - Wood encyclopedia. The standard work for wood and forestry. (4) Hamburg: Nikol-Verlag, pp. 321-322

Tab. 4.1.5 B: Material data sheet, ash, specific[17]

General description		
Certifications/Information	FSC and PEFC 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 m³	10
Environmental impact per m³	**A1-A3**	
Global Warming Potential (GWP)	-1,74 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (720 kg/m³)		9
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 m³	
Global Warming Potential (GWP)	26,907 Kg CO_2-eqv.	
Main raw material origin: Germany, Central Europe/Production site		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 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	10
Total average rating		**9,5**
Processing		
Mechanical	Good; woods with higher bulk density tend to tear out when planed; can be cut and peeled	
Drying	Good; technical drying is preferable	
Adhesion	Good	

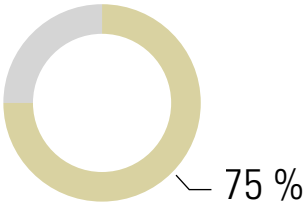
[17] BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

Surface finishing	Good; can be stained and varnished	
Natural durability DIN EN 350-2	Low, especially outdoors; not weather-resistant; however, fairly resistant to alkalis and acids; durability class 5	
Physical properties		
Kiln density (0 % wood moisture content)	410… 650… 820 kg/m³	
Bulk density (12 - 15 % wood moisture)	450… 720… 860 kg/m³	
Pore ratio	ca. 57 %	
Shrinkage rate at 1 % moisture reduction	radial - 0,13 %; tangetial - 0,72 %; volume - 0,43-0,45 %	
Mechanical properties		
Compressive strength (σ_{dB})	23… 52… 80 N/mm²	
Flexural strength (σ_{bB})	58… 105… 210 N/mm²	
Tensile strength (σ_{zB} ‖) Tensile strength (σ_{zB} ⊥)	70… 165… 293 N/mm² 7… 11,2 N/mm²	
Shear strength (τ_{aB})	9… 12… 14,6 N/mm²	
Hardness (HB ‖)	36… 65… 100 N/mm²	
Hardness (HB ⊥)	37… 41 N/mm²	
E-modulus (E_b ‖)	4400… 13400… 18100 N/mm²	



4.2 Wood-based materials

4.2.1 MDF, medium density fiberboard (black)



Tab. 4.2.1 A: Material data sheet, MDF, general[18]

Material group	Natural synthetic material; wood based panels; fiberboards
Name	Medium Density Fiberboard, MDF (GB, US); Mitteldichte Faserplatte, MDF (D)
Short name	MDF
Manufactured in	Germany; Poland
Origin of the wood	Austria, Belarus, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Lithuania, Luxembourg, Netherlands, Norway, Poland, Slovenia, Spain, Switzerland, UK
Version	Black
Use	Predominantly for industrial furniture construction and interior finishing; MDF. LA, load-bearing, dry, service class lt. EN 1995-1-1: 1; MDF. HLS, load-bearing purposes, moist, service class lt. EN 1995-1-1: 1 and 2; MDF. RWH, sarking boards for roofing and walls, service class lt. EN 1995-1-1

[18] 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. 4.2.1 B: Material data sheet, MDF, specific[19][20]

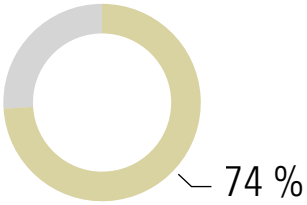
General description		
Certifications/Information	FSC, PEFC, E1 (EU), CARB (USA), CE	
Emission class	E1, CARB	
Fire resistance	**Fire behavior**: D-s2,d0 according to EN 13986 depending on end use (thickness: ≥9 mm/raw density: ≥600 kg/m³)	
Length	2800 - 5600 mm	
Wide	2100 mm	
Thickness	10 - 25 mm	
Color	Anthracite to black, partly darker and lighter inlays	
Texture	Plain, fibrous mottled (top view), loose to very fine scatter (cross section)	
Basic materials		
Wood chips	Predominantly spruce and pine, approx. 82 %.	
Binder	Synthetic binders; UMF adhesive (urea-melamine-formaldehyde resin), approx. 11 %.	
Water	ca. 5-7 %	
Kerosene wax emulsions	< 1 %	
Life cycle assessment data MDF, average (GER)		4,66
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	13,09 MJ	2
Use of freshwater resources (FW)	0,0037 m³	2
Environmental impact per m³	**A1-A3**	
Global Warming Potential (GWP)	-0,088 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (720 kg/m³)		8,5
Production site: Germany, Poland/ZEITRAUM		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 CO_2-eqv.	
Main raw material origin: Germany, Central Europe/production site		
Truck - ca. 1500 km	A4	9
Total non-renewable primary energy (PENRT)	1812 MJ	

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

[20] 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

Use of freshwater resources (FW)	0,09582 m^3	
Global Warming Potential (GWP)	134,535 CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	10
Total average rating		**7,52**
Processing		
Mechanical	Very good; can be sawed, drilled and milled with common machines	
Adhesion	Good	
Surface finishing	Moderately good; material tends to swell in combination with water, aqueous primers must therefore be intermediately sanded	
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)	
Physical properties		
Bulk density according to EN 323	670… 730 kg/m^3	
Basis weight (18 mm)	12,1… 13,1 kg/m^2	
Material moisture at delivery	4 - 8 %	
Mechanical properties		
Compressive strength (σ_{dB})	12 N/mm^2	
Flexural strength (σ_{bB})	21 N/mm^2	
Tensile strength (σ_{zB} ||)	12 N/mm^2	
Shear strength (τ_{aB})	6,5 N/mm^2	
E-modulus (E_b ||)	2900 N/mm^2	

4.2.2 MDF, medium density fiberboard, coated



Tab. 4.2.2 A: Material data sheet, MDF, coated, general[21]

Material group	Natural synthetic material; wood based panels; fiberboards
Name	Medium Density Fiberboard, MDF (GB, US); Mitteldichte Faserplatte, MDF (D)
Short name	MDF
Manufactured in	Germany, Poland
Origin of the wood	Germany (hardwood and softwood), 87% of which sourced regionally
Version	Coatings: - Light Grey U 708 PM - Graphite Grey U961 PM
Use	Predominantly for industrial furniture construction and interior finishing; MDF. LA, load-bearing, dry, service class lt. EN 1995-1-1: 1; MDF. HLS, load-bearing purposes, moist, service class lt. EN 1995-1-1: 1 and 2; MDF. RWH, sarking boards for roofing and walls, service class lt. EN 1995-1-1

[21] 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. 4.2.2 B: Material data sheet, MDF, coated, specific[22][23]

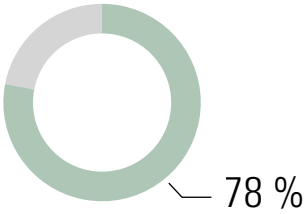
General description		
Certifications/Information	FSC, PEFC, E1 (EU), CARB 2 (USA), TSCA, EPD, ISO 9001	
Emission class	E1E05, CARB2, TSCA	
Fire resistance	**Fire behavior**: D-s2,d0	
Length	n.a.	
Wide	n.a.	
Thickness	n.a.	
Color	Light Grey U 708 PM, Graphite Grey U961 PM	
Texture	Smooth, monochromatic (top view), loose to very fine scattering (cross section)	
Basic materials/auxiliary materials		
Wood fibers	approx. 90 % (hardwood and softwood)	
Binder	Synthetic binders; UMF adhesive (urea-melamine-formaldehyde resin), approx. 10%	
Water	ca. 5-7 %	
Kerosene wax emulsions	< 1 %	
Life cycle assessment data MDF, coated (GER)		4,66
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	13,09 MJ	2
Use of freshwater resources (FW)	0,0037 m^3	2
Environmental impact per m^3	**A1-A3**	
Global Warming Potential (GWP)	-0,088 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (720 kg/m^3)		8,5
Production site: Germany, Poland/ZEITRAUM		
Truck - 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)	134,535 CO_2-eqv.	
Main raw material origin: Central Europe/Production site		
Truck - ca. 1500 km	A4	9

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

[23] 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.

Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m^3	
Global Warming Potential (GWP)	134,535 CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ Recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	9
Total average rating		**7,36**
Processing		
Mechanical	Very good; can be sawed, drilled and milled with common machines	
Adhesion	Good	
Surface finishing	Moderately good; material tends to swell in combination with water, aqueous primers must therefore be intermediately sanded	
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)	
Physical properties		
Bulk density according to EN 323	600… 800 kg/m^3	
Basis weight (18 mm)	12,1… 13,1 kg/m^2	
Material moisture at delivery	ca. 4 - 8 %	
Mechanical properties		
Flexural strength (σ_{bB})	30 N/mm^2	

4.2.3 MDF, medium density fiberboard



Tab. 4.2.2 A: Material data sheet, MDF, general[24]

Material group	Natural synthetic material; wood based panels; fiberboards
Name	Medium Density Fiberboard, MDF (GB, US); Mitteldichte Faserplatte, MDF (D)
Short name	MDF
Manufactured in	Germany, Poland
Origin of the wood	Germany (hardwood and softwood), 87% of which sourced regionally
Use	Predominantly for industrial furniture construction and interior finishing; MDF. LA, load-bearing, dry, service class lt. EN 1995-1-1: 1; MDF. HLS, load-bearing purposes, moist, service class lt. EN 1995-1-1: 1 and 2; MDF. RWH, sarking boards for roofing and walls, service class lt. EN 1995-1-1

[24] 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

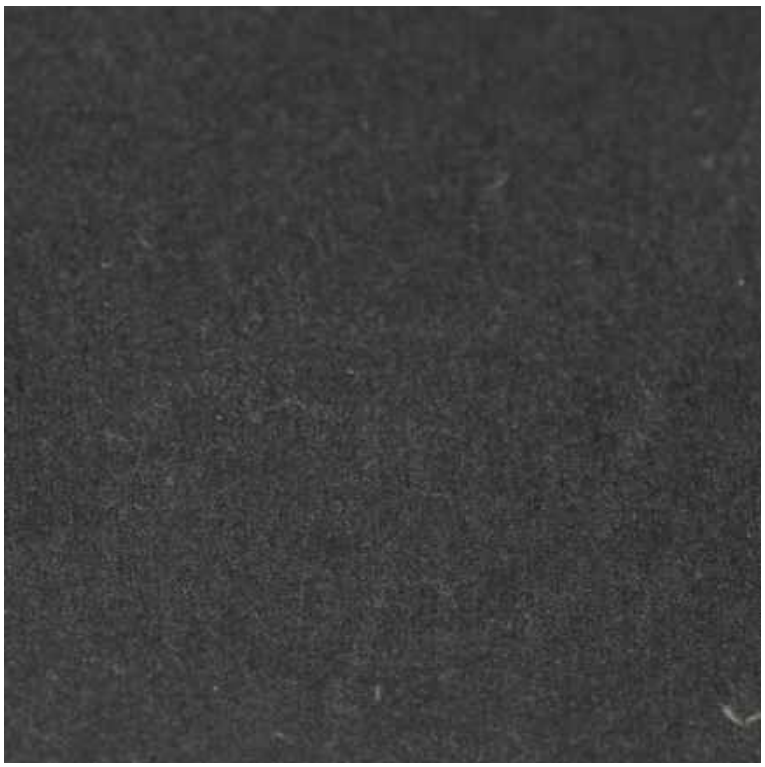
Tab. 4.2.3 B: Material data sheet, MDF, specific[25][26]

General description		
Certifications/Information	FSC, PEFC, E1 (EU), CARB 2 (USA), TSCA, EPD, ISO 9001	
Emission class	E1E05, CARB2, TSCA	
Fire resistance	**Fire behavior**: D-s2,d0	
Length	n.a.	
Wide	n.a.	
Thickness	n.a.	
Basic materials/auxiliary materials		
Wood fibers	approx. 90 % (hardwood and softwood)	
Binder	Synthetic binders; UMF adhesive (urea-melamine-formaldehyde resin), approx. 10%	
Water	ca. 5-7 %	
Kerosene wax emulsions	< 1 %	
Life cycle assessment data MDF (GER)		7
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	8,46 MJ	6
Use of freshwater resources (FW)	0,0025 m^3	5
Environmental impact per m^3	**A1-A3**	
Global Warming Potential (GWP)	-0,99 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (720 kg/m^3)		8,5
Production site: Germany, Poland/ZEITRAUM		
Truck - 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)	134,535 CO_2-eqv.	
Main raw material origin: Central Europe/Production site		
Truck - ca. 1500 km	A4	9
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m^3	

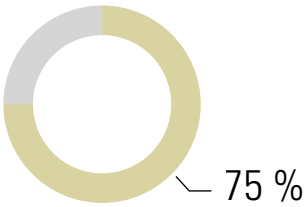
[25] BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021.

[26] 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.

Global Warming Potential (GWP)	134,535 CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ Recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	9
Total average rating		**7,75**
Processing		
Mechanical	Very good; can be sawed, drilled and milled with common machines	
Adhesion	Good	
Surface finishing	Moderately good; material tends to swell in combination with water, aqueous primers must therefore be intermediately sanded	
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)	
Physical properties		
Bulk density according to EN 323	600… 800 kg/m³	
Basis weight (18 mm)	12,1… 13,1 kg/m²	
Material moisture at delivery	ca. 4 - 8 %	
Mechanical properties		
Flexural strength (σ_{bB})	30 N/mm²	



4.2.4 MDF, medium density fiberboard (black, veneered), AD JUST



Tab. 4.2.4 A: Material data sheet, MDF, medium density fiberboard (black, veneered), AD JUST, general[27]

Material group	Natural synthetic material; wood based panels; fiberboards
Name	Medium Density Fiberboard, MDF (GB, US); Mitteldichte Faserplatte, MDF (D)
Short name	MDF
Manufactured in	France
Origin of the wood	Europe (top veneer outside Germany if necessary)
Version	Black, veneered
Use	Predominantly for industrial furniture construction and interior finishing

[27] 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. 4.2.4 B: Material data sheet, MDF, medium density fiberboard (black, veneered), AD JUST, specific[28][29]

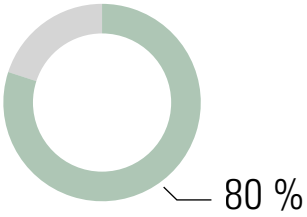
General description		
Certifications/Information	PEFC, E1 (Measured values comply with the requirement according to E1 (EU)), CARB (USA), CE	
Emission class	E1, CARB	
Formaldehyd emission (717-1)	≤ 0,05 ppm	
Fire resistance (EN-13501-1)	**Fire behavior**: D-s2,d0	
Thickness	11 - 41 mm	
Color	Anthracite to black, partly darker and lighter inlays	
Texture	Plain, fibrous mottled (top view), loose to very fine scatter (cross section)	
Life cycle assessment data MDF, average (GER)		4,66
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	13,09 MJ	2
Use of freshwater resources (FW)	0,0037 m³	2
Environmental impact per m³	**A1-A3**	
Global Warming Potential (GWP)	-0,088 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (720 kg/m³)		8,5
Production site: France/ZEITRAUM		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 CO_2-eqv.	
Main raw material origin: Europe/production site		
Truck - ca. 1500 km	A4	9
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9

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

[29] 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

Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	10
Total average rating		**7,52**
Processing		
Mechanical	Very good; can be sawed, drilled and milled with common machines	
Adhesion	Good	
Surface finishing	Moderately good; material tends to swell in combination with water, aqueous primers must therefore be intermediately sanded	
Biological durability use (EN 335)	Class: 1	
Physical properties		
Bulk density according to EN 323	670… 750 kg/m³	
Material moisture at delivery	3 - 7 %	
Mechanical properties		
Flexural strength (σ_{bB})	17 - 22 N/mm²	
E-modulus (E_b ||)	1900 - 2500 N/mm²	

4.2.5 Plywood, veneer panel (moulded wood)



Tab. 4.2.5 A: Material data sheet, plywood, veneer panel, general[30]

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	Germany
Origin of the wood	Germany (top veneer outside Germany if necessary)
Version	Moulded wood
Use	Mainly for industrial furniture making and interior design; plywood moldings; boat and aircraft building; special parts: bulletproof elements impregnated in resin; model and tool making

[30] 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

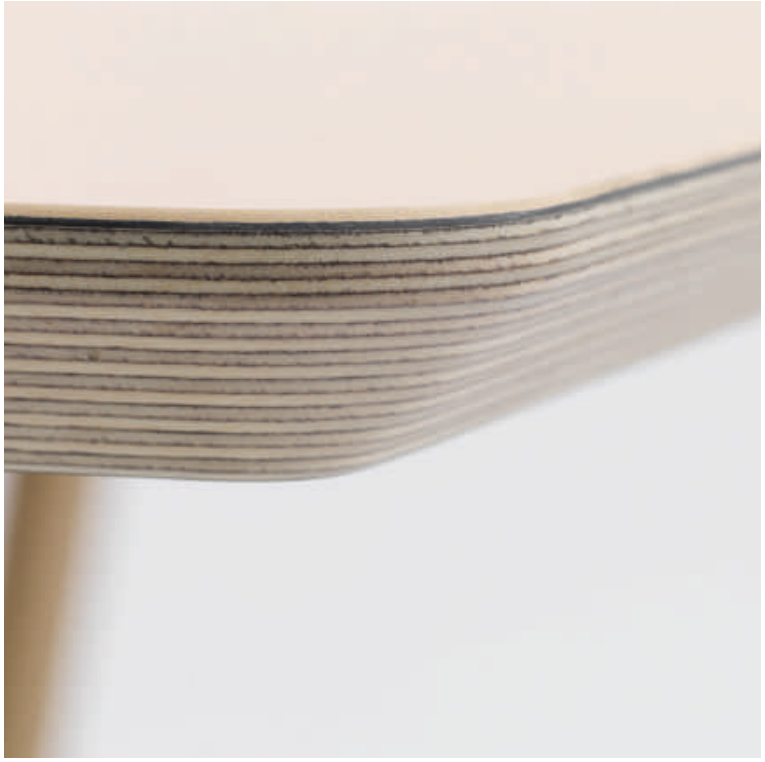
Tab. 4.2.5 B: Material data sheet, plywood, veneer panel, specific[31][32]

General description (manufacturer spec.)		
Certifications/Information	FSC, PEFC, E1 (EU), ISO 50001, REACH	
Emission class	E1 (CARB not relevant)	
Fire resistance	**Fire behavior**: The tested product fulfills the requirements of building material class B1 for flame-retardant building materials according to DIN 4102, Part 1 (May 1998) when freely suspended or at a distance greater than 40 mm from the same or other flat building materials	
General description (general)		
Length	1220 - 3050 mm	
Wide	1220 - 3050 mm	
Thickness	4 - 80 mm	
Color	mostly light white yellowish (birch, spruce, pine, maple and poplar), to reddish (beech) rotary cut veneer, birch, beech or poplar; figured, plain	
Texture	plain, figured, smooth (top view), structure of several layers of veneer, smooth (cross section)	
Basic materials/auxiliary materials		
Veneer layers	From at least three layers; 0.8 - 2.5 mm thick veneer layers	
Binder	Synthetic binders; UMF adhesive (melamine-formaldehyde resin), urea-formaldehyde resin (UF adhesive); approx. 5%	
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 m^3	**A1-A3**	
Global Warming Potential (GWP)	-1,5 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (1200 kg/m^3)		9,5
Production site: Germany/ZEITRAUM		
Truck - ca. 1000 km	A4	9
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,064 m^3	

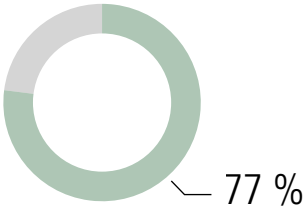
[31] BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

[32] 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

Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Main raw material origin: Germany/Production site		
Truck - ca. < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m^3	
Global Warming Potential (GWP)	8,969 CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	10
Total average rating		**7,97**
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)	
Physical properties		
Bulk density according to EN 323	400… 1000 kg/m^3	
Basis weight (18 mm)	n.a.	
Material moisture at delivery	8 %	
Mechanical properties		
Compressive strength (σ_{dB})	n.a.	
Flexural strength (σ_{bB})	5… 120 N/mm^2	
Tensile strength (σ_{zB} ||)	n.a.	
Shear strength (τ_{aB})	n.a.	
E-modulus (E_b ||)	500… 14000 N/mm^2	



4.2.6 Plywood



Tab. 4.2.6 A: Material data sheet, plywood, plywood, general[33]

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	France
Origin of the wood	France
Version	Maritime pine plywood, 24 mm, according to DIN 13986
Use	Maritime pine plywood according to DIN 13986 for use according to DIN EN 1995-1-1/ Maritime pine plywood - according to DIN EN 636-3

[33] 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. 4.2.6 B: Material data sheet, plywood, plywood, specific[34][35]

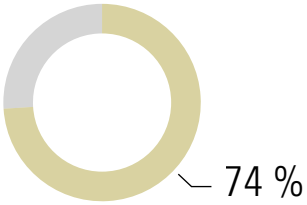
General description (manufacturer spec.)		
Certifications/Information	PEFC, E1 (EU), CE, BFU 100	
Emission class	E1	
Fire resistance	**Fire behavior**: according to DIN EN 13986: D-s2, d0, normal flammability, no burning dripping/falling off	
General description (general)		
Length	2440 - 2800 mm	
Wide	1220 - 1250 mm	
Thickness	7 - 45 mm	
Color	Mostly light white yellowish rotary cut veneer (maritime pine)	
Texture	Plain, figured, smooth (top view), structure of several layers of veneer, smooth (cross section)	
Basic materials/auxiliary materials		
Veneer layers	From at least three layers (7 mm) to 17 layers (45 mm)	
Binder	DIN EN 314-2 gluing class 3, outdoor use	
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 m^3	**A1-A3**	
Global Warming Potential (GWP)	-1,5 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (590-600 kg/m^3)		9
Production site: France/ZEITRAUM		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,096 m^3	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Main raw material origin: Central Europe/Production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	

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

[35] 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

Use of freshwater resources (FW)	0,06388 m^3	
Global Warming Potential (GWP)	89,69 CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	9
Total average rating		**7,72**
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)	
Physical properties		
Bulk density	540 kg/m^3	
Basis weight (18 mm)	n.a.	
Material moisture at delivery	ca. 8 %	
Mechanical properties		
Compressive strength (σ_{dB})	ca. 22,5 N/mm^2	
Flexural strength (σ_{bB})	ca. 15 N/mm^2	
Tensile strength (σ_{zB} ||)	ca. 13,5 N/mm^2	
Shear strength (τ_{aB}) (transverse to plate plane)	n.a.	
E-modulus (E_b ||)	ca. 5000 N/mm^2	

4.2.7 Plywood, back panels



Tab. 4.2.7 A: Material data sheet, Plywood, back panels, general[36]

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

[36] 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. 4.2.7 B: Material data sheet, Plywood, back panels, specific[37][38]

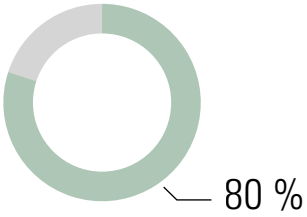
General description (manufacturer spec.)		
Certifications/Information	FSC 100 %, FSC Mix, FSC Controlled Wood	
Emission class	n.a.	
Fire resistance	**Fire behavior**: B1	
General description (general)		
Length	2540 mm	
Wide	1840 mm	
Thickness	4 - 19 mm	
Texture	Plain, figured, smooth (top view), structure 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 m^3	**A1-A3**	
Global Warming Potential (GWP)	-1,5 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (590-600 kg/m^3)		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		

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

[38] 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)	
Physical properties		
Bulk density	450 kg/m³	

4.2.8 Slatted frame slats



Tab. 4.2.8 A: Slatted frame, general[39]

Material group	Natural-synthetic material; wood-based materials; plywood; veneer panels
Name	Plywood (GB, US) Schichtholz Leisten(D)
Short name	FU
Manufactured in	Germany
Origin of the wood	Germany
Version	Slatted frame slats
Use	Slatted frames

[39] 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. 4.2.8 B: Slatted frame slats, specific[40][41]

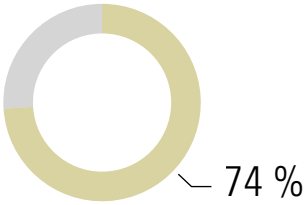
General description (manufacturer spec.)		
Certifications/Information	PEFC	
Life cycle assessment data plywood, average (GER)		6,33
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	6,8 MJ	8
Use of freshwater resources (FW)	0,004 m³	1
Environmental impact per m³	**A1-A3**	
Global Warming Potential (GWP)	-1,5 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (590-600 kg/m³)		10
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 m³	
Global Warming Potential (GWP)	26,907 Kg CO_2-eqv.	
Main raw material origin: Germany/Production site		
Truck - ca. < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	10
Total average rating		**8,05**
Processing		
Mechanical	Very good; can be sawed, drilled and milled with common machines	

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

[41] 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

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)	

4.2.9 Chipboard, P2



Tab. 4.2.9 A: Material data sheet, chipboard, P2, general[42]

Material group	Natural-synthetic material; wood-based materials; chipboard; P2
Name	Chipboard, Particleboard (GB, US); Flachpressplatte; Spanplatte (D)
Short name	FPY
Manufactured in	Czech Republic
Origin of the wood	Europe
Version	P2
Use	For furniture and interior fittings in dry areas, statically non-load-bearing

[42] 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. 4.2.9 B: Material data sheet, chipboard, P2, specific[43][44]

General description (manufacturer spec.)		
Certifications/Information	FSC, PEFC, E1 (EU)	
Emission class	E1	
Fire resistance	**Fire behavior**: according to DIN EN 13986: D-s1, d0, normal flammability, no smoke development, no burning dripping/falling off	
General description (general)		
Length	n.a.	
Wide	n.a.	
Thickness	n.a.	
Color	Mostly light white yellowish rotary cut veneer	
Texture	Wood chips of different sizes, dense top layers and looser middle layer are characteristic of a particleboard	
Basic materials/auxiliary materials (general)		
Fresh wood	15-25 %	
Industrial wood	60-70 %	
Waste wood	8-15 %	
Binder	6-10 %	
Life cycle assessment data particleboard, average (GER)		9
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	5,303 MJ	9
Use of freshwater resources (FW)	0,0011 m^3	8
Environmental impact per m^3	**A1-A3**	
Global Warming Potential (GWP)	-1,23 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (620-720 kg/m^3)		9,5
Production site: Czech Republic/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 Kg CO_2-eqv.	
Main raw material origin: Central Europe/production site		
Truck - ca. 1000 km	A4	10

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

[44] 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

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.	
Sustainability Assessment		
Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	90 %	9
Circulation potential	Only thermally recyclable	4
Socially compatible	Yes	8
Total average rating		**7,41**
Processing		
Mechanical	Very good; can be sawed, drilled and milled with common machines	
Adhesion	Very good	
Surface finishing	Good; varnishable; coating possible, narrow surfaces must be provided with a narrow surface coating	
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)	
Physical properties		
Bulk density	620-720 kg/m^3	
Material moisture at delivery	ca. 8 %	
Mechanical properties		
Compressive strength (σ_{dB})	ca. 13-15 N/mm^2	
E-modulus (E_b ||)	ca. 1900 N/mm^2	

4.3 Metal

4.3.1 Aluminium

58 %

Tab. 4.3.1 A: Material data sheet, aluminum, general[45][46]

Material group	Synthetic material; metals; light metals
Name	Aluminium (GB, US); Aluminium (D)
Short name	Al
Occurrence	Worldwide; largest manufacturing country for aluminum is China
Use	(Lightweight construction); articles of daily use in the sports and leisure sector; sanitary and architectural sector; electrical engineering: conductor material; furniture and accessories sector; aluminum foil; chemical industry; construction industry

[45] 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

[46] BAUTABELLEN FÜR INGENIEURE , 21 Edition 2014, Bundesanzeiger Verlag GmbH, Cologne, Andrej Albert

Tab. 4.3.1 B: Material data sheet, aluminum, specific[47][48]

General description		
Certifications/Information	n.a.	
Emission class (formaldehyde)	Formaldehyde free	
Surface	Good reflectivity	
Color	Silvery	
Life cycle assessment data aluminum profile (GER)		0
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	112,7 MJ	0
Use of freshwater resources (FW)	0,1017 m^3	0
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	8,589 Kg CO_2-eqv.	0
Environmental impact Transport, per 1000 kgkm (640 kg/m^3)		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 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		

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

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

Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	52 % (Europe as of 2021)	6
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	8
Total average rating		**5,83**
Processing		
Mechanical	Very easy casting and forming (e.g. sand casting), bending, pressing, rolling, deep drawing and forging	
Joints	When welding, the use of a shielding gas such as argon or helium is recommended; simple joints by bonding with reactive adhesives such as epoxy resin or polyurethane; stable bonds result from light roughening of the bonding surface	
Surface finishing	Easy to grind and polish (fix with clear varnish); for colored surfaces due to the anodizing process	
Other	When exposed to air, aluminum forms a thin oxide layer on the surface. It protects the metal from corrosion and weathering	
Durability	Weather resistant; more corrosion resistant than iron	
Physical properties		
Density	2,7 g/cm³	
Mohs hardness	2,75	
Magnetism	paramagnetic	
Electrical conductivity	37,7*10^6 S/m	
Thermal Abrasiveness	237 W/(m*K)	
Mechanical properties aluminum (alloys) for sheets and profiles		
Yield strength (ßs)	90 - 250 N/mm²	
Tensile strength (ßz)	120 - 400 N/mm²	
Elongation at break	5 - 20 %	
E-modulus (E)	70*10^3 N/mm²	
Shear modulus (G)	27*10^3 N/mm²	
Poisson's ratio	0,3	
Notes	Aluminum production is very energy-intensive. Only about 1 % of this energy is needed to produce a comparable quantity of copper. A positive aspect is the good recyclability; aluminum has a neutral taste and is approved for contact with food	

4.3.2 Aluminium profile, RAIL

59 %

Tab. 4.3.2 A: Material data sheet, aluminum profile, RAIL, general[49][50]

Material group	Synthetic material; metals; light metals
Name	Aluminium (GB, US); Aluminium (D)
Short name	Al
Manufactured in	Germany
Occurrence	Worldwide; largest manufacturing country for aluminum is China
Use	(Lightweight construction); articles of daily use in the sports and leisure sector; sanitary and architectural sector; electrical engineering: conductor material; furniture and accessories sector; aluminum foil; chemical industry; construction industry

[49] 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

[50] BAUTABELLEN FÜR INGENIEURE , 21 Edition 2014, Bundesanzeiger Verlag GmbH, Cologne, Andrej Albert

Tab. 4.3.2 B: Material data sheet, aluminum profile, RAIL, specific[51][52]

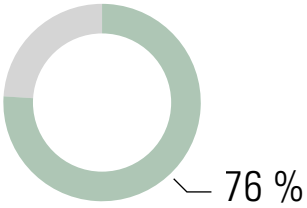
General description		
Certifications/Information	n.a.	
Emission class (formaldehyde)	Formaldehyde free	
Life cycle assessment data aluminum profile (GER)		0
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	112,7 MJ	0
Use of freshwater resources (FW)	0,1017 m^3	0
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	8,589 Kg CO_2-eqv.	0
Environmental impact Transport, per 1000 kgkm (640 kg/m^3)		4,5
Production site: Germany/ZEITRAUM		
Truck - ca. 1000 km	A4	9
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,064 m^3	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Main raw material origin: China/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/moderately repairable (> 20 years)	9

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

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

Biological reproduction/ recycled material	52 % (Europe as of 2021)	6
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	8
Total average rating		**5,91**
Processing		
Mechanical	Very easy casting and forming (e.g. sand casting), bending, pressing, rolling, deep drawing and forging	
Joints	When welding, the use of a shielding gas such as argon or helium is recommended; simple joints by bonding with reactive adhesives such as epoxy resin or polyurethane; stable bonds result from light roughening of the bonding surface	
Surface finishing	Easy to grind and polish (fix with clear varnish); for colored surfaces due to the anodizing process	
Other	When exposed to air, aluminum forms a thin oxide layer on the surface. It protects the metal from corrosion and weathering	
Durability	Weather resistant; more corrosion resistant than iron	
Notes	Aluminum production is very energy-intensive. Only about 1 % of this energy is needed to produce a comparable quantity of copper. A positive aspect is the good recyclability; aluminum has a neutral taste and is approved for contact with food	

4.3.3 Steel, powder coated frames



Tab. 4.3.3 A: Material data sheet, steel, powder coated frames, general[53]

Material group	Natural material; metals; transition metals
Parts origin	Italy and Turkey (depends on model)
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

[53] 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. 4.3.3 B: Material data sheet, steel, powder coated frames, specific[54][55]

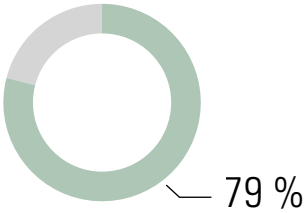
General description		
Certifications/Information	ISO 14001, ISO 9001 (depends on model)	
Emission class (formaldehyde)	Formaldehyde free	
Surface	smooth, hard	
Color	black	
Life cycle assessment data Steel profile, powder-coated (GER)		4,33
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	12,49 MJ	2
Use of freshwater resources (FW)	0,0026 m^3	4
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	1,09 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (7850 kg/m^3)		4
Production site: Italy, Turkey/ZEITRAUM (depends on model)		
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		

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

[55] 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		**7,55**
Processing		
Mechanical	More difficult to machine due to hardness, drilling, turning, milling, cutting; forming (bending, compression, tension forming)	
Joints	Riveting; screwing and welding	
Surface finishing	Engraving, polishing, embossing, grinding, lasering	
Other	High plastic deformability under impact loading; materials with low carbon content are easier to deform	
Durability	Heat resistant, corrosion and heat resistant	
Physical properties		
Density	7,85 g/cm³	
Electrical conductivity	9,93*10^6 S/m	
Thermal Abrasiveness	80,2 W/(m*K)	
Mechanical properties mild steel		
Yield strength (ßs)	185 - 360 N/mm²	
Tensile strength (ßz)	310 - 680 N/mm²	
Elongation at break	18 - 26 %	
E-modulus (E)	210*10^3 N/mm²	
Shear modulus (G)	85*10^3 N/mm²	
Poisson's ratio	0,28	
Notes	The life cycle assessment of iron improves the more often the material has been recycled or the proportion of recycled material increases	

4.3.4 Steel, MORPH LOUNGE/ DINING



Tab. 4.3.4 A: Material data sheet, steel, MORPH LOUNGE/DINING, general

Material group	Natural material; metals; transition metals
Parts origin	Bavaria, Germany
Occurrence	Worldwide; South America, Western Australia, China and Eastern Europe, Canada
Use	Metal chair frame

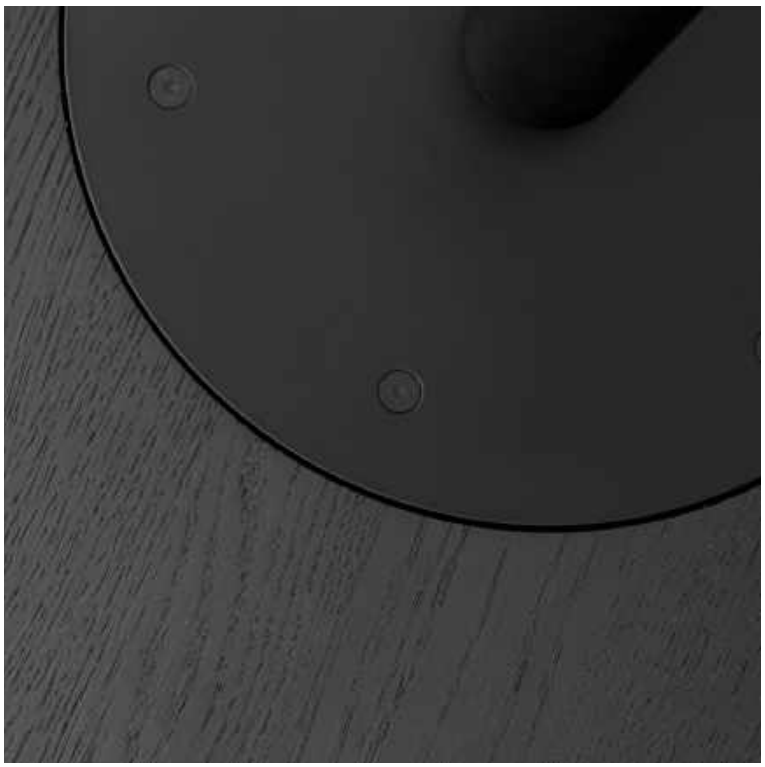
Tab. 4.3.4 B: Material data sheet, steel, MORPH LOUNGE/DINING specific[56][57]

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 m³	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)		5
Production site: Germany/ZEITRAUM		
Truck ø - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-Äqv.	
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 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		

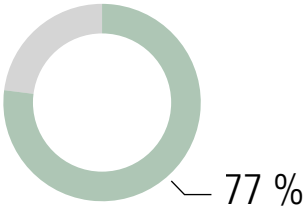
[56] BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

[57] 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		**7,88**
Processing		
Mechanical	More difficult to machine due to hardness, drilling, turning, milling, cutting; forming (bending, compression, tension forming)	
Joints	Riveting; screwing and welding	
Surface finishing	Engraving, polishing, embossing, grinding, lasering	
Other	High plastic deformability under impact loading; materials with low carbon content are easier to deform	
Durability	Heat resistant, corrosion and heat resistant	
Notes	The life cycle assessment of iron improves the more often the material has been recycled or the proportion of recycled material increases	



4.3.5 Steel, powder coated rack, KONTRA/VERMU/KUYU



Tab. 4.3.5 A: Material data sheet, steel, powder coated frames, KONTRA/VERMU/KUYU, general

Material group	Natural material; metals; transition metals
Parts origin	Bavaria, Germany
Occurrence	Worldwide; South America, Western Australia, China and Eastern Europe, Canada
Use	Metal table rack

Tab. 4.3.5 B: Material data sheet, steel, powder coated frames, KONTRA/VERMU/KUYUs specific[58][59]

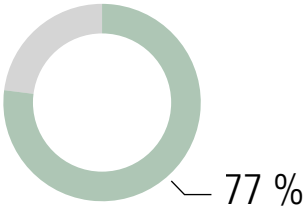
General description		
Certifications/Information	ISO 3834, ISO 9001, EN 15085-2	
Emission class (formaldehyde)	Formaldehyde free	
Surface	smooth, hard	
Color	black	
Life cycle assessment data Steel profile, (GER)		4,33
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	12,49 MJ	2
Use of freshwater resources (FW)	0,0026 m³	4
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	1,09 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (7850 kg/m³)		5
Production site: Germany/ZEITRAUM		
Truck ø - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
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 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		

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

[59] 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**
Processing		
Mechanical	More difficult to machine due to hardness, drilling, turning, milling, cutting; forming (bending, compression, tension forming)	
Joints	Riveting; screwing and welding	
Surface finishing	Engraving, polishing, embossing, grinding, lasering	
Other	High plastic deformability under impact loading; materials with low carbon content are easier to deform	
Durability	Heat resistant, corrosion and heat resistant	
Notes	The life cycle assessment of iron improves the more often the material has been recycled or the proportion of recycled material increases	

4.3.6 Steel, powder coated rack, KIN



Tab. 4.3.6 A: Material data sheet, steel, powder coated rack, KIN, general

Material group	Natural material; metals; transition metals
Parts origin	Bavaria, Germany
Occurrence	Worldwide; South America, Western Australia, China and Eastern Europe, Canada
Use	Metal KIN rack

Tab. 4.3.6 B: Material data sheet, steel, powder coated rack, KIN, specific[60][61]

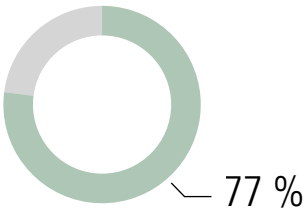
General description		
Certifications/Information	ISO 3834, ISO 9001	
Emission class (formaldehyde)	Formaldehyde free	
Surface	smooth, hard	
Color	matt black, stone grey, white, poppy	
Life cycle assessment data Steel profile, (GER)		4,33
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	12,49 MJ	2
Use of freshwater resources (FW)	0,0026 m³	4
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	1,09 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (7850 kg/m³)		5
Production site: Germany/ZEITRAUM		
Truck ø - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
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 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		

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

[61] 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**
Processing		
Mechanical	More difficult to machine due to hardness, drilling, turning, milling, cutting; forming (bending, compression, tension forming)	
Joints	Riveting; screwing and welding	
Surface finishing	Engraving, polishing, embossing, grinding, lasering	
Other	High plastic deformability under impact loading; materials with low carbon content are easier to deform	
Durability	Heat resistant, corrosion and heat resistant	
Notes	The life cycle assessment of iron improves the more often the material has been recycled or the proportion of recycled material increases	

4.3.7 Steel



Tab. 4.3.7 A: Material data sheet, steel, general[62]

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

[62] 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. 4.3.7 B: Material data sheet, steel, specific[63][64]

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/m^3)		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		

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

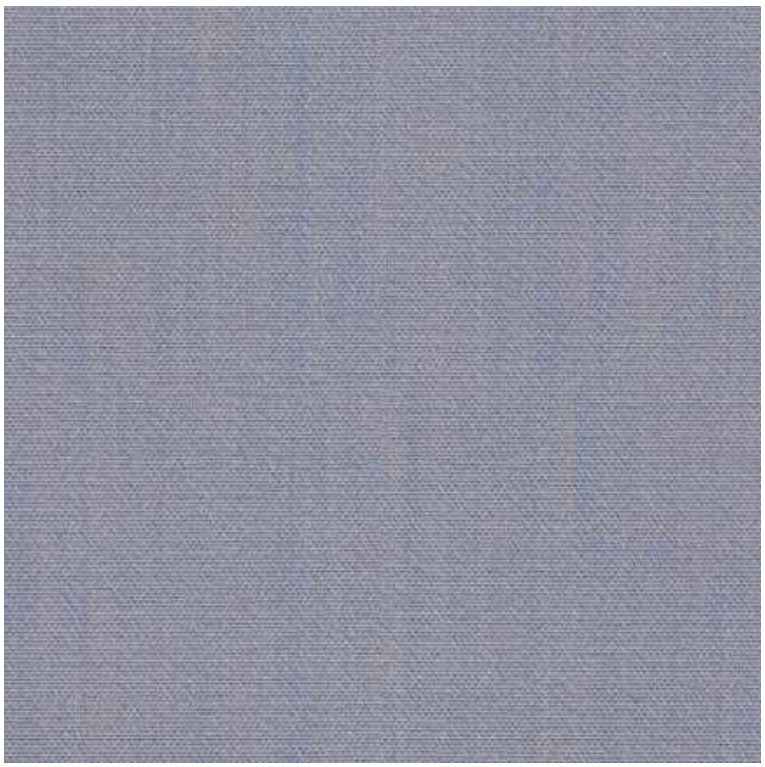
[64] MATERIALARCHIV (2019) - Materialarchiv <http://www.materialarchiv.ch/app-tablet/#search> Accessed, on 03/01/2019

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	

4.4 Textile fiber materials

Name	Fiber/type	Abbreviation
Plant fibers (cellulose)		
Seed fiber	- Cotton - Kapok	CO KP
Bast fiber	- Linen (Flax) - Hemp - Jute - Ramie	LI HA JU RA
Hard fiber	- Sisal - Manila (Abacá) - Coconut	SI AB CC
Animal fibers (protein)		
Wolle	- Wool - Virgin wool	WO WV
Feine Tierhaare	- Alpaca - Llama - Vicuña - Guanaco - Camel - Rabbit - Angora - Mohair - Cashmere - Cashgora - Yak	WP WL WG WU WK WN WA WM WS WSA WY
Grobe Tierhaare	- Cattle hair - Horsehair - Goat hair	HR HS HZ
Seiden	- Silk (Mulberry Silk) - Tussah silk	SE ST
Mineralische Fasern		
Gesteinsfasern	- Asbestos (carcinogenic)	AS
Chemiefasern (natürliche Polymere)		
Zellulosische Chemiefasern	- Viscose - Modal - Lyocell - Cupro - Acetate - Triacetate	CV CMD CLY CUP CA CTA

Alginate	Alginate	ALG
Rubber	Rubber	LA
Synthetic fibers (synthetic polymers)		
Elasto	Elastan (Polyurethan) Elastodien	EL ED
Fluoro	Fluoro	PTFE
Polyacrylic	Polyacrylic Modacrylic	PAN MAC
Polyamide	Polyamide Aramid	PA AR
Polychloride	Polyvinyl chloride Polyvinylindene chloride	CLF CLF
Polyester	Polyester	PES
Polyolefin	Polyethylen Polypropylen	PE PP
Polyvinylalcohol	Polyvinylalcohol	PVAL
Synthetic fibers (inorganic substances)		
Glass		GF
Carbon		CF
Metal		MTF



4.4.1 Kvadrat, Atlas

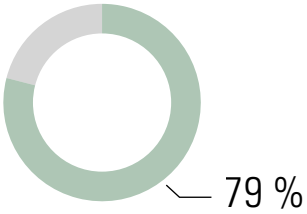


Fig. 4.4.1: www.kvadrat.dk

Tab. 4.4.1 A: Material data sheet, atlas, general[65]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, nylon (polyamide)
Name	Atlas
Material abbreviation	WV (virgin wool); PA (polyamide (nylon))
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Margrethe Odgaard
Version	37 different colors
Use	Mainly for furniture upholstery

[65] KVADRAT (2021) - Kvadrat; Products; Atlas <https://kvadrat.de/products> Accessed, on 11/12/2021

Tab. 4.4.1 B: Material data sheet, atlas, specific[66][67]

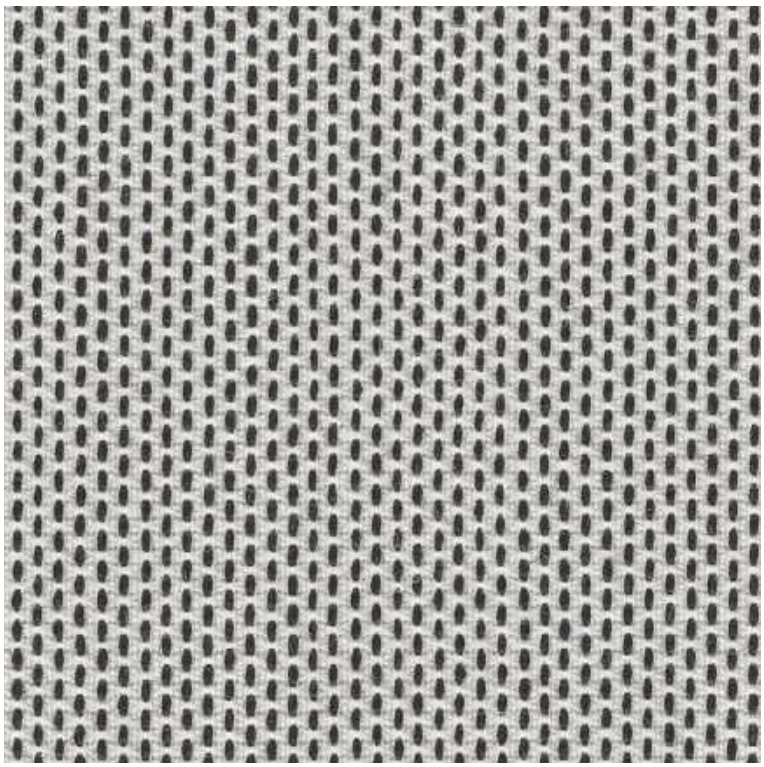
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ÖNORM B1/Q1 • AS/NZS 3837 class 2 • ASTM E84 Class A Adhered • ASTM E84 Class A Unadhered	
Environmental benefits		
AZO dyes	n.a.	
Heavy metals	n.a.	
Formaldehyde	n.a.	
Brominated flame retardants	n.a.	
Spinning oil used	n.a.	
Appearance		
Pattern	Uni	
Length	ca. 31 m	
Wide	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; foreign fibers may be present in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	90 %	
Nylon (polyamide)	10 %	
LCA data comparative fabric for Atlas, Kvadrat		7,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	62 MJ	9
Use of freshwater resources (FW)	ca. 0,23 m³	6
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	4,9 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (0.400 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[66] KVADRAT (2021) - Kvadrat; Products; Atlas <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 400 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	4 - 5	
Light fastness (ISO 1-8)	6 - 7	
Seam slippage	6,7 mm (warp); 3 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.2 Kvadrat, Basel

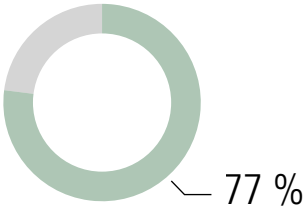


Fig. 4.4.2: www.kvadrat.dk

Tab. 4.4.2 A: Material data sheet, Basel, general[68]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, nylon (polyamide).
Name	Basel
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Herzog & de Meuron
Version	10 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[68] KVADRAT (2021) - Kvadrat; Products; Basel <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.2 B: Material data sheet, Basel, specific[69][70]

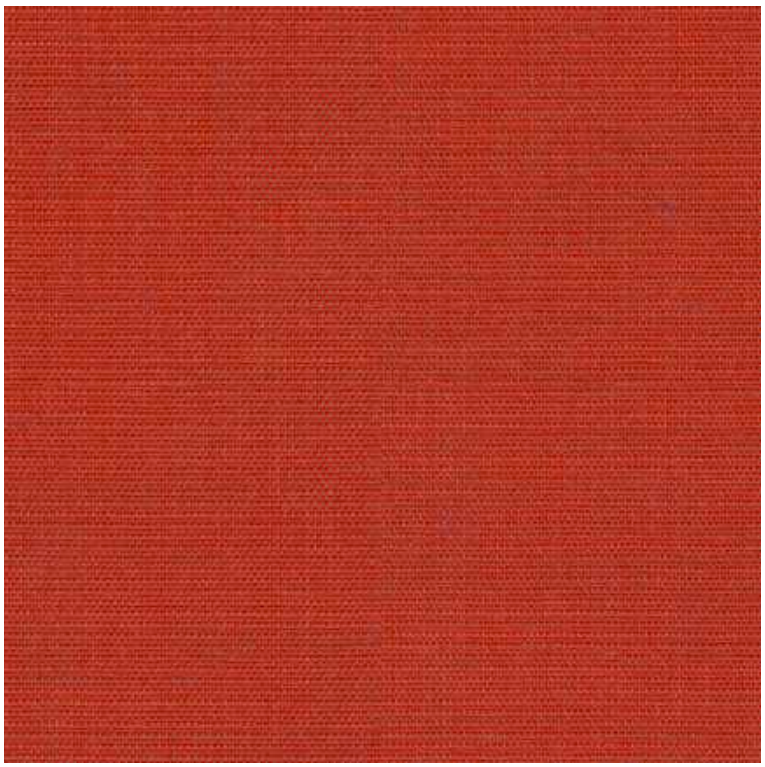
General description (manufacturer spec.)		
Certifications/Information	EU Ecolabel, Greenguard Gold, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ÖNORM B1/Q1 • AS/NZS 3837 class 2	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Uni	
Length	ca. 45 m	
Wide	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	90 %	
Nylon (polyamide)	10 %	
Life cycle assessment data Basel, Kvadrat		6,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	78 MJ	8
Use of freshwater resources (FW)	ca. 0,29 m³	5
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	6,3 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0.510 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	

[69] KVADRAT (2021) - Kvadrat; Products; Basel <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,72**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 510 g/m	
Mechanical properties		
Resilience	50.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6 - 7	
Seam slippage	3,5 mm (warp); 1,4 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.3 Kvadrat, Canvas 2

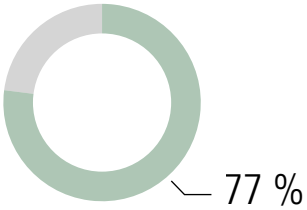


Fig. 4.4.3: www.kvadrat.dk

Tab. 4.4.3 A: Material data sheet, Canvas 2, general[71]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, nylon (polyamide)
Name	Canvas 2
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Giulio Ridolfo
Version	55 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[71] KVADRAT (2021) - Kvadrat; Products; Canvas 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.3 B: Material data sheet, canvas 2, specific[72][73]

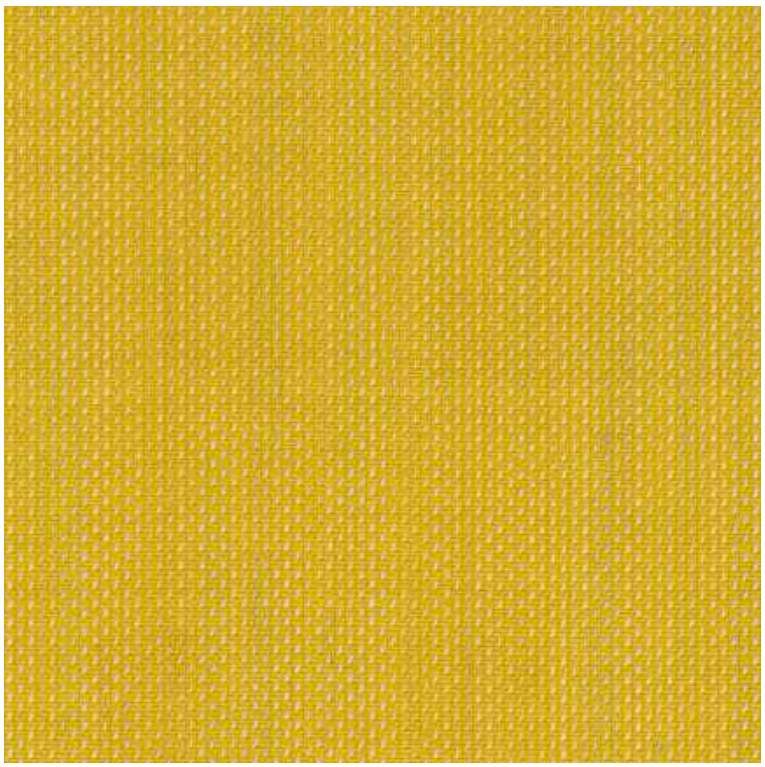
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, LCA Data, EU Ecolabel „The Flower“, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: AS/NZS 1530.3 • BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ÖNORM B1/Q1	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Solid	
Length	ca. 30 m	
Wide	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	90 %	
Nylon (polyamide)	10 %	
Life Cycle Assessment Data Canvas 2, Kvadrat		6,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	74 MJ	8
Use of freshwater resources (FW)	ca. 0,27 m³	5
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	5,9 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0.480 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[72] KVADRAT (2021) - Kvadrat; Products; Canvas 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,72**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 480 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6	
Seam slippage	3,5 mm (warp); 2 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.4 Kvadrat, Clara 2

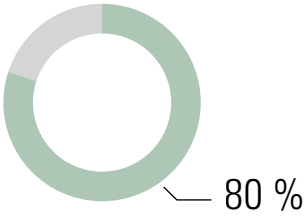


Fig. 4.4.4: www.kvadrat.dk

Tab. 4.4.4 A: Material data sheet, Clara 2, general[74]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, nylon (polyamide)
Name	Clara 2
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Anne Birgitte Hansen
Version	24 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[74] KVADRAT (2021) - Kvadrat; Products; Clara 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.4 B: Material data sheet, Clara 2, specific[75][76]

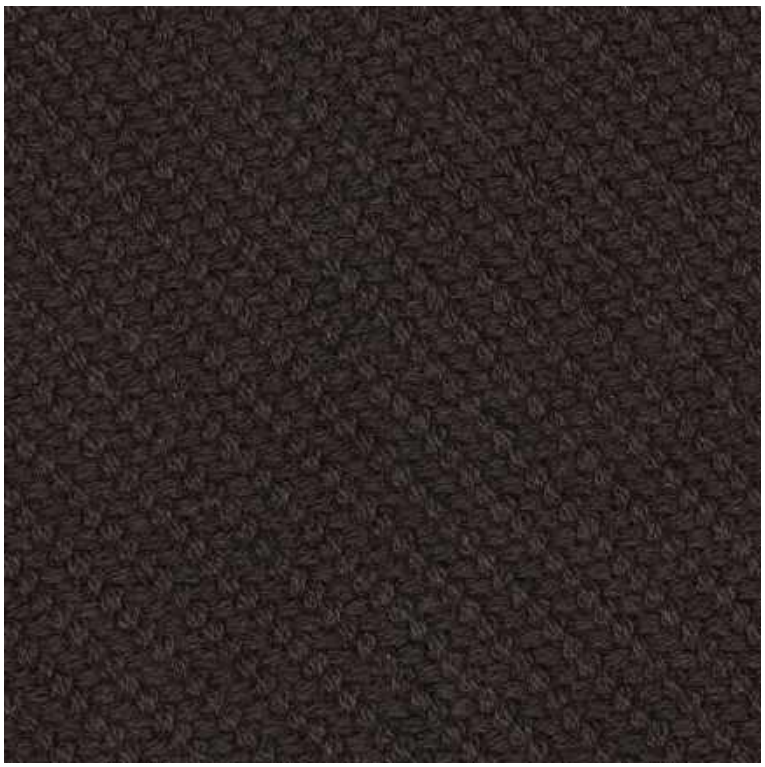
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, LCA Data, EU Ecolabel „The Flower“, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: AS/NZS 3837 • BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ÖNORM B1/Q1	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Geometric	
Length	ca. 31 m	
Wide	138 cm	
Thickness	n.a.	
Color	www.kvadrat.dk.; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	92 %	
Nylon (polyamide)	8 %	
Life cycle assessment data Clara 2, Kvadrat		7,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	62 MJ	9
Use of freshwater resources (FW)	ca. 0,23 m³	6
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	5,0 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (0.400 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	

[75] KVADRAT (2021) - Kvadrat; Products; Clara 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	92 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**8,05**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 400 g/m	
Mechanical properties		
Resilience	80.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6	
Seam slippage	8 mm (warp); 7,5 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.5 Kvadrat, Coda 2

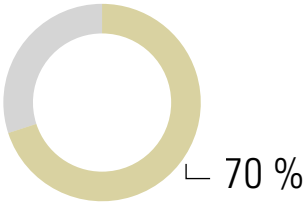


Fig. 4.4.5: www.kvadrat.dk

Tab. 4.4.5 A: Material data sheet, Coda 2, general[77]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, nylon (polyamide)
Name	Coda 2
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Norway Says & Per Bjørnsen
Version	18 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[77] KVADRAT (2021) - Kvadrat; Products; Coda 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.5 B: Material data sheet, Coda 2, specific[78][79]

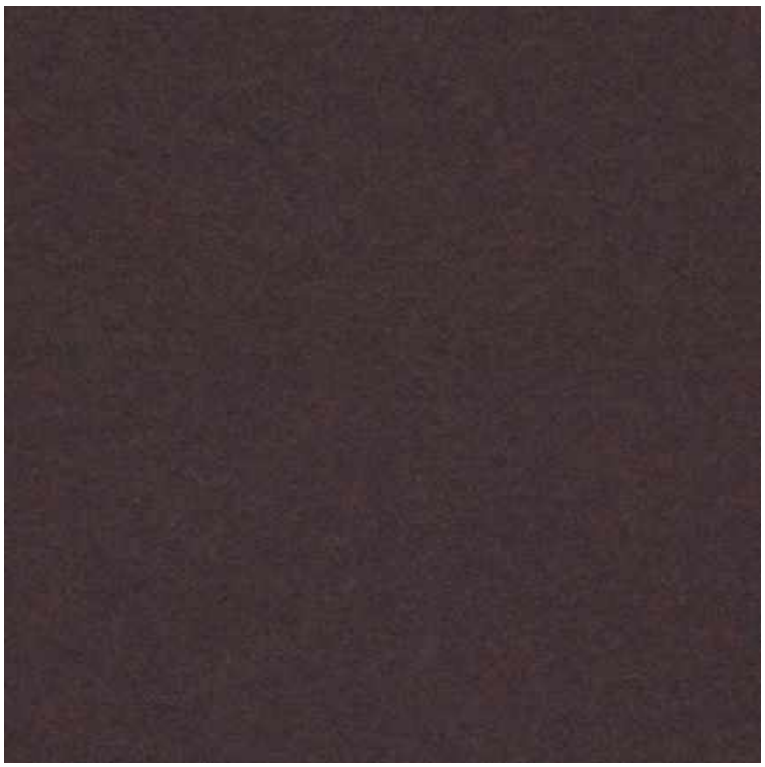
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Brandprüfungen**: BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • ÖNORM B1/Q1 • EN 1021-1/2 • AS/NZS3837 class 3	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Geometric	
Length	ca. 25 m	
Wide	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	Fabric; twill weave	
Basic materials		
Virgin wool	90 %	
Nylon (polyamide)	10 %	
Life cycle assessment data Coda 2, Kvadrat		2,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	130 MJ	4
Use of freshwater resources (FW)	ca. 0,49 m³	1
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	11 Kg CO_2-eqv.	2
Environmental impact Transport, per 1000 kgkm (0.860 kg/m)		3,5
Production site: Norway/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	

[78] KVADRAT (2021) - Kvadrat; Products; Coda 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**6,97**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 860 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6	
Seam slippage	5,5 mm (warp); 5 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Appears monochromatic at long distances, on closer inspection it appears three-dimensional and is two-color	



4.4.6 Kvadrat, Divina MD

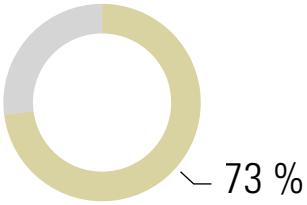


Fig. 4.4.6: www.kvadrat.dk

Tab. 4.4.6 A: Material data sheet, Divina MD, general[80]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool
Name	Divina MD
Material abbreviation	WV (virgin wool)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Finn Sködt
Version	27 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[80] KVADRAT (2021) - Kvadrat; Products; Divina MD <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.6 B: Material data sheet, Divina MD, specific[81][82]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, LCA Data, EU Ecolabel „The Flower“, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: AS/NZS 1530.3 • BS 5852 Crib 5 • BS 5852 part 1 • BS 5867 part 2 type B • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • EN 13501, C-s1, d0, glued • NFPA 701 with treatment • ASTM E84 Class B Unadhered • ASTM E84 Class A Adhered • ÖNORM B1/Q1 • GB 50222 B1 with treatment (Chinese)	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Solid	
Length	ca. 25 m	
Wide	150 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	Fabric; twill weave	
Basic materials		
Virgin wool	100 %	
Life cycle assessment data Divina MD, Kvadrat		2,66
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	120 MJ	4
Use of freshwater resources (FW)	ca. 0,48 m³	1
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	10 Kg CO_2-eqv.	3
Environmental impact Transport, per 1000 kgkm (0.840 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[81] KVADRAT (2021) - Kvadrat; Products; Divina MD <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled materia	> 95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,27**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 840 g/m	
Mechanical properties		
Resilience	45.000 Martindale	
Pilling (ISO1-5)	3	
Light fastness (ISO 1-5)	5 - 6	
Seam slippage	2 mm (warp); 2 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	

4.4.7 Kvadrat, Elle

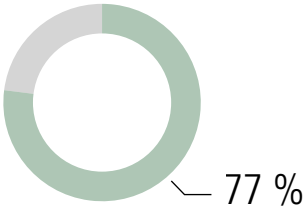


Fig. 4.4.7: www.kvadrat.dk

Tab. 4.4.7 A: Material data sheet, Elle, general[83]

Material group	Natural synthetic material; textiles; upholstery fabric; cotton, viscose, polyacrylic, wool, polyamide
Name	Elle
Material abbreviation	CO (cotton); CV (viscose); PAN (polyacrylic); WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Italy (I)
Designer	SAHCO
Version	14 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[83] KVADRAT (2021) - Kvadrat; Products; Foss <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.7 B: Material data sheet, Elle, specific[84][85]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • US Cal. Bull. 117-2013	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Solid	
Length	ca. 25 m	
Wide	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Cotton	25 %	
Viscose	20 %	
Polyacylic	20 %	
Virgin wool	20 %	
Polyamide (Nylon)	15 %	
Life cycle assessment data Elle (no data available) - Savanna, Kvadrat		6
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	99 MJ	6
Use of freshwater resources (FW)	0,20 m³	6
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	6,2 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0,900 kg/m)		6
Production site: Italy/ZEITRAUM		
Truck - ca. 800 km	A4	9

[84] KVADRAT (2021) - Kvadrat; Products; Foss <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Total non-renewable primary energy (PENRT)	966,4 MJ	
Use of freshwater resources (FW)	0,0511 m^3	
Global Warming Potential (GWP)	71,752 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
k.A. - ø > 7000 km	A4	
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	65 %	7
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,66**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 900 g/m	
Mechanical properties		
Resilience	70.000 Martindale	
Pilling (EN ISO 12945)	4 - 5	
Light fastness (ISO 105-B02)	6 - 7	
Seam slippage	n.a.	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 110 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	

4.4.8 Kvadrat, Foss

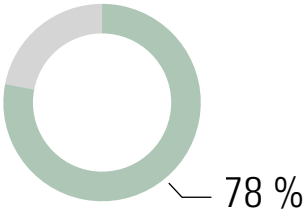


Fig. 4.4.8: www.kvadrat.dk

Tab. 4.4.8 A: Material data sheet, Foss, general[86]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, viscose, nylon, linen
Name	Foss
Material abbreviation	WV (virgin wool); CV (viscose); PA (polyamide); LI (linen)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Louise Sigvardt & Tone Barnung
Version	29 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[86] KVADRAT (2021) - Kvadrat; Products; Foss <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.8 B: Material data sheet, Foss, specific[87][88]

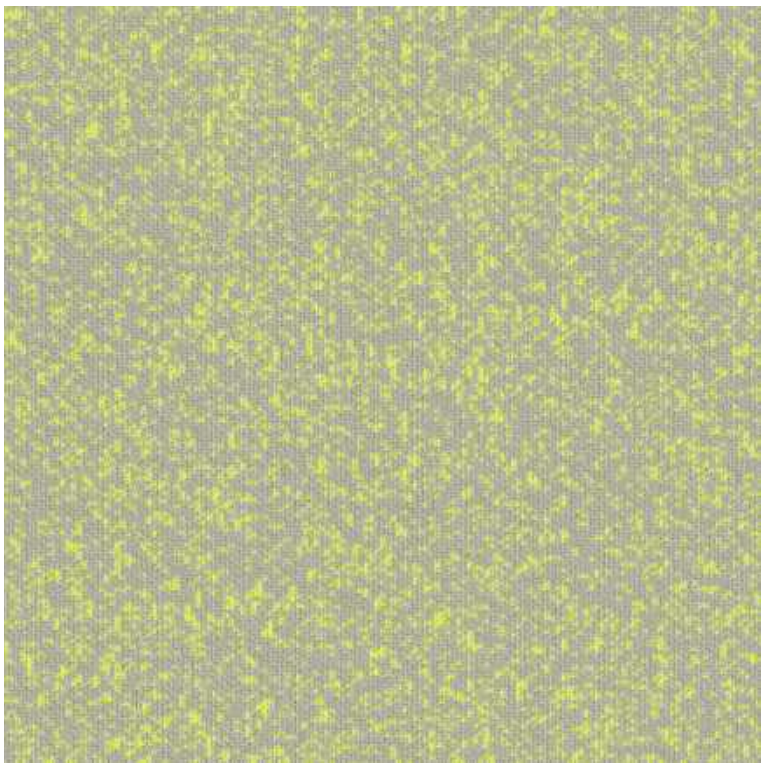
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • SN 198 898 5.3 with treatment • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2 • ASTM E84 Class B Unadhered • ASTM E84 Class A Adhered	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Solid	
Length	ca. 25 m	
Wide	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	76 %	
Viscose	11 %	
Polyamide (Nylon)	8 %	
Linen	5 %	
Life cycle assessment data Foss, Kvadrat		6,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	78 MJ	8
Use of freshwater resources (FW)	ca. 0,26 m³	5
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	6,1 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0.500 kg/m)		3,5
Production site: Norway/ZEITRAUM		

[87] KVADRAT (2021) - Kvadrat; Products; Foss <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Truck - ca. 2000 km	A4	7
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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	92 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,8**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 500 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6 - 7	
Seam slippage	n.a.	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.9 Kvadrat, Galaxy

66 %

Fig. 4.4.9: www.kvadrat.dk

Tab. 4.4.9 A: Material data sheet, Galaxy, general[89]

Material group	Natural synthetic material; textiles; upholstery fabric; polyester
Name	Galaxy
Material abbreviation	PE (Polyester)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Portugal (PRT)
Designer	Alfredo Häberli
Version	12 different colors
Use	Predominantly for furniture upholstery; High traffic areas; Outdoor and/or humid environments; Removable upholstery fabrics; Allergy friendly

[89] KVADRAT (2019) - Kvadrat; Products; Galaxy <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

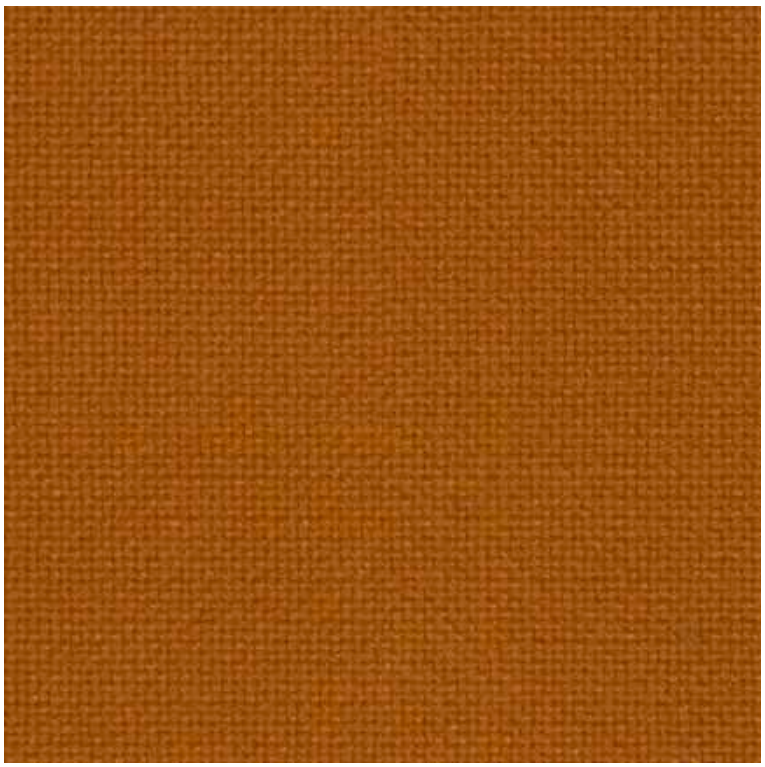
Tab. 4.4.9 B: Material data sheet, Galaxy, specific[90][91]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: IMO FTP Code 2010 Part 8 • NF D 60 013 • NF P 92 507 M1 • SN 198 898 5.2 • UNI 9175 1IM • US Cal. Bull. 117-2013 • DIN 4102 B1 • EN 1021-1/2 • ASTM E84 Class A Unadhered • ÖNORM B1/Q1 • BS 5852 Crib 5	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Organic	
Length	ca. 25 m	
Width	175 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	Complex bond	
Basic materials		
Polyester	100 %	
Life cycle assessment data Galaxy, Kvadrat		8,33
Resource use per m²	**A1-A3**	
Total nicht erneuerbare Primärenergie (PENRT)	74 MJ	8
Use of freshwater resources (FW)	ca. 0,082 m³	9
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	3,7 Kg CO_2-eqv.	8
Environmental impact Transport, per 1000 kgkm (0.760 kg/m)		4,5
Production site: Portugal/ZEITRAUM		
Truck - ca. 2500 km	A4	6
Total nicht erneuerbare Primärenergie (PENRT)	3020 MJ	
Use of freshwater resources (FW)	0,159 m³	

[90] KVADRAT (2021) - Kvadrat; Products; Galaxy <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Global Warming Potential (GWP)	224,225 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total nicht erneuerbare Primärenergie (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	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**6,63**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 760 g/m	
Mechanical properties		
Resilience	50.000 Martindale	
Pilling (ISO1-5)	5	
Light fastness (ISO 1-5)	6 - 7	
Rubbing fastness	5 (dry), 4 - 5 (wet)	
Seam slippage	5,5 mm (warp), 5 mm (weft)	
Care		
Washing	max. 60 °C, gentle wash	
Chlorine	Do not bleach	
Drying drum	Possible in tumble dryer	
Ironing	Moderate hot ironing, max. 110 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Incoming rate: approx. 1	



4.4.10 Kvadrat, Hallingdal 65

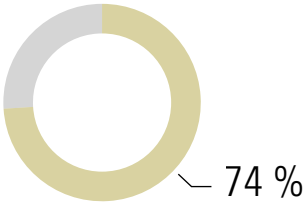


Fig. 4.4.10: www.kvadrat.dk

Tab. 4.4.10 A: Material data sheet, Hallingdal 65, general[92]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, viscose
Name	Hallingdal 65
Material abbreviation	WV (virgin wool); CV (viscose)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Nanna Ditzel
Version	58 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[92] KVADRAT (2021) - Kvadrat; Products; Hallingdal 65 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.10 B: Material data sheet, Hallingdal 65, specific[93][94]

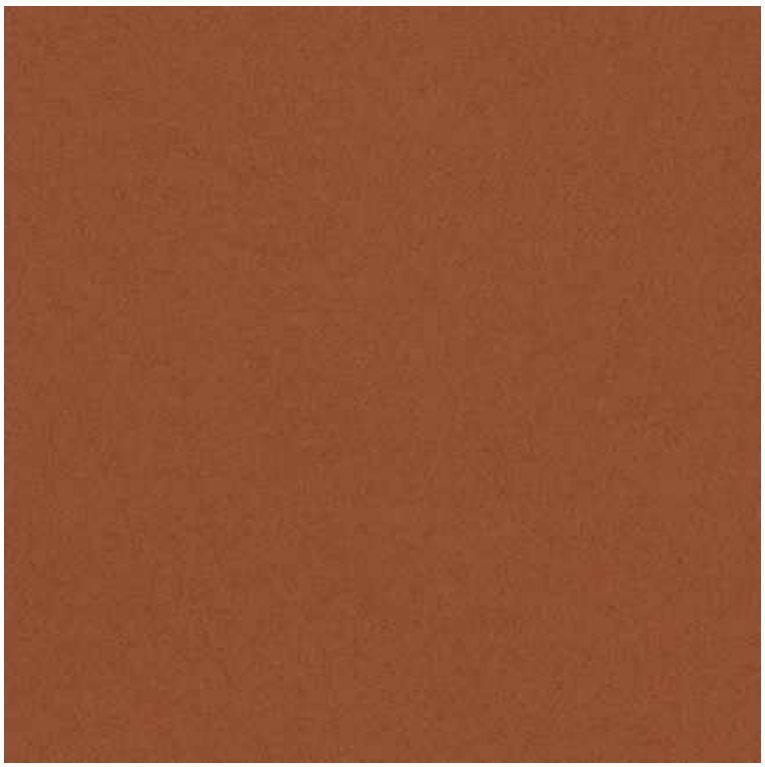
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower“, ISO 9001, ISO 14001, REACH, LCA Data, CP65	
Fire resistance	**Fire tests**: AS/NZS 1530.3 • BS 5852 Crib 5 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ASTM E84 Class A Adhered • SN 198 898 5.3 with treatment • ÖNORM B1/Q1 • GB 50222 B1 with treatment (Chinese) • AS/NZS 3837 class 2 • ASTM E84 Class B Unadhered	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Solid	
Length	ca. 25 m	
Width	130 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	70 %	
Viscose	30 %	
Life cycle assessment data Hallingdal 65, Kvadrat		4
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	110 MJ	6
Use of freshwater resources (FW)	ca. 0,41 m³	2
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	8,9 Kg CO_2-eqv.	4
Environmental impact Transport, per 1000 kgkm (0.795 kg/m)		3,5
Production site: Norway/ZEITRAUM		
Truck - ca. 2000 km	A4	7

[93] KVADRAT (2021) - Kvadrat; Products; Hallingdal 65 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	> 95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,41**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 795 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	3	
Light fastness (ISO 1-5)	7	
Seam slippage	4,5 mm (warp), 4 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.11 Kvadrat, Hero

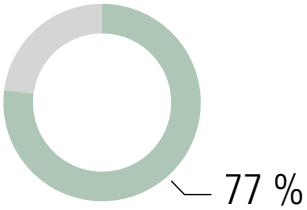


Fig. 4.4.11: www.kvadrat.dk

Tab. 4.4.11 A: Material data sheet, Hero, general[95]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, viscose
Name	Hero
Material abbreviation	WV (virgin wool); VI (viscose)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Patricia Urquiola
Version	31 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[95] KVADRAT (2021) - Kvadrat; Products; Hero <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.11 B: Material data sheet, Hero, specific[96][97]

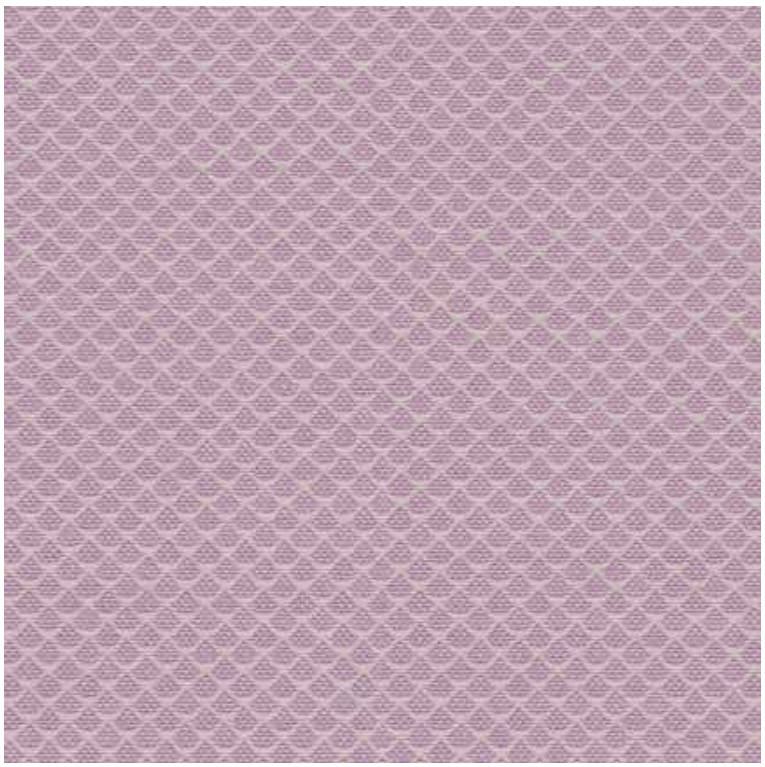
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower“, ISO 9001, ISO 14001, REACH, LCA Data, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 7 with treatment • IMO FTP Code 2010 Part 8 • NF D 60 013 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • NFPA 701 with treatment • AS/NZS 3837 class 2 • ASTM E84 Class B Adhered • ASTM E84 Class A Unadhered	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Solid	
Length	ca. 25 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	96 %	
Viscose	4 %	
Life Cycle Assessment Data Hero, Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	ca. 0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.580 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[96] KVADRAT (2021) - Kvadrat; Products; Hero <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	96 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially acceptable	Yes	10
Total average rating		**7,72**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 580 g/m	
Mechanical properties		
Resilience	45.000 Martindale	
Pilling (ISO1-5)	3 - 4	
Light fastness (ISO 1-5)	5 - 6	
Seam slippage	3,5 mm (warp), 3 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.12 Kvadrat, Jaali

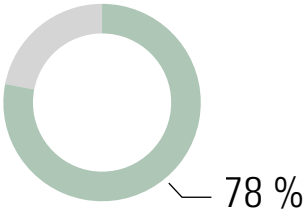


Fig. 4.4.12: www.kvadrat.dk

Tab. 4.4.12 A: Material data sheet, Jaali, general[98]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Jaali
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Doshi Levien
Version	20 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[98] KVADRAT (2021) - Kvadrat; Products; Jaali <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.12 B: Material data sheet, Jaali, specific[99][100]

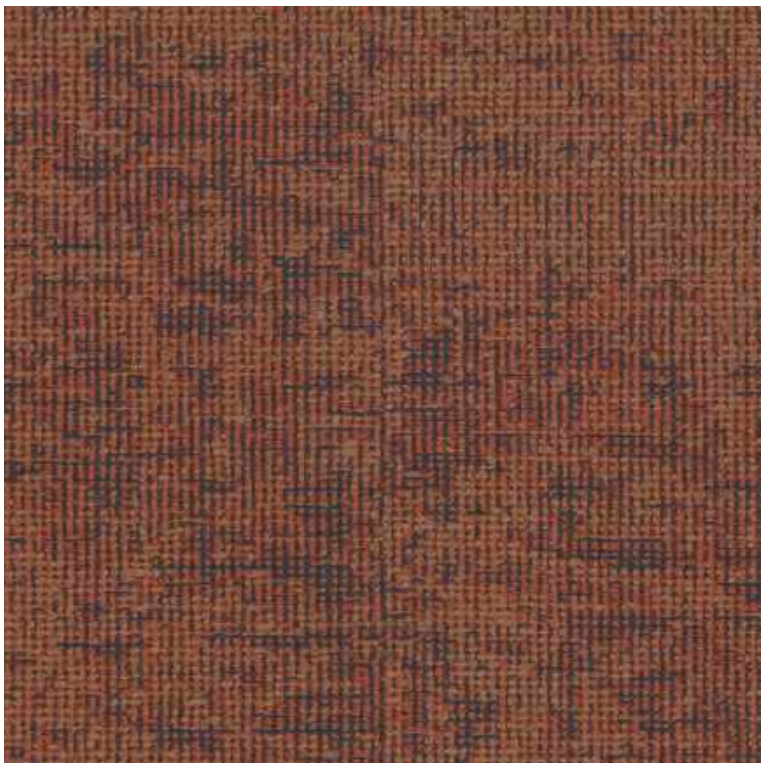
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower“, ISO 9001, ISO 14001, REACH, LCA Data, CP65	
Fire resistance	**Fire tests**: AS/NZS 1530.3 • BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Geometric	
Length	n.a.	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Basic materials		
Virgin wool	92 %	
Polyamide	8 %	
Life cycle assessment data Jaali, Kvadrat		6
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	80 MJ	8
Use of freshwater resources (FW)	ca. 0,30 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	6,5 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0.520 kg/m)		3,5
Production site: Norway/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	

[99] KVADRAT (2021) - Kvadrat; Products; Jaali <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	92 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,75**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 520 g/m	
Mechanical properties		
Resilience	80.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6	
Seam slippage	4 mm (warp), 2 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.13 Kvadrat, Memory 2

67 %

Fig. 4.4.13: www.kvadrat.dk

Tab. 4.4.13 A: Material data sheet, Memory 2, general[101]

Material group	Natural-synthetic material; textiles; upholstery fabric; polyehylene (Trevira)
Name	Memory 2
Material abbreviation	PE (polyethylene)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Netherlands (NLD)
Designer	Patricia Urquiola
Version	20 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[101] KVADRAT (2021) - Kvadrat; Products; Memory 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

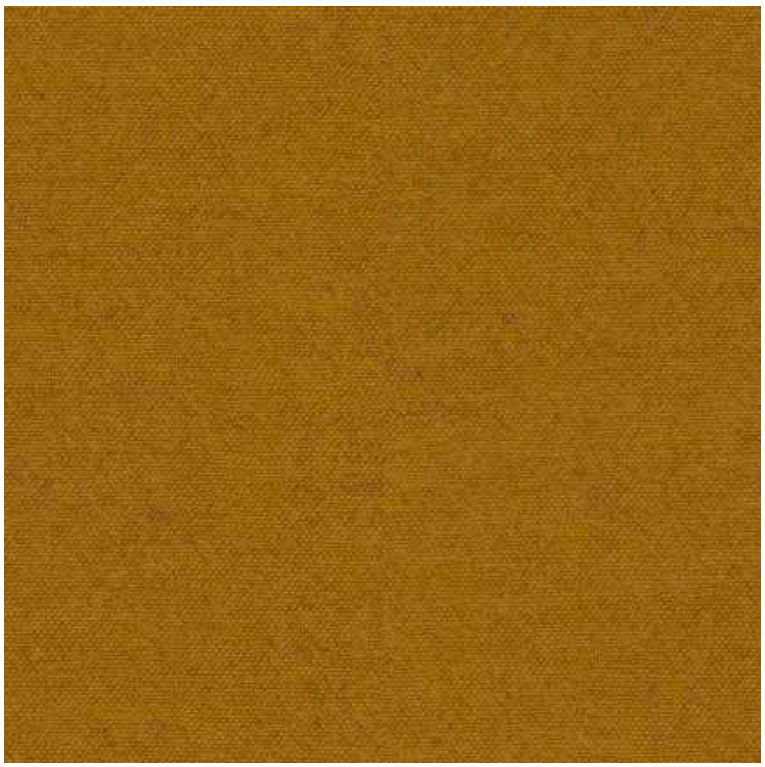
Tab. 4.4.13 B: Material data sheet, memory 2, specific[102][103]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • IMO FTP Code 2010 Part 8 • JIS L 1091 A-1 D • NF D 60 013 • NF P 92 507 M1 • NFPA 260 • SN 198 898 5.2 • UNI 9175 1IM • UNI 9177 Classe 1 • US Cal. Bull. 117-2013 • DIN 4102 B1 • EN 1021-1/2 • AS/NZS 3837 class 1 • ASTM E84 Class A Unadhered • NFPA 701 • ÖNORM B1/Q1 • EN 13501-1, B-s1, d0	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Organic	
Length	ca. 30 m	
Width	150 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile Fläche	n.a.	
Basic materials		
Trevira (polyethylene)	100 %	
Life Cycle Assessment Data Memory 2, Kvadrat		8
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	85 MJ	7
Use of freshwater resources (FW)	ca. 0,095 m³	9
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	4,2 Kg CO_2-eqv.	8
Environmental impact Transport, per 1000 kgkm (0.700 kg/m)		6
Production site: Netherlands/ZEITRAUM		
Truck - ca. 800 km	A4	9
Total non-renewable primary energy (PENRT)	966,4 MJ	

[102] KVADRAT (2021) - Kvadrat; Products; Memory 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,0511 m³	
Global Warming Potential (GWP)	71,752 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable/moderately repairable (10 - 20 years)	6
Biological reproduction/ recycled material	0 %	0
Circulation potential	100 % (technological)	10
Socially compatible	Yes	10
Total average rating		**6,66**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 700 g/m	
Mechanical properties		
Resilience	35.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6	
Seam slippage	2,5 mm (warp), 2 mm (weft)	
Care		
Washing	Gentle cycle up to max. 60 °C	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.14 Kvadrat, Melange Nap

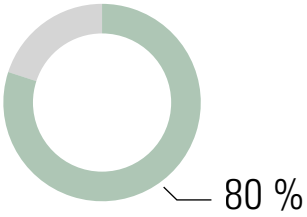


Fig. 4.4.14 www.kvadrat.dk

Tab. 4.4.14 A: Materialdatenblatt, Melange Nap, allgemein[104]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, nylon
Name	Melange Nap
Material abbreviation	VW (Virgin Wool), PA (Polyamide (Nylon))
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Akira Minagawa
Version	26 different colors
Use	Mainly for furniture upholstery

[104] KVADRAT (2021) - Kvadrat; Products; Melange Nap <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.14 B: Materialdatenblatt, Melange Nap, spezifisch[105][106]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ASTM E84 Class B Adhered • ASTM E84 Class A Unadhered • AS/NZS 3837 class 2 • SN 198 898 5.3 with treatment	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 29 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	97 %	
Nylon (polyamide)	3 %	
Life cycle assessment data Melange Nap, Kvadrat		7
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	67 MJ	9
Use of freshwater resources (FW)	ca. 0,26 m³	5
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	5,6 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (0.440 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[105] KVADRAT (2021) - Kvadrat; Products; Melange Nap <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	97 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**8**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 440 g/m	
Mechanical properties		
Resilience	60.000 Martindale	
Pilling (ISO1-5)	3 - 4	
Light fastness (ISO 1-8)	6	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	

4.4.15 Kvadrat, Molly 2

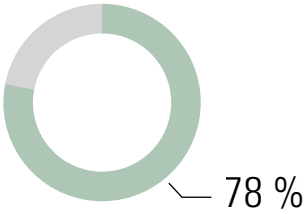


Fig. 4.4.15: www.kvadrat.dk

Tab. 4.4.15 A: Material data sheet, Molly 2, general[107]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool
Name	Molly 2
Material abbreviation	WV (virgin wool)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Åsa Pärson
Version	15 different colors
Use	Mainly for furniture upholstery

[107] KVADRAT (2021) - Kvadrat; Products; Molly 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.15 B: Material data sheet, Molly 2, specific[108][109]

General description (manufacturer spec.)		
Certifications/Information	Greenguard.Gold, EU Ecolabel „The Flower“, REACH, ISO 9001, ISO 14001, CP65	
Fire resistance	**Fire tests:** BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ÖNORM B1/Q1	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 25,5 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	100 %	
Life cycle assessment data Molly 2, Kvadrat		4
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	99 MJ	6
Use of freshwater resources (FW)	ca. 0,4 m³	2
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	8,4 Kg CO_2-eqv.	4
Environmental impact Transport, per 1000 kgkm (0.690 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	

[108] KVADRAT (2021) - Kvadrat; Products; Molly 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	> 95 %	10
Circulation potential	100% (organic/undyed)	10
Socially compatible	Yes	10
Total average rating		**7,83**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 690 g/m	
Mechanical properties		
Resilience	75.000 Martindale	
Pilling (ISO1-5)	3 - 4	
Light fastness (ISO 1-5)	6	
Seam slippage	n.a.	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	

4.4.16 Kvadrat, Plecto

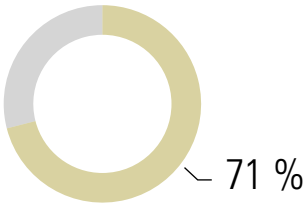


Fig. 4.4.16: www.kvadrat.dk

Tab. 4.4.16 A: Material data sheet, Plecto, general[110]

Material group	Natural-synthetic material; textiles; upholstery fabric; new wool, polyester, nylon
Name	Plecto
Material abbreviation	VW (virgin wool), PE (polyester), PA (nylon/polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Netherlands (NLD)
Designer	Febrik
Version	17 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[110] KVADRAT (2021) - Kvadrat; Products; Pro 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.16 B: Materialdatenblatt, Plecto, spezifisch[111][112]

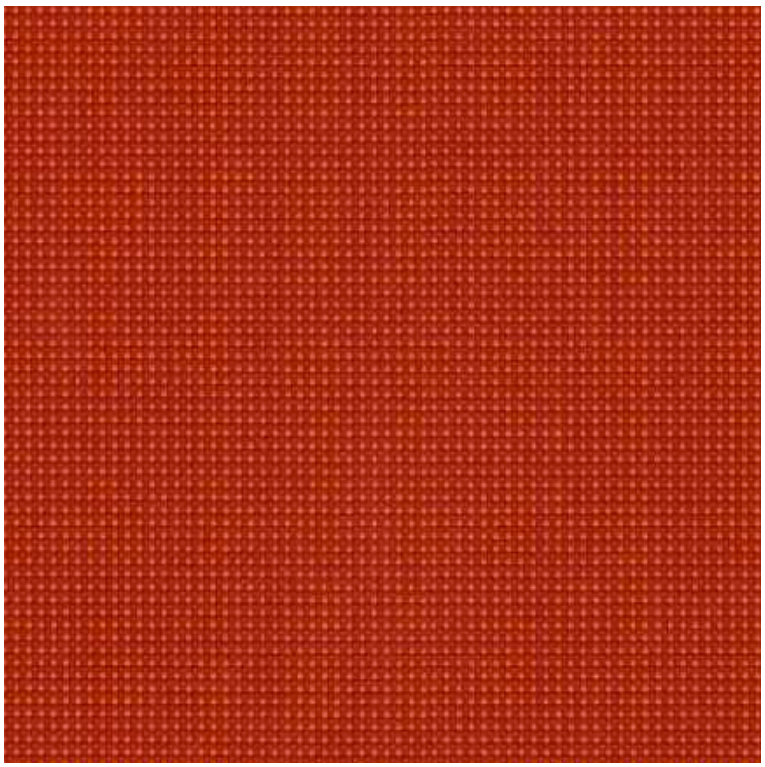
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: AS/NZS 3837 class 2 • BS 5852 Crib 5 with treatment • IMO FTP Code 2010 Part 8 • IMO FTP Code 2010 Part 9 • UNI 9175 1IM • US Cal. Bull. 117-2013 • DIN 4102 B2 • EN 1021-1/2 • ASTM E84 Class A Unadhered	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin Wool	50 %	
Polyamide	16 %	
Polyester	34 %	
Life Cycle Assessment Data Plecto, Kvadrat		6
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	88 MJ	7
Use of freshwater resources (FW)	ca. 0,25 m³	5
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	6,1 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0.510 kg/m)		4,5
Production site: Netherlands/ZEITRAUM		
Truck - ca. 800 km	A4	9
Total non-renewable primary energy (PENRT)	966,4 MJ	

[111] KVADRAT (2021) - Kvadrat; Products; Pro 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,0511 m^3	
Global Warming Potential (GWP)	71,752 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	50 %	5
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,08**
Economics		
Warranty	5 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 660 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	3 - 4	
Light fastness (ISO 1-5)	7	
Seam slippage	n.a.	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 110 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	

Notes	Colors may vary slightly	



4.4.17 Kvadrat, Pro 3

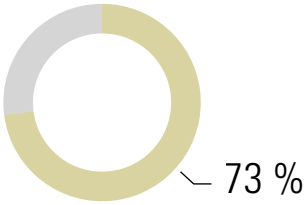


Fig. 4.4.17: www.kvadrat.dk

Tab. 4.4.17 A: Material data sheet, Pro 3, general[113]

Material group	Natural-synthetic material; textiles; upholstery fabric; polyethylene (Trevira CS)
Name	Pro 3
Material abbreviation	PE (polyethylene)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Netherlands (NLD)
Designer	Finn Sködt
Version	35 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[113] KVADRAT (2021) - Kvadrat; Products; Pro 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

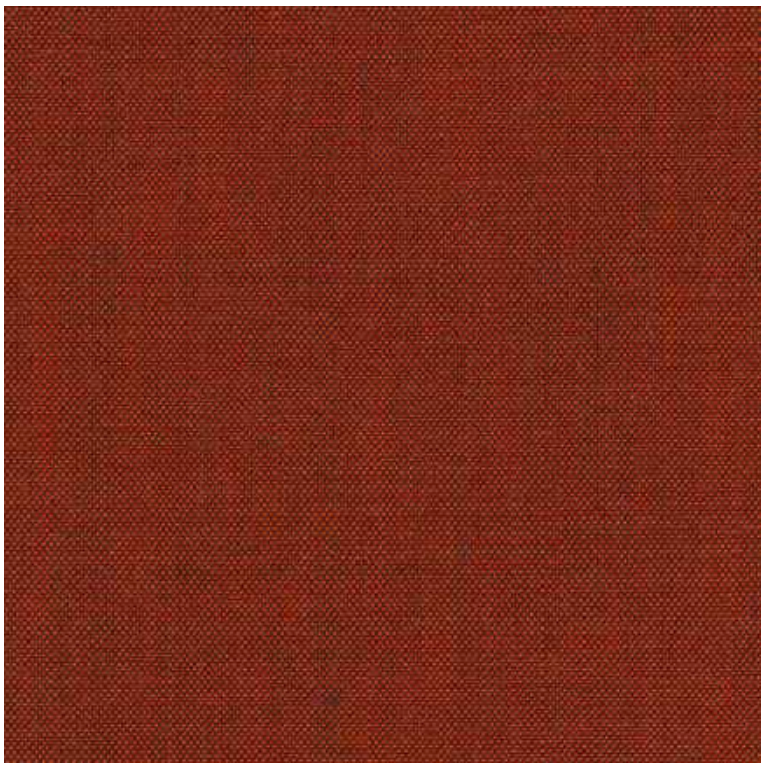
Tab. 4.4.17 B: Materialdatenblatt, Pro 3, spezifisch[114][115]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, LCA Data, ISO 9001, ISO 14001, REACH, CP65	
Fire resistance	**Fire tests**: AS/NZS 1530.3 • BS 5852 Crib 5 • FAR 25.853 • IMO FTP Code 2010 Part 7 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NF P 92 507 M1 • SN 198 898 5.2 • UNI 9175 1IM • UNI 9177 Classe 1 • US Cal. Bull. 117-2013 • DIN 4102 B1 • EN 1021-1/2 • ASTM E84 Class A Unadhered • NFPA 701 • ÖNORM B1/Q1 • AS/NZS 3837 class 1 • EN 13501-1, B-s1, d0	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 30 m	
Width	150 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Polyethylene (Trevira)	100 %	
Life Cycle Assessment Data Pro 3, Kvadrat		9
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	58 MJ	9
Use of freshwater resources (FW)	ca. 0,065 m³	9
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	2,9 Kg CO_2-eqv.	9
Environmental impact Transport, per 1000 kgkm (0.510 kg/m)		6
Production site: Netherlands/ZEITRAUM		
Truck - ca. 800 km	A4	9
Total non-renewable primary energy (PENRT)	966,4 MJ	

[114] KVADRAT (2021) - Kvadrat; Products; Pro 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,0511 m³	
Global Warming Potential (GWP)	71,752 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
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	100 % (technological)	10
Socially compatible	Yes	10
Total average rating		**7,33**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 510 g/m	
Mechanical properties		
Resilience	80.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	7	
Seam slippage	n.a.	
Care		
Washing	Gentle cycle up to max. 60 °C	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.18 Kvadrat, Remix 3

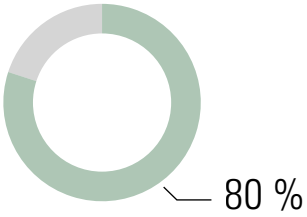


Fig. 4.4.18: www.kvadrat.dk

Tab. 4.4.18 A: Material data sheet, Remix 3, general[116]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Remix 3
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Giulio Ridolfo
Version	62 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[116] KVADRAT (2021) - Kvadrat; Products; Remix 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.18 B: Material data sheet, Remix 3, specific[117][118]

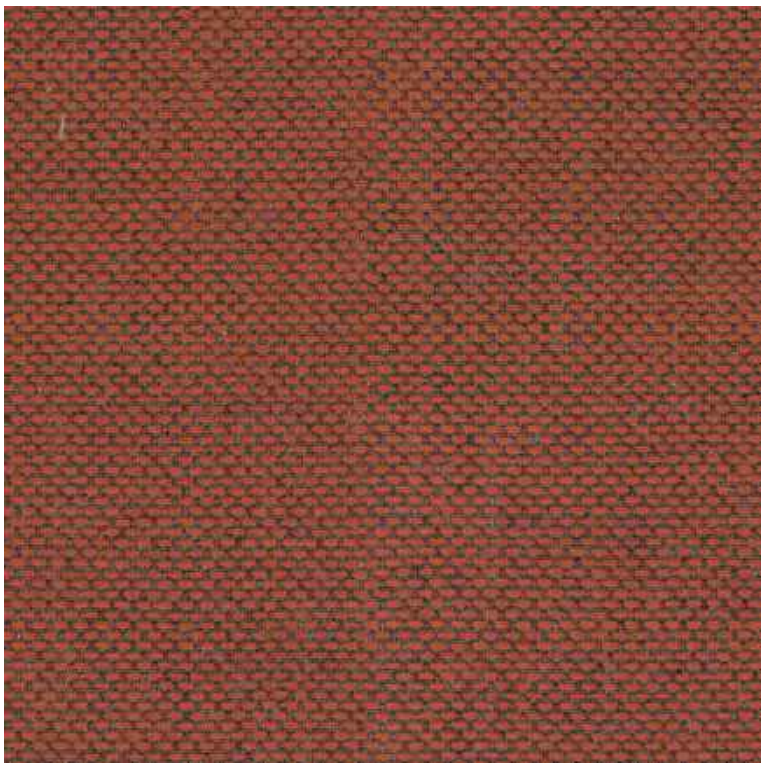
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower", REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests:** AS/NZS 1530.3 • BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 7 with treatment • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2 • ÖNORM B1/Q1 • ASTM E84 Class A Unadhered • ASTM E84 Class A Adhered • GB 50222 B1 with treatment (Chinese)	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 31 m	
Width	138 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	92 %	
Polyamide (Nylon)	8 %	
Life Cycle Assessment Data Remix 3, Kvadrat		7
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	65 MJ	9
Use of freshwater resources (FW)	ca. 0,24 m³	6
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	5,2 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0.415 kg/m)		4
Production site: Great Britain/ZEITRAUM		

[117] KVADRAT (2021) - Kvadrat; Products; Remix 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Truck - 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)	134,535 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	92 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**8**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 415 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6 - 7	
Seam slippage	4 mm (warp), 2,2 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.19 Kvadrat, Re-wool

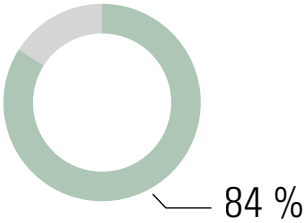


Fig. 4.4.19: www.kvadrat.dk

Tab. 4.4.19 A: Material data sheet, Re-wool, general[119]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, polyamide (nylon)
Name	Re-wool
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Margrethe Odgaard
Version	21 different colors
Use	Mainly for furniture upholstery; Commercial and residential; Hard and soft upholstery

[119] KVADRAT (2021) - Kvadrat; Products; Re-wool <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.19 B: Material data sheet, Re-wool, specific[120][121]

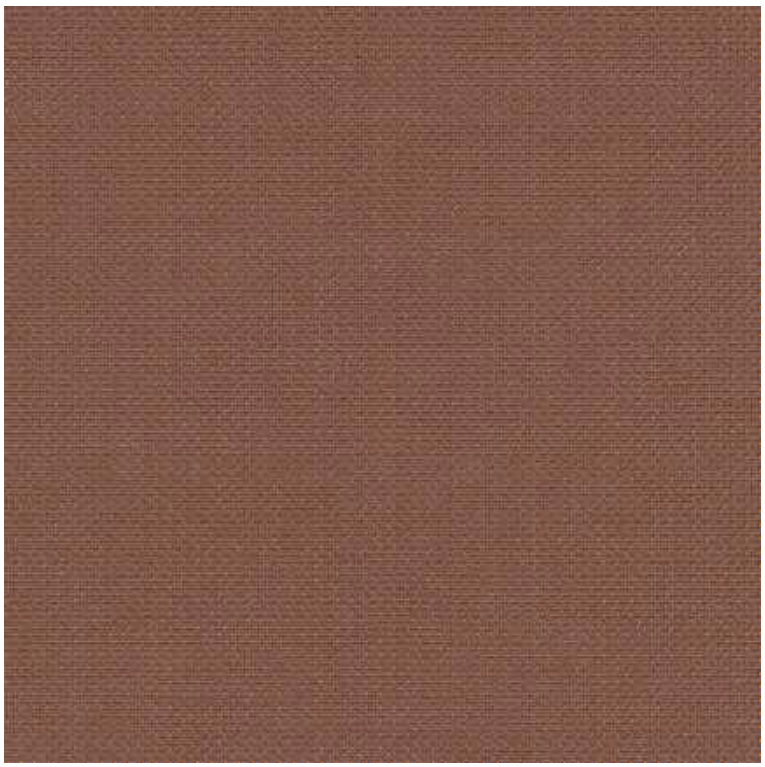
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower", REACH, ISO 9001, ISO 14001, CP65	
Fire resistance	**Fire tests:** AS/NZS 1530.3 • BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • SN 198 898 5.3 with treatment • AS/NZS 3837 class 2 • ÖNORM B1/Q1	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 23 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	Fabric	
Basic materials		
Virgin wool	45 %	
Recycling wool	45 %	
Polyamide (Nylon)	10 %	
Life cycle assessment data Re-wool, Kvadrat		7
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	70 MJ	8
Use of freshwater resources (FW)	ca. 0,21 m³	6
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	4,9 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (0.540 kg/m)		7,66
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[120] KVADRAT (2021) - Kvadrat; Products; Re-wool <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Main raw material origin: Australia o. New Zealand/production site; 45% virgin wool		5
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Main raw material origin: production site; 45 % recycled virgin wool		10
Truck - 0 km	A4	
Total non-renewable primary energy (PENRT)	0 MJ	
Use of freshwater resources (FW)	0 m³	
Global Warming Potential (GWP)	0 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**8,44**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 540 g/m	
Mechanical properties		
Resilience	50.000 Martindale	

Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6	
Rubbing fastness	4 - 5 (dry), 4 (wet)	
Seam slippage	3,5 mm (warp), 5 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	The fabric is partly made by reusing waste from Kvadrat's yarn spinning mills in the UK	



4.4.20 Kvadrat, Revive 1

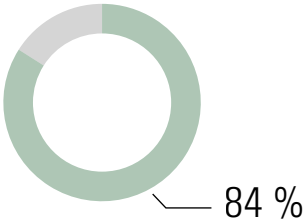


Fig. 4.4.20: www.kvadrat.dk

Tab. 4.4.20 A: Material data sheet, Revive 1, general[122]

Material group	Natural synthetic material; textiles; upholstery fabric; recycled polyester
Name	Revive
Material abbreviation	PE (Polyester)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	China (CHN)
Designer	Geogina Wright
Version	Revive 1; Revive 2; 25 different color shades
Use	Predominantly for furniture upholstery; High traffic areas; Outdoor and/or humid environments; Removable upholstery fabrics; Allergy friendly

[122] KVADRAT (2021) - Kvadrat; Products; Revive 1 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.20 B: Material data sheet, Revive 1, specific[123][124]

General description (manufacturer spec.)		
Certifications/Information	Greenguard, Greenguard Gold, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • IMO FTP Code 2010 Part 8 • NF D 60 013 with treatment • SN 198 898 5.3 with treatment • UNI 9175 1IM • UNI 9177 Classe 1 • US Cal. Bull. 117-2013 • DIN 4102 B1 • EN 1021-1/2 • ASTM E84 Class A Unadhered • ASTM E84 Class B Adhered • AS/NZS 3837 class 1 • BS 5852 part 1 with treatment • GB 50222 B1 with treatment (Chinese) • ÖNORM B1/Q1 • NFPA 701	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 50 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	Fabric	
Basic materials		
Recycling-Polyester	100 %	
Life cycle assessment data Revive 1, Kvadrat		8
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	54 MJ	10
Use of freshwater resources (FW)	0,1845 m³	5
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	3,249 Kg CO_2-eqv.	9
Environmental impact Transport, per 1000 kgkm (0.420 kg/m)		4,5
Production site: China/ZEITRAUM		
Truck - ca. 2000 km	A4	0

[123] KVADRAT (2021) - Kvadrat; Products; Revive 1 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Main raw material origin: China/production site		9
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % technological	10
Socially compatible	Yes	9
Total average rating		**8,41**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 420 g/m	
Mechanical properties		
Resilience	60.000 Martindale	
Pilling (ISO1-5)	4 - 5	
Light fastness (ISO 1-5)	5	
Rubbing fastness	5 (dry), 5 (wet)	
Seam slippage	3,5 mm (warp), 4 mm (weft)	
Care		
Washing	Gentle wash cycle, max. 60 °C	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Made from PET bottles; shrinkage rate: approx. 1 %	

4.4.21 Kvadrat, Savanna

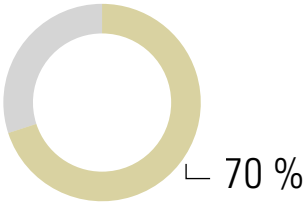


Fig. 4.4.21: www.kvadrat.dk

Tab. 4.4.21 A: Material data sheet, Savanna, general[125]

Material group	Natural synthetic material; textiles; upholstery fabric; polyester, virgin wool, polyacrylate, cotton, polyamide, linen
Name	Savanna
Material abbreviation	PE (polyester); WV (virgin wool); PAR (polyarcylate); CO (cotton); PA (polyamide); LI (linen)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Aggebo & Henriksen
Version	12 different colors
Use	Predominantly for furniture upholstery; High traffic areas; Outdoor and/or humid environments; Removable upholstery fabrics; Allergy friendly

[125] KVADRAT (2021) - Kvadrat; Products; Savanna <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

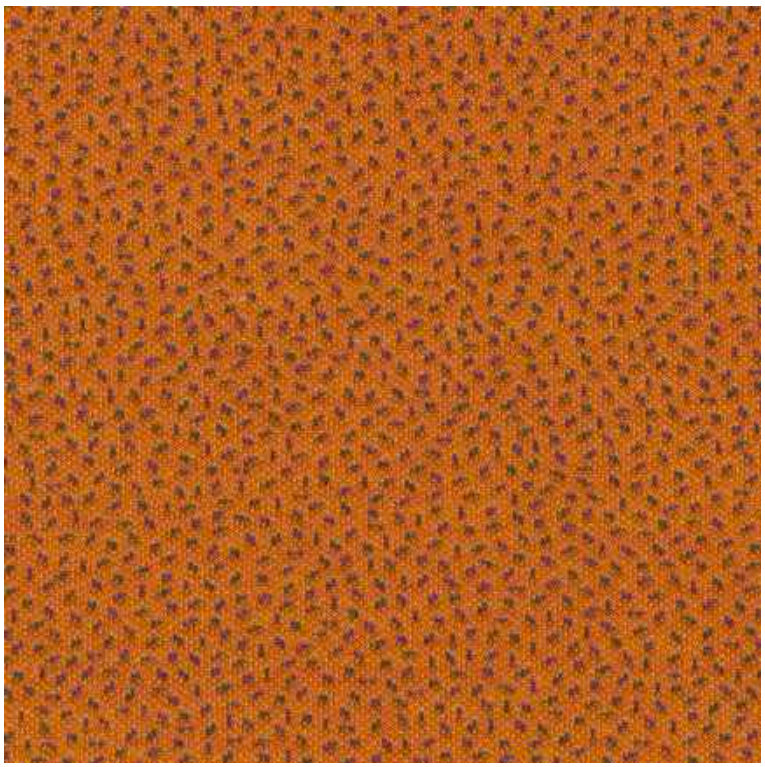
Tab. 4.4.21 B: Material data sheet, Savanna, specific[126][127]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, ISO 9001, ISO 14001, LCA Data, REACH, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • NF D 60 013 with treatment • SN 198 898 5.3 with treatment • UNI 9175 1IM with treatment • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2 • BS 5852 part 1 with treatment	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	n.a.	
Appearance		
Pattern	Stripe	
Length	ca. 25 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Polyester	34 %	
Virgin wool	31 %	
Polyacrylate	26 %	
Cotton	4 %	
Polyamide (Nylon)	3 %	
Linen	2 %	
Life cycle assessment data Savanna, Kvadrat		6
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	99 MJ	6
Use of freshwater resources (FW)	0,20 m³	6
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	6,2 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (0.680 kg/m)		5

[126] KVADRAT (2021) - Kvadrat; Products; Savanna <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Production site: Norway/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
k.A. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	37 %	4
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 680 g/m	
Mechanical properties		
Resilience	45.000 Martindale	
Pilling (ISO1-5)	3	
Light fastness (ISO 1-5)	6 - 7	
Seam slippage	n.a.	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.22 Kvadrat, Sprinkles

64 %

Fig. 4.4.22: www.kvadrat.dk

Tab. 4.4.22 A: Material data sheet, sprinkles, general[128]

Material group	Natural synthetic material; textiles; upholstery fabric; polyester filling, wool, polyester, polyamide
Name	Sprinkles
Material abbreviation	PE (polyester), WV (virgin wool), PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Netherlands (NLD)
Designer	Bertjan Pot
Version	23 different colors
Use	Mainly for furniture upholstery

[128] KVADRAT (2021) - Kvadrat; Products; Sprinkles <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

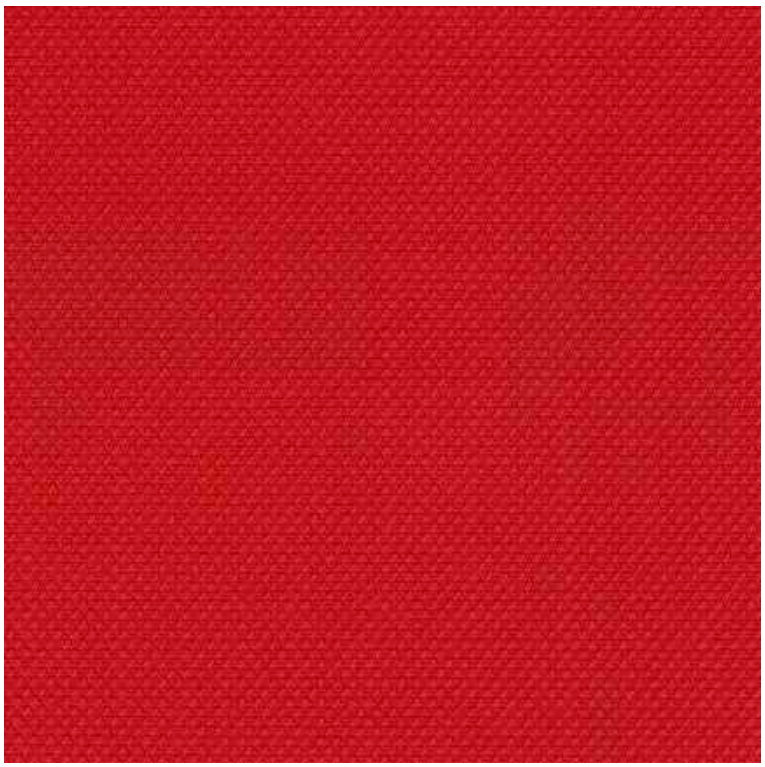
Tab. 4.4.22 B: Material data sheet, sprinkles, specific[129][130]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests:** BS 5852 crib 5 with treatment • BS 5852 part 1 • UNI 9175 1IM • US Cal. Bull. 117-2013 • DIN 4102 B2 • EN 1021-1/2 • ASTM E84 Class A Unadhered • IMO FTP Code 2010 Part 8 • IMO FTP Code 2010 Part 9	
Environmental benefits		
AZO dyes	All limit values and specifications of the EU Ecolabel are complied with	
Heavy metals	All limit values and specifications of the EU Ecolabel are complied with	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	Biodegradable	
Appearance		
Pattern	Uni	
Length	ca. 20 m	
Width	160 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Polyester	60 %	
Wool	30 %	
Polyamide	10 %	
Life cycle assessment data Sprinkles, Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	110 MJ	5
Use of freshwater resources (FW)	0,25 m³	5
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	6,8 Kg CO_2-eqv.	6
Environmental impact Transport, per 1000 kgkm (1.07 kg/m)		6
Production site: Netherlands/ZEITRAUM		
Truck - ca. 800 km	A4	9

[129] KVADRAT (2021) - Kvadrat; Products; Sprinkles <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Total non-renewable primary energy (PENRT)	966,4 MJ	
Use of freshwater resources (FW)	0,0511 m^3	
Global Warming Potential (GWP)	71,75 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
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	Durable/moderately repairable (10 - 20 years)	6
Biological reproduction/ recycled material	30 %	3
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**6,38**
Economics		
Warranty	5 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 1070 g/m	
Mechanical properties		
Resilience	80.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-8)	7	
Care		
Washing	Wash at max. 30°C, gentle cycle	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Do not hot iron, max. 110 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.23 Kvadrat, Steelcut 2

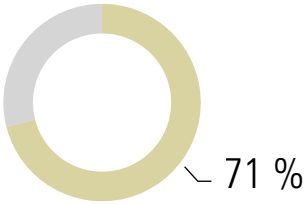


Fig. 4.4.23: www.kvadrat.dk

Tab. 4.4.23 A: Material data sheet, Steelcut 2, general[131]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Steelcut 2
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Dijkmeijer & Ridolfo
Version	37 different colors
Use	Mainly for furniture upholstery

[131] KVADRAT (2021) - Kvadrat; Products; Steelcut 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.23 B: Material data sheet, Steelcut 2, specific[132][133]

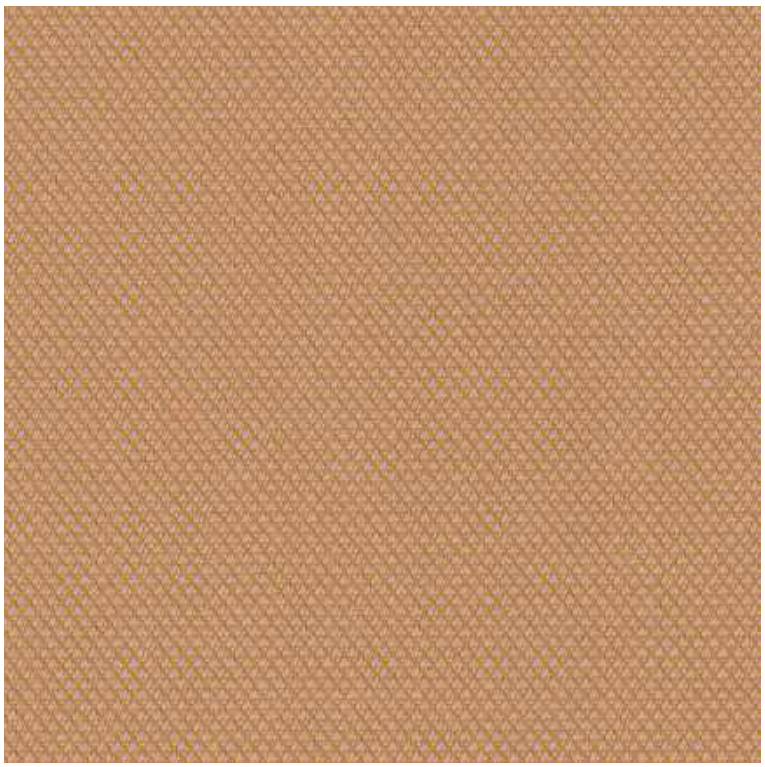
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower", REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests:** AS/NZS 1530.3 • BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2 • ÖNORM B1/Q1 • ASTM E84 Class A Unadhered • ASTM E84 Class B Adhered	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 24,5 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	90 %	
Polyamide (Nylon)	10 %	
Life cycle assessment data Steelcut 2, Kvadrat		2,66
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	130 MJ	4
Use of freshwater resources (FW)	0,47 m³	1
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	10 Kg CO_2-eqv.	3
Environmental impact Transport, per 1000 kgkm (0.825 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[132] KVADRAT (2021) - Kvadrat; Products; Steelcut 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,11**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 825 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	3 - 4	
Light fastness (ISO 1-5)	5	
Rubbing fastness	5 (dry, 5 (wet)	
Seam slippage	3 mm (warp), 3 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.24 Kvadrat, Steelcut Trio 3

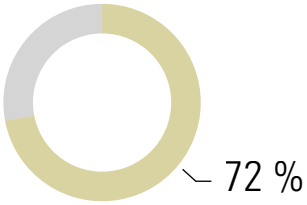


Fig. 4.4.24: www.kvadrat.dk

Tab. 4.4.24 A: Material data sheet, Steelcut Trio 3, general[134]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Steelcut Trio 3
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Dijkmeijer & Ridolfo
Version	54 different colors
Use	Mainly for furniture upholstery

[134] KVADRAT (2021) - Kvadrat; Products; Steelcut Trio 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.24 B: Material data sheet, Steelcut Trio 3, specific[135][136]

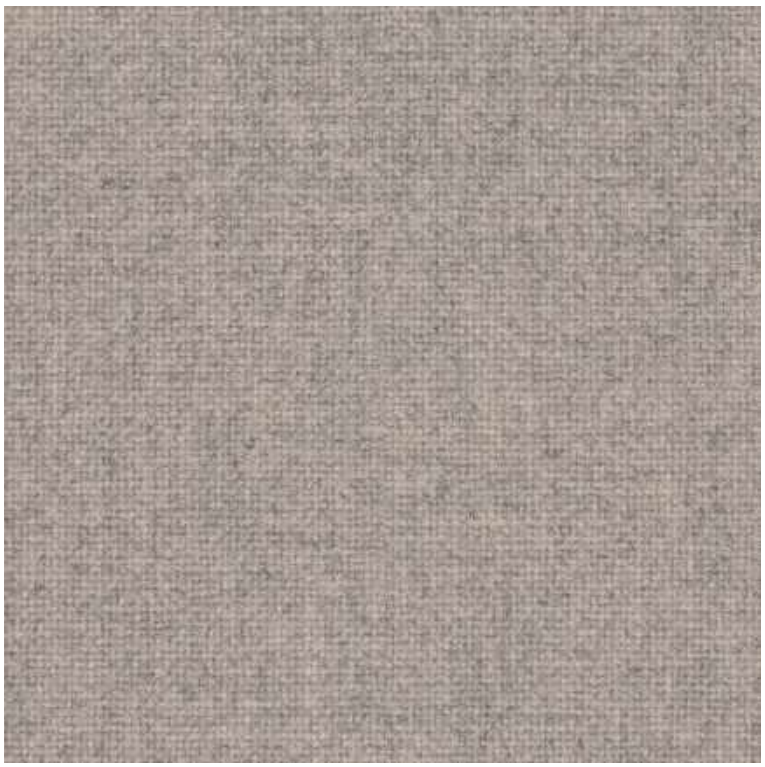
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower", REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests:** AS/NZS 1530.3 • BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • NFPA 260 • SN 198 898 5.3 with treatment • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ASTM E84 Class B Unadhered • ASTM E84 Class B Adhered • ÖNORM B1/Q1 • AS/NZS 3837 class 2 • GB 50222 B1 with treatment (Chinese)	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 24 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	90 %	
Polyamide (Nylon)	10 %	
Life cycle assessment data Steelcut Trio 3, Kvadrat		3
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	120 MJ	4
Use of freshwater resources (FW)	0,43 m³	2
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	9,5 Kg CO_2-eqv.	3
Environmental impact Transport, per 1000 kgkm (0.770 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8

[135] KVADRAT (2021) - Kvadrat; Products; Steelcut Trio 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	90 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,16**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 825 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	3 - 4	
Light fastness (ISO 1-5)	5	
Rubbing fastness	5 (dry, 5 (wet)	
Seam slippage	3 mm (warp), 3 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.25 Kvadrat, Tonica 2

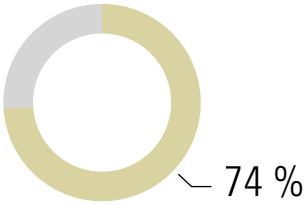


Fig. 4.4.25: www.kvadrat.com

Tab. 4.4.25 A: Material data sheet, Tonica 2, general[137]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool
Name	Tonica 2
Material abbreviation	WV (virgin wool)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Great Britain (GB)
Designer	Georgina Wright
Version	39 different colors
Use	Mainly for furniture upholstery

[137] KVADRAT (2021) - Kvadrat; Products; Tonica 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.25 B: Material data sheet, Tonica 2, specific[138][139]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, EU Ecolabel „The Flower", REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests:** BS 5852 crib 5 with treatment • BS 5852 ignition source 3 • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • ÖNORM B1/Q1 • AS/NZS 3837 class 2 • NFPA 260 • ASTM E84 Class B Unadhered • ASTM E84 Class A Adhered	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	Biodegradable	
Appearance		
Pattern	n.a.	
Length	ca. 25 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	100 %	
Life cycle assessment data Tonica 2, Kvadrat		3,66
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	110 MJ	5
Use of freshwater resources (FW)	0,43 m³	2
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	8,9 Kg CO_2-eqv.	4
Environmental impact Transport, per 1000 kgkm (0.700 kg/m)		4
Production site: Great Britain/ZEITRAUM		
Truck - ca. 1500 km	A4	8
Total non-renewable primary energy (PENRT)	1812 MJ	

[138] KVADRAT (2021) - Kvadrat; Products; Tonica 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Containerschiff - ca. 10000 km	A4	
Total non-renewable primary energy (PENRT)	1094 MJ	
Use of freshwater resources (FW)	0,005636 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	> 95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,44**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 700 g/m	
Mechanical properties		
Resilience	45.000 Martindale	
Pilling (ISO1-5)	4 - 5	
Light fastness (ISO 1-5)	6 -7	
Rubbing fastness	5 (dry, 4-5 (wet)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	

4.4.26 Kvadrat, Raf Simons, Balder 3

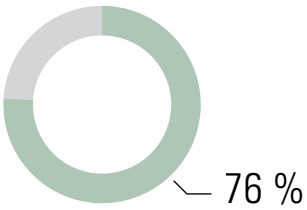


Fig. 4.4.26: www.kvadrat.dk

Tab. 4.4.26 A: Material data sheet, Balder 3, general[140]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, cotton, polyamide
Name	Balder 3
Material abbreviation	WV (virgin wool); CO (cotton); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Raf Simons & Fanny Aronsen
Version	19 different colors
Use	Predominantly for furniture upholstery; High traffic areas; Outdoor and/or humid environments; Removable upholstery fabrics; Allergy friendly

[140] KVADRAT (2021) - Kvadrat; Products; Balder 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.26 B: Material data sheet, Balder 3, specific[141][142]

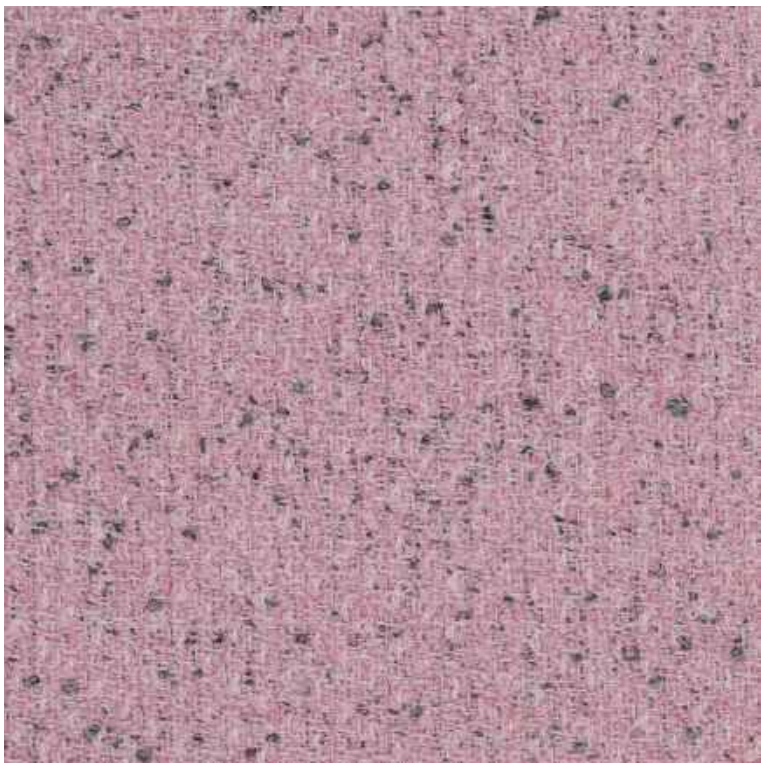
General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests**: AS/NZS 1530.3 • BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NFPA 260 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Stripe	
Length	ca. 30 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	68 %	
Cotton	26 %	
Polyamide (Nylon)	6 %	
Life cycle assessment data Balder 3, Kvadrat		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	90 MJ	7
Use of freshwater resources (FW)	0,37 m³	3
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,2 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.685 kg/m)		3,5
Production site: Norway/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	

[141] KVADRAT (2021) - Kvadrat; Products; Balder 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	94 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,58**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 685 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	6	
Seam slippage	3 mm (warp), 3 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.27 Kvadrat, Raf Simons, Pilot

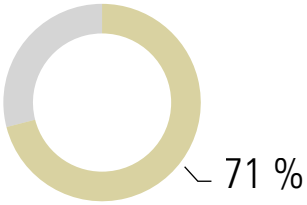


Fig. 4.4.27: www.kvadrat.dk

Tab. 4.4.27 A: Material data sheet, pilot, general[143]

Material group	Natural-synthetic material; textiles; upholstery fabric; virgin wool, polyester, polyamide
Name	Pilot
Material abbreviation	WV (virgin wool); PE (polyester); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Raf Simons
Version	10 different colors
Use	Predominantly for furniture upholstery; High traffic areas; Outdoor and/or humid environments; Removable upholstery fabrics; Allergy friendly

[143] KVADRAT (2021) - Kvadrat; Products; Pilot <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.27 B: Material data sheet, pilot, specific[144][145]

General description (manufacturer spec.)		
Certifications/Information	Greenguard Gold, REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • BS 5852 part 1 • IMO FTP Code 2010 Part 8 • NF D 60 013 • UNI 9175 1IM • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2 • ÖNORM B1/Q1	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	n.a.	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 27 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	82 %	
Polyester	10 %	
Polyamide (Nylon)	8 %	
LCA data comparator for Pilot (no data available) - Steelcut Trio 3, Kvadrat		3
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	120 MJ	4
Use of freshwater resources (FW)	0,43 m³	2
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	9,5 Kg CO_2-eqv.	3
Environmental impact Transport, per 1000 kgkm (0.770 kg/m)		3,5
Production site: Norway/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	

[144] KVADRAT (2019) - Kvadrat; Products; Pilot <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: Australia or New Zealand/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	82 %	9
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,08**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 770 g/m	
Mechanical properties		
Resilience	70.000 Martindale	
Pilling (ISO1-5)	4	
Light fastness (ISO 1-5)	7	
Seam slippage	4,5 mm (warp), 5 mm (weft)	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	
Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	

Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	

4.4.28 Kvadrat, Raf Simons, Sunniva 3

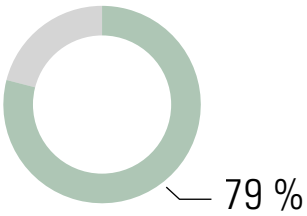


Fig. 4.4.28: www.kvadrat.dk

Tab. 4.4.28 A: Material data sheet, Sunniva 3, general[146]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, viscose, linen, polyester, polyamide
Name	Sunniva 3
Material abbreviation	WV (virgin wool); CV (viscose); LI (linen); PE (polyester); PA (polyamide)
Manufacturer	Kvadrat, Denmark (DK)
Manufactured in	Norway (NO)
Designer	Raf Simons & Fanny Aronsen
Version	35 different colors
Use	Predominantly for furniture upholstery; High traffic areas; Outdoor and/or humid environments; Removable upholstery fabrics; Allergy friendly

[146] KVADRAT (2021) - Kvadrat; Products; Sunniva 2 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

Tab. 4.4.28 B: Material data sheet, Sunniva 3, specific[147][148]

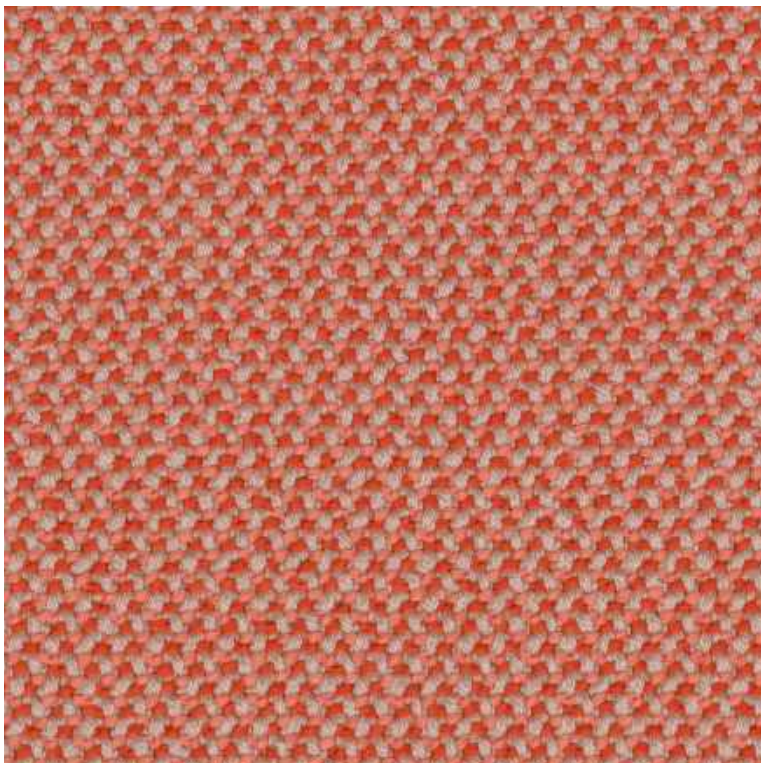
General description (manufacturer spec.)		
Certifications/Information	Greenguard, REACH, ISO 9001, ISO 14001, LCA Data, CP65	
Fire resistance	**Fire tests**: BS 5852 crib 5 with treatment • IMO FTP Code 2010:Part 8 with treatment • NFPA 260 • US Cal. Bull. 117-2013 • EN 1021-1/2 • AS/NZS 3837 class 2	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	ca. 25 m	
Width	140 cm	
Thickness	n.a.	
Color	www.kvadrat.dk; Foreign fibers can occur in light colors	
Textile surface	n.a.	
Basic materials		
Virgin wool	58 %	
Viscose	25 %	
Linen	8 %	
Polyamide (Nylon)	5 %	
Polyester	4 %	
Life cycle assessment data Sunniva 3, Kvadrat		7
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	74 MJ	8
Use of freshwater resources (FW)	0,24 m³	6
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	5,5 Kg CO_2-eqv.	7
Environmental impact Transport, per 1000 kgkm (0.590 kg/m)		3,5
Production site: Norway/ZEITRAUM		

[147] KVADRAT (2021) - Kvadrat; Products; Sunniva 3 <https://www.kvadrat.dk/en/products> Accessed, on 11/12/2021

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

Truck - ca. 2000 km	A4	7
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.	
Main raw material origin: Australia or New Zealand/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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	91 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,91**
Economics		
Warranty	10 years warranty	
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 590 g/m	
Mechanical properties		
Resilience	50.000 Martindale	
Pilling (ISO1-5)	3	
Light fastness (ISO 1-5)	5 - 6	
Seam slippage	n.a.	
Care		
Washing	Do not wash	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing, max. 150 °C	
Dry cleaning	Professional cleaning with trichloroethane, normal	
Notes	Colors may vary slightly	



4.4.29 Rohi, Credo

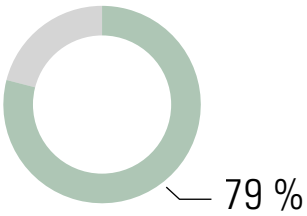


Fig. 4.4.29: www.rohi.com

Tab. 4.4.29 A: Material data sheet, Credo, general[149]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Credo
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	27 different colors
Use	Object areas and private living spaces with very high stresses

[149] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.29 B: Material data sheet, Credo, specific[150][151]

General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • ÖNORM B1/Q1 • IMO 2014/90/EU **Fire tests (with optional flame retardant finish)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical • BKZ 5.3 SN 198898 •NF P92-507 M2	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	140 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	95 %	
Polyamide (Nylon)	5 %	
LCA data comparator for Credo, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5

[150] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5
Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Hauptrohstoff-Ursprung: Australien/Herstellungsort		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 870 g/m	
Mechanical properties		
Resilience	100.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Light fastness (ISO 1-5)	min. 5 - 8	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	

4.4.30 Rohi, Dante

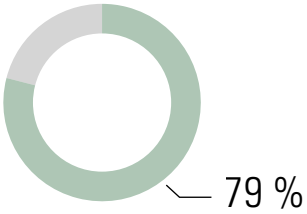


Fig. 4.4.30: www.rohi.com

Tab. 4.4.30 A: Material data sheet, Dante, general[152]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Dante
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	24 different colors
Use	Object areas and private living spaces with very high stresses

[152] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.30 B: Material data sheet, Dante, specific[153][154]

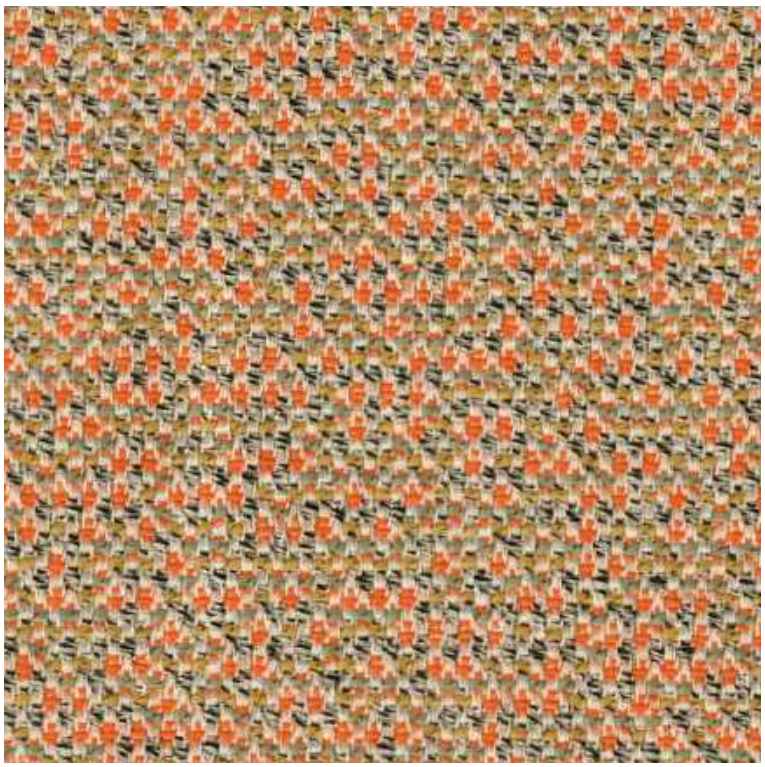
General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • IMO 2014/90/EU **Fire tests (with optional flame retardant finish)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	140 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	95 %	
Polyamide (Nylon)	5 %	
LCA data comparator for Dante, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5

[153] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: Australia/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 920 g/m	
Mechanical properties		
Resilience	52.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Light fastness (ISO 1-5)	min. 5 - 8	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	



4.4.31 Rohi, Mica

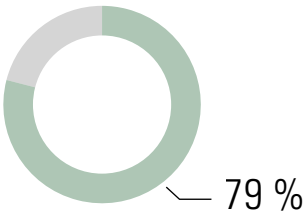


Fig. 4.4.31: www.rohi.com

Tab. 4.4.31 A: Material data sheet, Mica, general[155]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Mica
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	30 different colors
Use	Object areas and private living spaces with very high stresses

[155] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.31 B: Material data sheet, mica, specific[156][157]

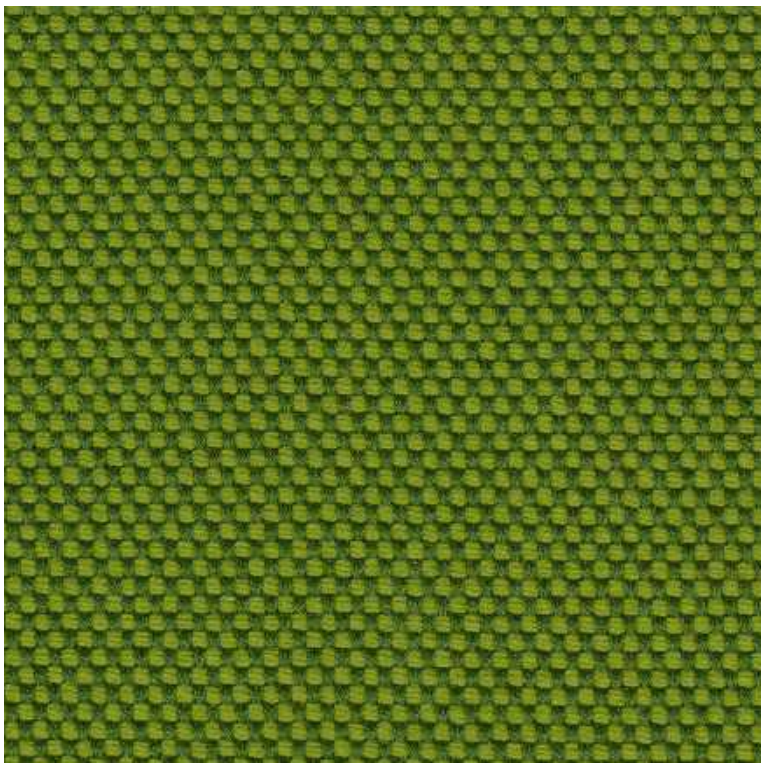
General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • ÖNORM B1/Q1 • IMO 2014/90/EU **Fire tests (with optional flame retardant finish)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	140 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	95 %	
Polyamide (Nylon)	5 %	
LCA data comparator for Mica, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5

[156] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Production site; Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: Australia/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 840 g/m	
Mechanical properties		
Resilience	50.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Light fastness (ISO 1-5)	min. 5 - 8	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	



4.4.32 Rohi, Novum

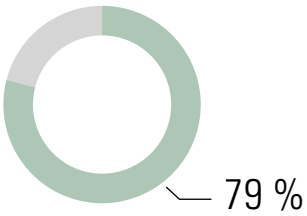


Fig. 4.4.32: www.rohi.com

Tab. 4.4.32 A: Material data sheet, Novum, general[158]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Novum
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	41 different colors
Use	Object areas and private living spaces with very high stresses

[158] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.32 B: Material data sheet, Novum, specific[159][160]

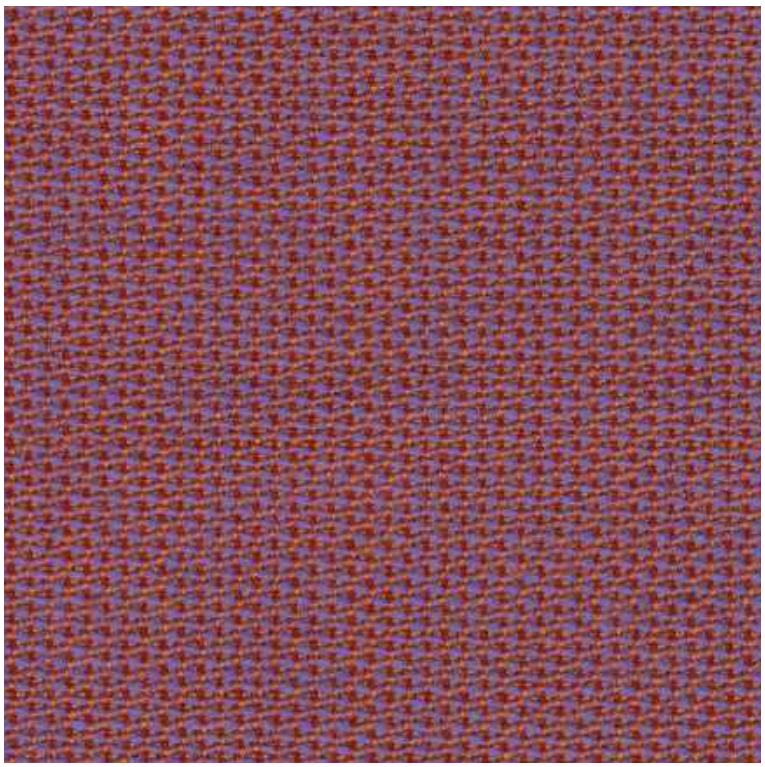
General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • IMO 2014/90/EU **Fire tests (with optional flame retardant finish)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	150 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	96 %	
Polyamide (Nylon)	4 %	
LCA data comparator for Novum, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5

[159] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: Australia/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	96 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 990 g/m	
Mechanical properties		
Resilience	90.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Light fastness (ISO 1-5)	min. 5 - 8	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	



4.4.33 Rohi, Topia

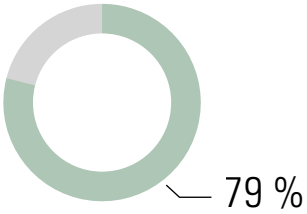


Fig. 4.4.33: www.rohi.com

Tab. 4.4.33 A: Material data sheet, Topia, general[161]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Topia
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	40 different colors
Use	Object areas and private living spaces with very high stresses

[161] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.33 B: Material data sheet, Topia, specific[162][163]

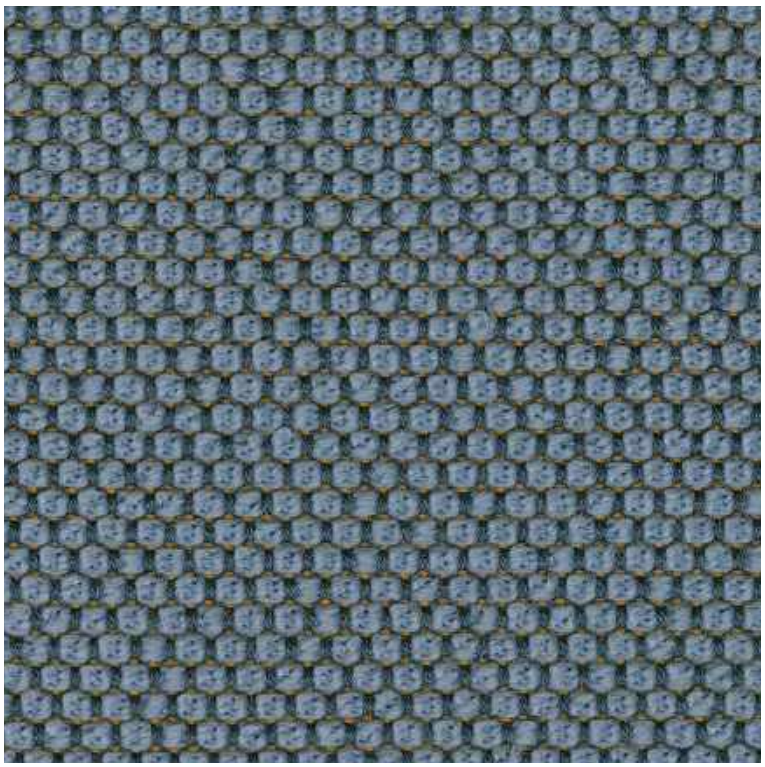
General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • ÖNORM B1/Q1 • IMO 2014/90/EU **Fire tests (with optional flame retardant finish)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical • BKZ 5.3 SN 198898 • NF P92-507 M2 • Bahn DIN EN 45545-2, R21, ISO5660-1 HL3	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	150 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	95 %	
Polyamide (Nylon)	5 %	
LCA data comparator for Topia, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5

[162] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5
Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: Australia/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (20 years)	9
Biological reproduction/ recycled material	95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 660 g/m	
Mechanical properties		
Resilience	50.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Light fastness (ISO 1-5)	min. 5 - 8	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	

Drying drum	Do not dry	
Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	



4.4.34 Rohi, Opera

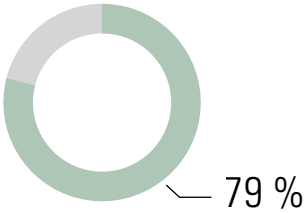


Fig. 4.4.34: www.rohi.com

Tab. 4.4.34 A: Material data sheet, Opera, general[164]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Opera
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	29 different colors
Use	Object areas and private living spaces with very high stresses

[164] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.34 B: Material data sheet, Opera, specific[165][166]

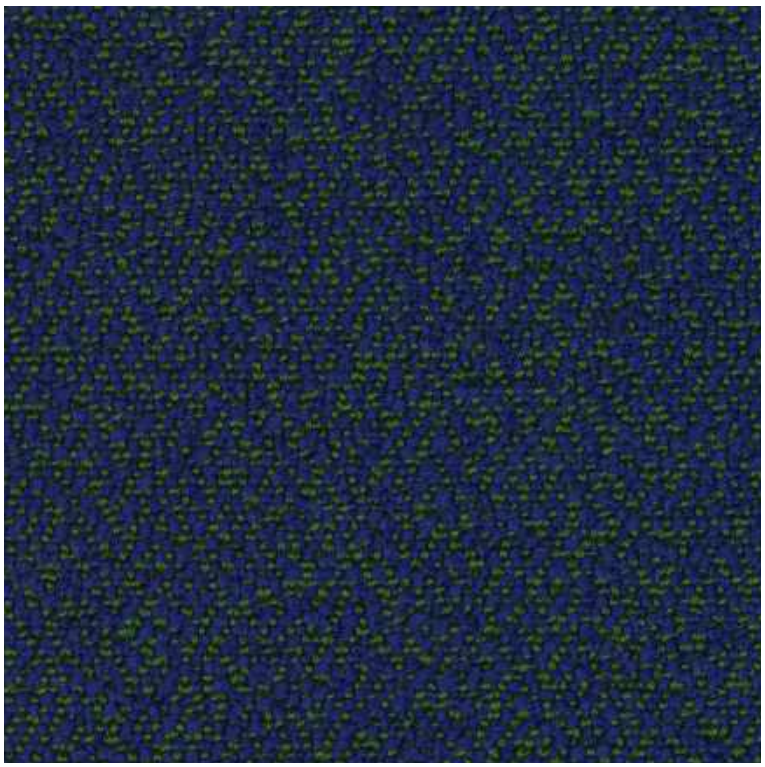
General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • ÖNORM B1/Q1 • IMO 2014/90/EU **Fire tests (with optional flame retardant finish)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical • NF P92-507 M2	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	140 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	96 %	
Polyamide (Nylon)	4 %	
LCA data comparator for Opera, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5

[165] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: Australia/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	96 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 1010 g/m	
Mechanical properties		
Resilience	90.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Light fastness (ISO 1-5)	min. 5 - 8	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	



4.4.35 Rohi, Sera

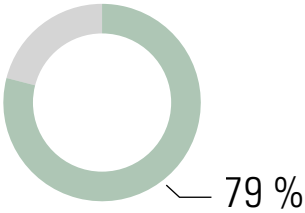


Fig. 4.4.35: www.rohi.com

Tab. 4.4.35 A: Material data sheet, Sera, general[167]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Sera
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	26 different colors
Use	Object areas and private living spaces with very high stresses

[167] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.35 B: Material data sheet, Sera, specific[168][169]

General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • IMO 2014/90/EU **Fire tests (with optional flame retardant equipment)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	150 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	96 %	
Polyamide (Nylon)	4 %	
LCA data comparator for Sera, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5

[168] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: Australia/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	96 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 910 g/m	
Mechanical properties		
Resilience	122.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Lichtechtheit (ISO 1-5)	min. 5 - 8	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	

4.4.36 Rohi, Shake

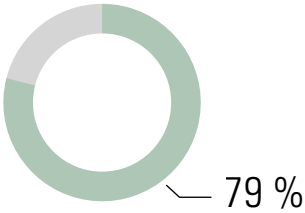


Fig. 4.4.36: www.rohi.com

Tab. 4.4.36 A: Material data sheet, Shake, general[170]

Material group	Natural synthetic material; textiles; upholstery fabric; virgin wool, polyamide
Name	Shake
Material abbreviation	WV (virgin wool); PA (polyamide)
Manufacturer	Rohi, Germany (GER)
Manufactured in	Germany (GER)
Designer	Rohi
Version	37 different colors
Use	Object areas and private living spaces with very high stresses

[170] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

Tab. 4.4.36 B: Material data sheet, Shake, specific[171][172]

General description (manufacturer spec.)		
Certifications/Information	RAL-UZ 117 2+3, IWTO Guidelines for Sheep Welfare, FR-free, AB2998 (US Export Norm), ISO 9001, REACH, CP65 (on request)	
Fire resistance	**Fire tests (without additional flame retardant finish)**: CAL TB 117 - 2013 • DIN EN 1021-1/-2 • BS 5852 Part 1: 1979 • UNI 9175 1 IM • ÖNORM B1/Q1 • IMO 2014/90/EU **Fire tests (with optional flame retardant equipment)**: BS 5852: 2006 Crib5 • DIN 4102-1 B2 • DIN EN 13501-1 E • FAR 25.853 12 sec. vertical • BKZ 5.3 SN 198898	
Environmental benefits		
AZO dyes	Not contained	
Heavy metals	Not contained	
Formaldehyde	Not contained	
Brominated flame retardants	Not contained	
Spinning oil used	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	150 cm	
Thickness	n.a.	
Color	www.rohi.com; Differences may occur	
Textile surface	n.a.	
Basic materials		
Virgin wool	95 %	
Polyamide (Nylon)	5 %	
LCA data comparator for Shake, Rohi (no data available) - Hero (96 % WV, 4 % PA), Kvadrat		5,33
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	89 MJ	7
Use of freshwater resources (FW)	0,34 m³	4
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	7,3 Kg CO_2-eqv.	5
Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		5

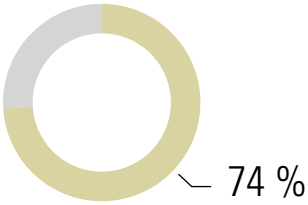
[171] ROHI (2021) - Rohi; Products <https://www.rohi.com/en/products/living/> Accessed, on 11/12/2021

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

Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: Australia/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
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 m³	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	95 %	10
Circulation potential	70 - 99 % technological/recycling	8
Socially compatible	Yes	10
Total average rating		**7,88**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 660 g/m	
Mechanical properties		
Resilience	> 70.000 Martindale	
Pilling (ISO1-5)	min. 4 - 5	
Lichtechtheit (ISO 1-5)	min. 5	
Seam slippage	n.a.	
Care		
Washing	Professional cleaning recommended	
Chlorine	Do not bleach	
Drying drum	Do not dry	

Ironing	Moderate hot ironing	
Dry cleaning	Professional cleaning recommended	

4.4.37 PP fleece



Tab. 4.4.37 A: Material data sheet, PP fleece, general[173]

Material group	Synthetic material; textiles; upholstery fabric; polypropylene
Material abbreviation	PP (polypropylene)
Manufacturer	WAILAND (GER)
Manufactured in	Germany (GER)
Version	2 different colors
Use	Lining fleece

[173] WAILAND (2022) - WAILAND; Products <https://www.wailand-textil.de/produkte> Accessed, on 05/30/2022

Tab. 4.4.37 B: Material data sheet, PP fleece, specific[174][175]

General description (manufacturer spec.)		
Certifications/Information	n.a.	
Fire resistance	n.a.	
Appearance		
Pattern	Solid	
Length	n.a.	
Width	150 cm	
Thickness	n.a.	
Color	grey, black	
Textile surface	n.a.	
Basic materials		
Polypropylene	100 %	
LCA data comparator for PP fleece, WAILAND (no data available) - Pro 3 (100 % Trivera), Kvadrat		9
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	58 MJ	9
Use of freshwater resources (FW)	ca. 0,065 m³	9
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	2,9 Kg CO_2-eqv.	9
Environmental impact Transport, per 1000 kgkm (0.870 kg/m)		6,5
Production site: Germany/ZEITRAUM		
Truck - < 100 km	A4	10
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,969 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9

[174] WAILAND (2022) - WAILAND; Products <https://www.wailand-textil.de/produkte> Accessed, on 05/30/2022

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

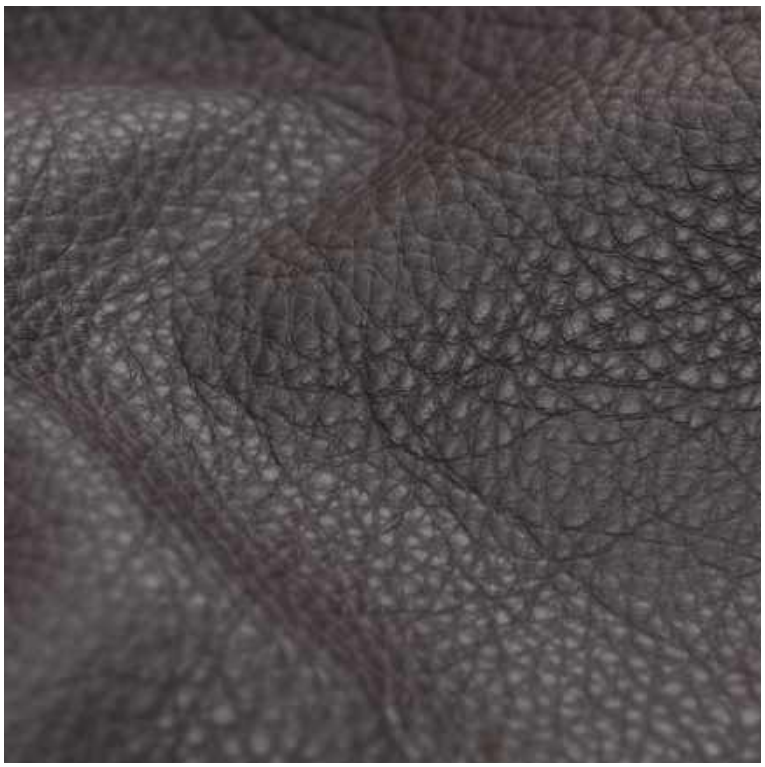
Biological reproduction/ recycled material	0 %	0
Circulation potential	100 % technological/recycling	10
Socially compatible	Yes	10
Total average rating		**7,41**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	ca. 150 g/m²	

4.5 Leather

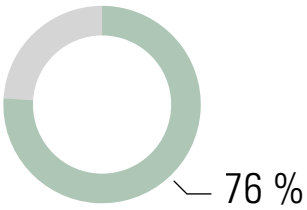
Leather is a natural product, which has been used by mankind for thousands of years. Its history goes back to 8000 BC. The tear-resistant material is used today, in addition to clothing, mainly as upholstery material. Its structure ranges from very fine to rough to coarse. As a natural material, it varies in thickness and elasticity and can be divided into different qualities depending on the body region of the animal and its condition. Leather is made durable by "tanning". A distinction is made between:

Mineral tanning: The most common type of mineral tanning is chrome tanning. Chromium salts are used in this process. After the process, the leather is soft, tear-resistant, supple and imperishable. The major disadvantage of this type of tanning is the environmental pollution caused by the use of heavy metals. The process takes 6 to 8 hours.

Vegetable tanning: In this process, purely vegetable tanning agents are used. The tanning substances can be obtained, for example, from tannic acid-containing woods, barks or leaves. The finished leather is very hard-wearing and, unlike conventionally tanned leather, has a harder feel. The process takes 16 to 18 hours.



4.5.1 Elmo Leather, Elmobaltique



Tab. 4.5.1 A: Material data sheet, Elmobaltique, general[176]

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Name	Elmobaltique
Manufacturer	Elmo Leather
Manufactured in	Sweden (S)
Cattle origin	Scandinavia
Version	22 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.1 B: Material data sheet, Elmobaltique, specific[177][178]

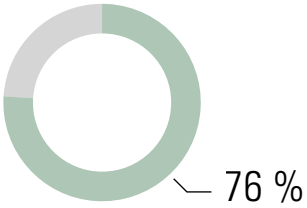
General description (manufacturer spec.)		
Certifications/Information	ISO 14001, CP65	
Fire resistance	**Fire tests**: CA TB 117-2013, EN 1021 - 1,2, IMO 2010 FTP Code Part 8 (IMO652), ISO 8191 - 1,2	
Appearance		
Size	2… 5 m²	
Thickness	1,3… 1,5 mm	
Color	22 color finishes	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		8,5
Production site: Sweden/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: North of Europe/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9

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

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

Biological reproduction/ recycled material	> 95 % (chrome tanning)	10
Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	10
Total average rating		**7,75**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
VerklebungAdhesion	good; possible with suitable adhesives	
Surface finishing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Tensile strength (DIN 53329-A)	20 N	
Light fastness (ISO 105-B02)	3	
Wet abrasion (ISO 11640)	20/4	
Dry abrasion (ISO 11640)	50/4	
Sweat (ISO 11640)	20/4	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, such as snakes, crocodiles or lizards	

4.5.2 Elmo Leather, Elmosoft



Tab. 4.5.2 A: Material data sheet, Elmosoft, general[179]

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Name	Elmosoft
Manufacturer	Elmo Leather
Manufactured in	Sweden (S)
Cattle origin	Scandinavia
Version	70 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.2 B: Material data sheet, Elmosoft, specific[180][181]

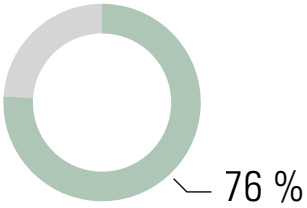
General description (manufacturer spec.)		
Certifications/Information	ISO 14001, ASTM E 662 SMP 800-C, BS 5852 crib 5, CA TB 117-2013, Chines B1, DIN 4102 - 1 (B1), DIN 53438 part 3, ECE R118, ECE R118 Annex 7 (May 2020), EN 1021 - 1,2, ISO 1716, ISO 3795, ISO 8191 - 1,2, ISO 8191 - 1,2 (Dark brown), NF P 92-503, Önorm B 3825, RDWC-CP1-04, UNI 9175, CP65	
Appearance		
Size	2… 5 m²	
Thickness	1,1… 1,3 mm	
Color	70 color versions	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		8,5
Production site: Sweden/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: North of Europe/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	

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

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

Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	> 95 % (chrome tanning)	10
Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	10
Total average rating		**7,75**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Adhesion	good; possible with suitable adhesives	
Surface finishing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Tensile strength (DIN 53329-A)	20 N	
Light fastness (ISO 105-B02)	6	
Wet abrasion (ISO 11640)	80/4	
Dry abrasion (ISO 11640)	2000/4	
Welding (ISO 11640)	n.a.	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, such as snakes, crocodiles or lizards	

4.5.3 Elmo Leather, Elmotique



Tab. 4.5.3 A: Material data sheet, Elmotique, general[182]

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Name	Elmotique
Manufacturer	Elmo Leather
Manufactured in	Sweden (S)
Cattle origin	Scandinavia
Version	18 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.3 B: Material data sheet, Elmotique, specific[183][184]

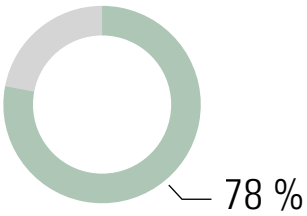
General description (manufacturer spec.)		
Certifications/Information	ISO 9001, ISO 14001, CP65	
Fire resistance	**Fire tests**: CA TB 117-2013, EN 1021 - 1,2, ISO 8191 - 1,2	
Appearance		
Size	2… 5 m²	
Thickness	1,0… 1,2 mm	
Color	18 color versions	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		8,5
Production site: Sweden/ZEITRAUM		
Truck - ca. 2000 km	A4	7
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Main raw material origin: North of Europe/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9

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

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

Biological reproduction/ recycled material	> 95 % (chrome tanning)	10
Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	10
Total average rating		**7,75**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Adhesion	good; possible with suitable adhesives	
Surface finishing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Tensile strength (DIN 53329-A)	20 N	
Light fastness (ISO 105-B02)	3	
Wet abrasion (ISO 11640)	20/4	
Dry abrasion (ISO 11640)	50/4	
Welding (ISO 11640)	20/4	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, such as snakes, crocodiles or lizards	

4.5.4 Reinhardt Leather, Florenz



Tab. 4.5.4 A: Material data sheet, Florence, general[185]

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Name	Florenz
Manufacturer	Leder Reinhardt GmbH
Manufactured in	Germany (GER)
Material origin	Italy
Version	53 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.4 B: Material data sheet, Florence, specific[186][187]

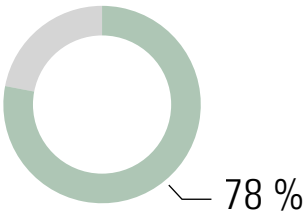
General description (manufacturer spec.)		
Certifications/Information	n.a.	
Fire resistance	**Fire tests**: DIN EN 1021-1+2 EUFAC-Guideline, CA TB 117-2013	
Appearance		
Size	4,8… 5,3 m²	
Thickness	1,0… 1,2 mm	
Color	53 color versions	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Umweltwirkung pro m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		10
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin: Germany/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9

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

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

Biological reproduction/ recycled material	> 95 % (chrome tanning)	10
Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	9
Total average rating		**7,83**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Adhesion	good; possible with suitable adhesives	
Surface finishing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Continuous folding behavior (EN ISO 5402)	30.000	
Light fastness (ISO 105-B02)	5	
Wet abrasion (ISO 11640)	250	
Dry abrasion (ISO 11640)	500	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, such as snakes, crocodiles or lizards	

4.5.5 Reinhardt Leather, Jepard



Tab. 4.5.5 A: Material data sheet, Jepard, general[188]

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Name	Jepard
Manufacturer	Leder Reinhardt GmbH
Manufactured in	Germany (GER)
Material origin	Italy
Version	13 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.5 B: Material data sheet, Jepard, specific[189][190]

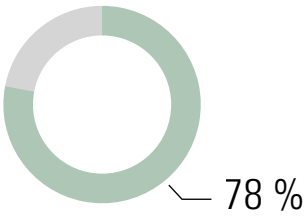
General description (manufacturer spec.)		
Certifications/Information	n.a.	
Fire resistance	**Fire tests**: CA TB 117-2013	
Appearance		
Size	4,2… 5,2 m²	
Thickness	1,1… 1,3 mm	
Color	13 color versions	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		10
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin: Italy/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	> 95 % (chrome tanning)	9

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

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

Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	9
Total average rating		**7,66**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Adhesion	good; possible with suitable adhesives	
Surface processing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Continuous folding behavior (EN ISO 5402)	30.000	
Light fastness (ISO 105-B02)	3	
Wet abrasion (ISO 11640)	20	
Dry abrasion (ISO 11640)	50	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, e.g. snakes, crocodiles or lizards	

4.5.6 Reinhardt Leather, Melano



Tab. 4.5.6 A: Material data sheet, Melano, general[191]

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Name	Melano
Manufacturer	Leder Reinhardt GmbH
Manufactured in	Germany (GER)
Material origin	Germany and Italy
Version	15 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.6 B: Material data sheet, Melano, specific[192][193]

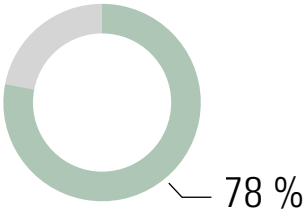
General description (manufacturer spec.)		
Certifications/Information	n.a.	
Fire resistance	**Fire tests**: CA TB 117-2013	
Appearance		
Size	4,8… 5,3 m²	
Thickness	1,0… 1,2 mm	
Color	15 color versions	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		10
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin: Germany, Italy/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	> 95 % (chrome tanning)	10

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

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

Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	9
Total average rating		**7,83**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Adhesion	good; possible with suitable adhesives	
Surface processing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Continuous folding behavior (EN ISO 5402)	30.000	
Light fastness (ISO 105-B02)	3	
Wet abrasion (ISO 11640)	20	
Dry abrasion (ISO 11640)	50	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, such as snakes, crocodiles or lizards	

4.5.7 Reinhardt Leather, Nevada



Tab. 4.5.7 A: Material data sheet, Nevada, general[194]

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Name	Nevada
Manufacturer	Leder Reinhardt GmbH
Manufactured in	Germany (GER)
Material origin	Europe
Version	22 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.7 B: Material data sheet, Nevada, specific[195][196]

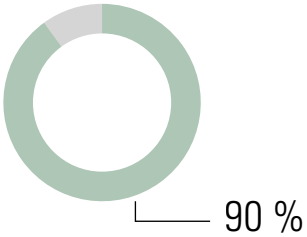
General description (manufacturer spec.)		
Certifications/Information	n.a.	
Fire resistance	**Fire tests**: CA TB 117-2013	
Appearance		
Size	4,8… 5,7 m²	
Thickness	1,4… 1,6 mm	
Color	22 color versions	
Texture	Pappillary layer - smooth, scarred. Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		10
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin: Europe/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	81 - 90 % (chrome tanning)	10

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

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

Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	9
Total average rating		**7,83**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Adhesion	good; possible with suitable adhesives	
Surface processing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Continuous folding behavior (EN ISO 5402)	n.a.	
Light fastness (ISO 105-B02)	3	
Wet abrasion (ISO 11640)	20	
Dry abrasion (ISO 11640)	50	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, such as snakes, crocodiles or lizards	

4.5.8 Reinhardt Leather, Gaucho



Tab. 4.5.8 A: Material data sheet, Gaucho, general[197]

Material group	Natural materials; animal products; leather from mammals, cowhide (vegetable tanning)
Name	Gaucho
Manufacturer	Leder Reinhardt GmbH
Manufactured in	Germany (GER)
Material origin	Italy and Spain
Version	8 different colors
Use	Clothing: jackets, pants, bags, backpacks, belts, etc.; jewelry; hats; caps; shoe soles, straps Furniture making: upholstery materials, seat shells, etc.; saddlery; automotive industry; book covers; art objects; etc.

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

Tab. 4.5.8 B: Material data sheet, Gaucho, specific[198][199]

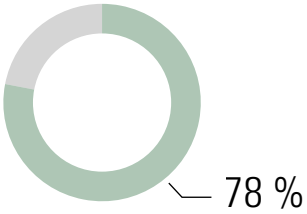
General description (manufacturer spec.)		
Certifications/Information	Cradle-to-Cradle GOLD	
Fire resistance	**Fire tests**: CA TB 117-2013	
Appearance		
Size	4,0… 5,0 m²	
Thickness	1,3… 1,6 mm	
Color	8 color versions	
Texture	Pappillary layer - smooth, scarred. Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		10
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin: Italy, Spain/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	100 % (vegetable tanning)	10

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

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

Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	10
Total average rating		**9**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Adhesion	good; possible with suitable adhesives	
Surface finishing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Physical properties		
Density	400… 900 kg/m³	
Mechanical properties		
Continuous folding behavior (EN ISO 5402)	n.a.	
Light fastness (ISO 105-B02)	3	
Wet abrasion (ISO 11640)	80	
Dry abrasion (ISO 11640)	500	
Elongation at break (unwashed underleather)	n.a.	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, such as snakes, crocodiles or lizards	

4.5.9 Reinhardt leather strap, MELLOW



Tab. 4.5.9 A: Material data sheet, Reinhardt leather strap, MELLOW, general

Material group	Natural materials; animal products; mammalian leather, cowhide (mineral tanning)
Manufacturer	Leder Reinhardt GmbH
Manufactured in	Germany (GER)
Cattle origin	Europe
Version	5 different colors
Use	MELLOW leather strap

Tab. 4.5.9 B: Material data sheet, Reinhardt leather strap, MELLOW, specific[200][201]

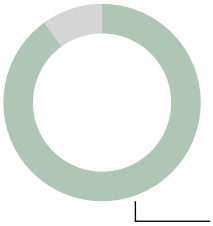
General description (manufacturer spec.)		
Certifications/Information	n.a.	
Fire resistance	n.a.	
Appearance		
Color	5 color versions	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 0,9 kg/m²)		10
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin: Europe/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	> 95 % (chrome tanning)	9
Circulation potential	40 - 70 % technological/downcycling	4
Socially compatible	Yes	9

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

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

Total average rating		**7,66**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Surface processing	good; can be dyed; smooth leather can and should be greased, oiled or waxed to protect the der from drying out; too much grease can also cause the leather to dry out; leather can be cleaned with lukewarm water; avoid using solvents	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Natural durability	With regular care, the service life of leather can be increased many times over	
Properties	Very tear-resistant; elastic; water-permeable; breathable	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, e.g. snakes, crocodiles or lizards	

4.5.10 Sleek leather



90 %

Tab. 4.5.10 A: Material data sheet, Sleek leather, general

Material group	Natural materials; animal products; leather, cowhide (vegetable tanned)
Manufacturer	Leder Reinhardt GmbH
Manufactured in	Germany (GER)
Cattle origin	Europe
Version	7 different colors
Use	Rear sleek leather, FRIDAY

Tab. 4.5.10 B: Material data sheet, Sleek leather, specific[202][203]

General description (manufacturer spec.)		
Certifications/Information	n.a.	
Fire resistance	UNI EN 1021-1: 2014, UNI EN 1021-2: 2014, CAL117 TB 2013	
Appearance		
Color	7 color versions	
Texture	Pappillary layer - smooth, scarred Reticular layer: fibrous (also called flesh side)	
Thickness	2,8 - 3,2 mm	
Life cycle assessment data leather		5
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	n.a.	
Use of freshwater resources (FW)	n.a.	
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	n.a.	
Environmental impact Transport, per 1000 kgkm (approx. 1,0 kg/m²)		10
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin: Europe/production site		
Truck - ca. 1000 km	A4	10
Total non-renewable primary energy (PENRT)	1208 MJ	
Use of freshwater resources (FW)	0,06388 m³	
Global Warming Potential (GWP)	89,69 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	100 % (vegetable tanning)	10

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

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

Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	10
Total average rating		**9**
Resistance to dirt	Not sensitive to dirt	
Processing		
Mechanically	Mechanical processing of the material with tools designed for this purpose; cutting possible; offcut (upholstered furniture) approx. 30-45 %	
Storage	Relative humidity: 50-70 %; Temperature: 5-15 %	
Other	Untreated leather is porous and permeable to water and air; direct sunlight can cause drying and color change	
Notes	The most important leather is cowhide; leather is largely a by-product of the meat industry; some animals are bred only for their leather, e.g. snakes, crocodiles or lizards	

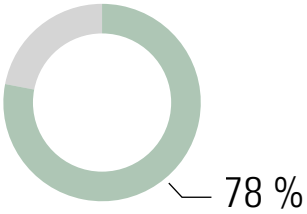
4.6 Upholstery material

Overview and classification of upholstery fabrics that can be used.

Tab. 4.6: Upholstery fillers: classification of upholstery fillers

Fillers			
Vegetable fillers	Animal fillers	Chemical fillers	Industrially manufactured fillers
- Afric - Tree-full - Refined coconut fiber - Hede (tow) - Sea grass - Alpine grass - Kapok	- horsehair - Cattle hair - Feathers - Down - New Wool	- PUR flexible foam - Composite foam - Latex foam - Latex flakes	- Wadding - Compressed polyester nonwovens - Cushion mats - Rubber hair - Rubber coco

4.6.1 Cotton from controlled organic cultivation (kbA)



Tab. 4.6.1 A: Material data sheet, cotton (kbA), general[204]

Material group	Natural material; Textile fiber material; Natural fiber; Seed fiber
Botanical name	*Gossypium (Malvaceae)*
Name	Cotton (GB, US); coton (FR); Baumwolle (D)
Material abbreviation	CO
Further processed in	Germany (GER)
Origin	Kyrgyzstan (KGZ)
Occurrence	Tropical to subtropical; largest growing areas: China, USA, India, Pakistan, Uzbekistan, Brazil, Turkey and Australia Frost-sensitive plant; Requires a lot of water and heat
Use	Mainly in the textile industry; cotton pads and sticks; bandages and plasters; coffee filters; book covers; various types of paper; automotive industry; pet food; natural fiber-reinforced plastics

[204] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

Tab. 4.6.1 B: Material data sheet, cotton (organic), specific[205][206][207]

General description		
Certifications/Information	Global Organic Textile Standard (GOTS); certified organic cultivation (kbA)	
Fire resistance	n.a.	
Fiber type	Natural fiber	
Natural fiber type	Seed fiber	
Fiber length	ca. 15 - 56 mm	
Fiber diameter	12 - 35 µm	
Color	White gray	
Fabric types	Batiste; Cotton satin; Canvas; Corduroy; Denim; Flannel; Terry; Cotton jersey; Calico; Molton; Muslin; Velvet; Velour	
Basic materials		
Cellulose	ca. 80 - 90 %	
Life cycle assessment data organic cotton		7
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	3,474 MJ	10
Use of freshwater resources (FW)	1,079 m^3	0
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	- 1,476 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (1.51 g/cm^3)		5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	604 MJ	
Use of freshwater resources (FW)	0,03194 m^3	
Global Warming Potential (GWP)	44,845 Kg CO_2-eqv.	
Main raw material origin: Kyrgyzstan/production site		
Truck - ca. 6500 km	A4	0
Total non-renewable primary energy (PENRT)	7852 MJ	
Use of freshwater resources (FW)	0,41522 m^3	
Global Warming Potential (GWP)	582,985 Kg CO_2-eqv.	
Sustainability Assessment		

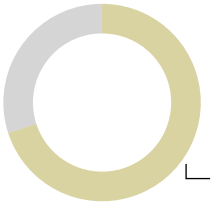
[205] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

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

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

Longevity	Permanent (10 - 20 years)	5
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	10
Total average rating		**7,83**
Resistance to dirt	n.a.	
Physical properties		
Weight	1,51 g/cm³	
Mechanical properties		
Tensile strength	287 - 800 N/mm²	
Modulus of elasticity	4500 - 11000 N/mm²	
Elongation at break	6 - 10 %	
Water absorption	8 %	
General properties	Resistant to mechanical and chemical influences; tear-, wet- and boil-proof; elastic; little dimensional stability; skin-friendly; high moisture absorption; tends to shrink after the first wash cycle	
Notes	Water consumption of the plant problematic: up to 2000 liters for the production of a T-shirt; often artificially irrigated fields	

4.6.2 Cotton (conventional)



70 %

Tab. 4.6.2 A: Material data sheet, cotton (conventional), general[208][209]

Material group	Natural material; Textile fiber material; Natural fiber; Seed fiber
Botanical name	*Gossypium (Malvaceae)*
Name	Cotton (GB, US); coton (FR); Baumwolle (D)
Material abbreviation	CO
Origin	Asia, South America
Further processed in	Germany (GER)
Occurrence	Tropical to subtropical; largest growing areas: China, USA, India, Pakistan, Uzbekistan, Brazil, Turkey and Australia Frost-sensitive plant; Requires a lot of water and heat
Use	Mainly in the textile industry; cotton pads and sticks; bandages and plasters; coffee filters; book covers; various types of paper; automotive industry; pet food; natural fiber-reinforced plastics

[208] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

[209] URBANA (2019) - Commodities <https://www.urbanara.de/blogs/magazin/warenkunde> Accessed, on 03/13/2019

Tab. 4.6.2 B: Material data sheet, cotton (conventional), specific[210][211][212]

General description		
Certifications/Information	n.a.	
Fire resistance	n.a.	
Fiber type	Natural fiber	
Natural fiber type	Seed fiber	
Fiber length	ca. 15 - 56 mm	
Fiber diameter	12 - 35 µm	
Color	White gray	
Fabric types	Batiste; Cotton satin; Canvas; Corduroy; Denim; Flannel; Terry; Cotton jersey; Calico; Molton; Muslin; Velvet; Velour	
Basic materials		
Cellulose	ca. 80 - 90 %	
Life cycle assessment data cotton (conventional)		6
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	11,71 MJ	9
Use of freshwater resources (FW)	1,081 m³	0
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	- 0,7779 Kg CO_2-eqv.	8
Environmental impact Transport, per 1000 kgkm (1.51 g/cm³)		5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	604 MJ	
Use of freshwater resources (FW)	0,03194 m³	
Global Warming Potential (GWP)	44,845 Kg CO_2-eqv.	
Main raw material origin: China/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	1721,2 MJ	
Use of freshwater resources (FW)	0,12106 m³	

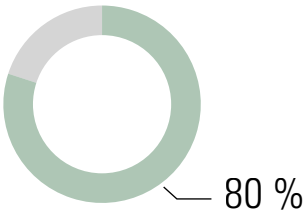
[210] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

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

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

Global Warming Potential (GWP)	128,22 Kg CO_2-eqv.	
Container ship - ca. 10000 km	A4	
Total non-renewable primary energy (PENRT)	1903 MJ	
Use of freshwater resources (FW)	0,009298 m^3	
Global Warming Potential (GWP)	157,1 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Permanent (10 - 20 years)	8
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % (biodegradable)	10
Socially compatible	No transparency	3
Total average rating		**7**
Resistance to dirt	n.a.	
Physical properties		
Weight	1,51 g/cm^3	
Mechanical properties		
Tensile strength	287 - 800 N/mm^2	
Modulus of elasticity	4500 - 11000 N/mm^2	
Elongation at break	6 - 10 %	
Water absorption	8 %	
General properties	Resistant to mechanical and chemical influences; tear-, wet- and boil-proof; elastic; little dimensional stability; skin-friendly; high moisture absorption; tends to shrink after the first wash cycle	
Notes	Water consumption of the plant problematic: up to 2000 liters for the production of a T-shirt; often artificially irrigated fields	

4.6.3 Coconut fibers latexed, from controlled organic cultivation (kbA)



Tab. 4.6.3 A: Material data sheet, coconut fibers, latexed, general[213][214]

Material group	Natural synthetic material; Textile fiber material; Natural fiber; Vegetable hard fiber (latexed)
Botanical name	*Cocos nucifera (Arecaceae)*
Name	coir fibre (GB, US); Kokosfaser, Coir (D); fibre de coco (FR)
Material abbreviation	CC
Further processed in	Germany (GER)
Origin	Sri Lanka
Occurrence	Especially Sri Lanka; India; Indonesia; Thailand; Malaysia; Vietnam; Papua New Guinea; Africa; Mexico; Brazil Sandy loam soils; fresh, loose, nutrient-rich and deep soils; tropical climates especially near the coast
Use	Mattresses

[213] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

[214] URBANA (2019) - Commodities <https://www.urbanara.de/blogs/magazin/warenkunde> Accessed, on 03/13/2019

Tab. 4.6.3 B: Material data sheet, coconut fibers, latexed, specific[215][216][217]

General description		
Certifications/Information	Global Organic Textile Standard (GOTS); Global Organic Latex Standard (GOLS)	
Fire resistance	n.a.	
Fiber type	Natural fiber	
Natural fiber type	Hard fiber	
Fiber length	ca. 150 - 200 mm	
Fiber diameter	100 - 450 µm	
Color	yellowish brown to dark brown	
Basic materials coconut mat		
Coconut fibers	ca. 44 % Zellulose	70 %
	ca. 45 % Lignin	
Natural latex		30 %
Life cycle assessment data coconut fibers		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 (1.15 g/cm³)		5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	604 MJ	
Use of freshwater resources (FW)	0,03194 m³	
Global Warming Potential (GWP)	44,845 Kg CO_2-eqv.	
Main raw material origin: Sri Lanka/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	1721,2 MJ	
Use of freshwater resources (FW)	0,12106 m³	

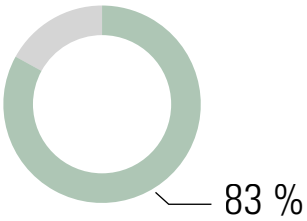
[215] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

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

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

Global Warming Potential (GWP)	128,22 Kg CO_2-eqv.	
Container ship - ca. 10000 km	A4	
Total non-renewable primary energy (PENRT)	1903 MJ	
Use of freshwater resources (FW)	0,009298 m^3	
Global Warming Potential (GWP)	157,1 Kg CO_2-eqv.	
Sustainability rating (latexed)		
Longevity	Very durable (> 20 years)	8
Biological reproduction/ recycled material	100 %	10
Circulation potential	Biodegradable	10
Socially compatible	Yes	10
Total average rating		**8**
Resistance to dirt	Not sensitive to dirt	
Physical properties		
Weight	1,15 g/cm^3	
Mechanical properties		
Tensile strength	131 - 220 N/mm^2	
Modulus of elasticity	4000 - 6000 N/mm^2	
Elongation at break	20 - 35 %	
General characteristics	Fully rot-resistant; very light; break-resistant; elastic; high heat-insulating effect; dirt-repellent	
Notes	In addition to the fibers of the coconut, the coconut milk, the coconut oil and the shell can also be processed or used. It can therefore be completely recycled. There is no waste and the remains can be fed into biological cycles	

4.6.4 Sheep wool fleece from controlled organic animal husbandry (kbT)



Tab. 4.6.4 A: Material data sheet, fleece of virgin sheep's wool (kbT), general[218][219]

Material group	Natural material; Textile fiber material; Natural fiber; Animal fiber
Name	Wool (GB, US); Wolle (D); Laine (FR)
Material abbreviation	WO (wool); WV (virgin wool)
Further processed in	Germany (GER)
Origin	Great Britain (GB)
Occurrence	Worldwide (depending on the type of wool, or the animal of origin) Highest sheep wool production: Australia; New Zealand; China; South Africa and Argentina
Use	Clothing: light and durable clothing; underwear; outerwear; jackets and coats; scarves and hats; blankets; carpets; upholstery fabrics; upholstery material; insulation material

[218] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

[219] URBANA (2019) - Commodities <https://www.urbanara.de/blogs/magazin/warenkunde> Accessed, on 03/13/2019

Tab. 4.6.4 B: Material data sheet, fleece of virgin sheep's wool (kbT), specific[220][221][222]

General description		
Certifications/Information	Global Organic Textile Standard (GOTS), controlled organic animal husbandry	
Fire resistance	Very fire resistant by nature	
Fiber type	Natural fiber	
Natural fiber type	Animal fiber	
Fiber length	ca. 4 - 14 mm	
Fiber diameter	ca. 20 - 50 µm	
Color	Whitish, gray to brown but also grayish brown, gray to black	
Basic materials		
Proteins		
Carbon	ca. 50 %	
Oxygen	ca. 23 %	
Nitrogen	ca. 17 %	
Hydrogen	ca. 6 %	
Sulfur	ca. 4 %	
Life cycle assessment data virgin wool		5
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	16,4 MJ	
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 (1.32 g/cm³)		9,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	00,0302615 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: Great Britain/production site		9
Truck - ca. 2000 km	A4	

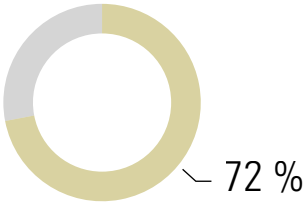
[220] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

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

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

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.	
Sustainability Assessment		
Longevity	Permanent (10 - 20 years)	5
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	10
Total average rating		**8,25**
Resistance to dirt	Not sensitive to dirt/self-cleaning	
Physical properties		
Weight	1,32 g/cm^3	
Mechanical properties		
Tensile strength	130 - 210 N/mm^2	
Elongation at break	28 - 48 %	
Water absorption	< 33 %	
General characteristics	Highly water repellent; good acid resistance; poor alkali resistance; insulating against heat loss; elastic; does not tend to wrinkle; high water absorption capacity; inherently self-cleaning and dirt repellent; flame retardant; color resistant; hardly absorbs odors; very wind permeable; tends to felt when exposed to heat	
Notes	"Wool" is the name given not only to the hair of sheep, but also of many other animals	

4.6.5 Sheep wool fleece (conventional)



Tab. 4.6.5 A: Material data sheet, fleece of virgin sheep's wool (conventional), general[223][224]

Material group	Natural material; Textile fiber material; Natural fiber; Animal fiber
Name	Wool (GB, US); Wolle (D); Laine (FR)
Material abbreviation	WO (wool); WV (virgin wool)
Further processed in	n.a.
Occurrence	Worldwide (depending on the type of wool, or the animal of origin) Highest sheep wool production: Australia; New Zealand; China; South Africa and Argentina
Use	Clothing: light and durable clothing; underwear; outerwear; jackets and coats; scarves and hats; blankets; carpets; upholstery fabrics; upholstery material; insulation material

[223] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

[224] URBANA (2019) - Commodities <https://www.urbanara.de/blogs/magazin/warenkunde> Accessed, on 03/13/2019

Tab. 4.6.5 B: Material data sheet, fleece of virgin sheep's wool (conventional), specific[225][226][227]

General description		
Certifications/Information	n.a.	
Fire resistance	Very fire resistant by nature	
Fiber type	Natural fiber	
Natural fiber type	Animal fiber	
Fiber length	ca. 4 - 14 mm	
Fiber diameter	ca. 20 - 50 µm	
Color	Whitish, gray to brown but also grayish brown, gray to black	
Life cycle assessment data virgin wool		5
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	16,4 MJ	
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 (1.32 g/cm³)		5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	00,0302615 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Hauptrohstoff-Ursprung: Australien/Herstellungsort		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	2416 MJ	
Use of freshwater resources (FW)	0,12776 m³	
Global Warming Potential (GWP)	179,38 Kg CO_2-eqv.	
Container ship - ca. 10000 km	A4	
Total non-renewable primary energy (PENRT)	1094 MJ	

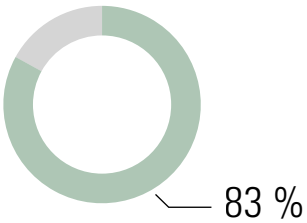
[225] BOBETH, W. (1993) - Textile Fibers (2) Berlin: Springer-Verlag Berlin Heidelberg GmbH

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

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

Use of freshwater resources (FW)	0,005636 m^3	
Global Warming Potential (GWP)	90,11 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Permanent (10 - 20 years)	5
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	8
Total average rating		**7,16**
Resistance to dirt	Not sensitive to dirt/self-cleaning	
Physical properties		
Weight	1,32 g/cm^3	
Mechanical properties		
Tensile strength	130 - 210 N/mm^2	
Elongation at break	28 - 48 %	
Water absorption	< 33 %	
General characteristics	Highly water repellent; good acid resistance; poor alkali resistance; insulating against heat loss; elastic; does not tend to wrinkle; high water absorption capacity; inherently self-cleaning and dirt repellent; flame retardant; color resistant; hardly absorbs odors; very wind permeable; tends to felt when exposed to heat	
Notes	"Wool" is the name given not only to the hair of sheep, but also of many other animals	

4.6.6 Down, duck/goose down



Tab. 4.6.6 A: Material data sheet, down, general[228]

Material group	Natural material; Animal material; Upholstery filler; Feathers
Name	Down (GB, US); Daunen (D); plumule (FR)
Origin	France (slaughter pluck)
Further processed in	Germany (GER)
Use	As upholstery filler in home textiles and clothing

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

Tab. 4.6.6 B: Material data sheet, down, specific[229][230]

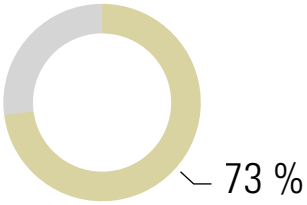
General description (manufacturer spec.)		
Certifications/Information	OEKO-TEX® STANDARD 100, Responsible Down Standard	
Fire behavior (EN 13501-1:2002)	s1 no/barely any smoke development	
Feather type	Down	
Smell	neutral	
Haptics	Hand warm, soft	
Color	Whitish gray to yellowish brown	
Life cycle assessment data down		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		9,5
Production site: France/ZEITRAUM		
Truck - ca. 1000 km	A4	9
Total nicht erneuerbare Primärenergie (PENRT)	860,6 MJ	
Einsatz von Süßwasserressourcen (FW)	00,06053 m^3	
Global Warming Potential (GWP)	64,11 Kg CO_2-eqv.	
Main raw material origin: France/production site		10
Truck - ca. 500 km	A4	
Total nicht erneuerbare Primärenergie (PENRT)	604 MJ	
Einsatz von Süßwasserressourcen (FW)	0,03194 m^3	
Global Warming Potential (GWP)	44,845 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable/moderately repairable (10 - 20 years)	6
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	9

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

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

Total average rating		**8,25**
Physical properties		
Weight	0.001 - 0.002 g/pc.	
General characteristics	Very good thermal insulating properties; very elastic and soft and therefore high dimensional stability	
Notes	The down manufacturer of ZEITRAUM completely renounces "live plucking;" 1 kg of material contains about 0.5 - 1.0 million downs	

4.6.7 Natural rubber (natural latex)



Tab. 4.6.7 A: Material data sheet, natural rubber, general[231][232]

Material group	Natural material; Bio-plastic; Vegetable upholstery material
Name	Natural Rubber (GB); Naturkautschuk (D); Caoutchouc Naturel (F)
Material abbreviation	NR
Manufactured in	Germany (GER)
Origin	India, especially Sri Lanka
Further processed in	Germany (GER)
Occurrence	Southeast Asia, India
Use	Vehicle construction: tires, suspensions, etc.; mechanical engineering: molded parts, vibration dampers, spring elements, etc.; medical technology: catheters, gloves, membranes, etc.; toys: Condoms, balloons, bungee cords, rubber animals, etc.; latex foam for the production of mattresses

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

[232] URBANA (2019) - Commodities <https://www.urbanara.de/blogs/magazin/warenkunde> Accessed, on 03/13/2019

Tab. 4.6.7 B: Material data sheet, natural rubber, specific[233][234]

General description		
Certifications/Information	GOLS, controlled organic cultivation	
Fire resistance	CAL 117 on request	
Delivery form	Bales, flakes, mats, sealants, etc.	
Texture	soft, porous	
Color	Whitish to yellow	
Life Cycle Assessment Data Natural Rubber		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 (approx. 1000 - 1500 kg/m³)		5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	0,030265 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: Sri Lanka/production site		0
Truck - ca. 2000 km	A4	
Total non-renewable primary energy (PENRT)	1721,2 MJ	
Use of freshwater resources (FW)	0,12106 m³	
Global Warming Potential (GWP)	128,22 Kg CO_2-eqv.	
Container ship - ca. 10000 km	A4	
Total non-renewable primary energy (PENRT)	1903 MJ	
Use of freshwater resources (FW)	0,009298 m³	
Global Warming Potential (GWP)	157,1 Kg CO_2-eqv.	
Sustainability Assessment		

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

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

Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	9
Total average rating		**7,33**

4.6.8 PUR flexible foam, (MDI)

51 %

Tab. 4.6.8 A: Material data sheet, PUR flexible foam, general[235]

Material group	Synthetic Material; Synthetic Upholstery Material
Name	Polyurethane Foam (GB); Polyurethan Weichschaum (D);
Material abbreviation	PUR foam
Manufactured in	Germany (GER)
Use	Automotive industry (upholstery, fittings); furniture upholstery; shoe soles; etc.

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

Tab. 4.6.8 B: Material data sheet, PUR flexible foam, specific[236][237]

General description (manufacturer spec.)		
Certifications/Information	Product specific	
Fire resistance	Product specific	
Delivery form	Bales, flakes, mats, etc.	
Texture	soft, porous	
Color	Available in all colors	
Life cycle assessment data Comparative material for PUR flexible foam (no data available) - PU slabstock foam insulation panels (GER)		3
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	98,5 MJ	0
Use of freshwater resources (FW)	0,028696 m³	9
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	4,48 Kg CO_2-eqv.	0
Environmental impact Transport, per 1000 kgkm (approx. 75 kg/m³)		6,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	0,030265 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	0 %	0
Circulation potential	70 - 99 % technological/downcycling	7

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

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

Socially compatible	Yes	9
Total average rating		**5,08**
Resistance to dirt	Not sensitive to dirt	
Physical properties (Type 75140)		
Weight	ca. 75 kg/m³	
Compression hardness (DIN 53577/ ISO3386)	14,5 kpa	
Indentation hardness (40 %; DIN 53576 B/ISO2439-B)	560 N	
Compression set test (50 %, 70 °C, 22 h; DIN 53572)	1,0 %	
Rebound elasticity (UNI 6457-ASTM D-3574)	56 %	
Mechanical properties (Type 75140)		
Tensile strength (DIN 53571/ISO 1798)	220 Kpa	
Fatigue test (UNI 6356 Pt. 2)	20 %	
Thermal properties		
Continuous operating temperature	ca. -40 bis 100 °C	
Notes	MDI: methylene diphenyl isocyanate; chemical compounds from the group of aromatic isocyanates	

4.6.9 PE FOAMFLEX

51 %

Tab. 4.6.9 A: Material data sheet, PE FOAMFLEX, general[238]

Material group	Synthetic Material; Synthetic Upholstery Material
Name	Polyethylene Foam (GB); Polyethylen-Schaumkante (D);
Material abbreviation	PE FOAMFLEX
Manufacturer	OKE Group GmbH
Manufactured in	Germany (GER)
Use	Shaping foam profiles for upholstery in the furniture sector

[238] OKE 2022: OKE Group; OKE plastics <https://www.oke-group.com/en/competences/extrusion/foam-extrusion/> Accessed, on 05/30/2022

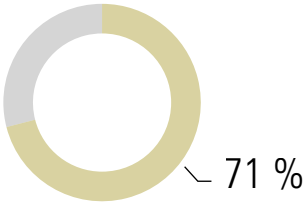
Tab. 4.6.9 B: Material data sheet, PE FOAMFLEX, specific[239]

General description (manufacturer spec.)		
Certifications/Information	ISO 9001, ISO 50001	
Delivery form	Profile on reels	
Texture	soft, porous	
Color	White	
Life cycle assessment data Comparative material for PE foam (GER)		3
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	96,03 MJ	0
Use of freshwater resources (FW)	0,01278 m³	10
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	3,055 Kg CO_2-eqv.	2
Environmental impact Transport, per 1000 kgkm (approx. 75 kg/m³)		6,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	0,030265 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	0 %	0
Circulation potential	70 - 99 % technological/downcycling	7
Socially compatible	Yes	9
Total average rating		**5,08**

[239] BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 05/30/2022.

Resistance to dirt	Not sensitive to dirt	

4.6.10 Polyester fibers



Tab. 4.6.10 A: Material data sheet, polyester fibers, general[240]

Material group	Synthetic Material; Synthetic Upholstery Material
Name	Polyester Fibers (GB); Polyesterfaser (D)
Material abbreviation	PES
Manufactured in	Germany (GER)
Use	Furniture upholstery

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

Tab. 4.6.10 B: Material data sheet, polyester fibers, specific[241][242]

General description		
Certifications/Information	REACH, OEKO-TEX® STANDARD 100, DIN EN ISO 9001, DIN EN ISO 14001, DIN EN ISO 50001, CP65	
Fire resistance	BS 5852 (depending on manufacturer)	
Delivery form	Mats, wadding, etc.	
Texture	soft, fibrous	
Color	Available in all colors	
Life cycle assessment data Comparative material for PE wadding (no data available) - PE nonwoven (GER)		9
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	22 MJ	8
Use of freshwater resources (FW)	0,00252 m³	10
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	0,73 Kg CO_2-eqv.	8
Environmental impact Transport, per 1000 kgkm (approx. 0.5 kg/m²)		6,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	0,030265 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable (> 20 years)	8
Biological reproduction/ recycled material	0 %	0
Circulation potential	100 % (technological)	10

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

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

Socially compatible	Yes	9
Total average rating		**7,08**
Resistance to dirt	Not sensitive to dirt	
Properties		
Density	1380 kg/m³	
Acid resistance	Conditionally resistant to organic and mineral acids	
Moisture absorption	0,2 to 0,5 %	
Thermal properties		
Softening temperature Vicat	ca. 230 °C to 240 °C	
Melting point/range	250 °C	

4.7 Plastics

4.7.1 AgriPlast, bioplastic, wood-plastic composite

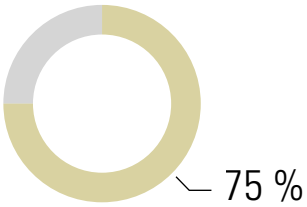


Fig. 4.7.1: www.biowert.com

Tab. 4.7.1 A: Material data sheet, Agriplast, bioplastic, general[243]

Material group	Natural-Synthetic Material; Plastic; Wood-Plastic Composite Material
Name	Wood-plastic composites; wood-polymer composites (GB, US); Holz-Kunststoff-Verbundwerkstoffe (D)
Short name	WPC (Wood-Plastic-Composites)
Manufactured in	Germany (GER)
Version	It is a plastic-cellulose mixture Available in the usual types for plastic: granules, injection molded parts, etc Cellulose content: 30-70 %
Use	Can be used in almost all areas as a plastic alternative

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

Tab. 4.7.1 B: Material data sheet, Agriplast, bioplastic, specific[244][245]

General description Agriplast NFLDPE 5050		
Emission class	Formaldehyde-free	
Fire resistance	**Fire protection**: n.a.	
Color	Brown, mottled; dyed available	
Texture	smooth, mottled, plastic-like to wood-like	
Basic materials/auxiliary materials		
Cellulose	50 % (Predominantly from grasses)	
Polypropylene	50 %	
Life cycle assessment data WPC, decking boards (GER)		7
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	29,1468 MJ	10
Use of freshwater resources (FW)	4,8809 m³	0
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	0,0138 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm (1.074 g/cm³)		7,66
Production site: Germany/ZEITRAUM		
Truck - ca. 200 km	A4	10
Total non-renewable primary energy (PENRT)	241,6 MJ	
Use of freshwater resources (FW)	0,012776 m³	
Global Warming Potential (GWP)	17,938 Kg CO_2-eqv.	
Main raw material origin (grasses): Germany/production site		10
Truck - < 100 km	A4	
Total non-renewable primary energy (PENRT)	120,8 MJ	
Use of freshwater resources (FW)	0,006388 m³	
Global Warming Potential (GWP)	8,97 Kg CO_2-eqv.	
Main raw material origin (PP): n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	

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

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

Use of freshwater resources (FW)	0,44716 m^3	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable (> 20 years)	8
Biological reproduction/ recycled material	50 %	5
Circulation potential	70 - 99 % technological/downcycling	7
Socially compatible	Yes	10
Total average rating		**7,44**
Processing		
Mechanically	Very good; with conventional plastic processing machines; drilling, sawing; milling; etc.	
Adhesion	Good; with adhesives for low-energy plastics	
Surface finishing	Brushing; Sanding; Painting; Oiling; Embossing	
Resistance	Low-maintenance; water-resistant; resistant to fungi and insects; weather-resistant with plastic content > 30 %	
Physical properties		
Bulk density according to DIN EN ISO 1183	1,074 g/cm^3	
Vicat softening temperature according to DIN EN ISO 306 Vicat B/50	110 °C	
Mechanical properties		
Flexural strength (σ_{bB})	22,3 N/mm^2	
Tensile strength (σ_{zB} ||)	15,1 N/mm^2	
E-modulus (E_b ||)	1003 N/mm^2	
Elongation according to DIN EN ISO 527	2,9 %	
Notes	Recyclable and residue-free disposal when incinerated; AgriPlast NFPP 5050 HM consists of 50 % cellulosic fibers derived from grasses and 50 % polypropylene	

4.7.2 Polyamide

61 %

Tab. 4.7.2 A: Material data sheet, polyamide, general[246]

Material group	Synthetic material; plastic
Name	Polyamide (GB, US); Polyamid (D)
Short name	PA
Manufactured in	Germany (GER)
Use	Machine and equipment construction; vehicle construction; electrical engineering; furniture construction

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

Tab. 4.7.2 B: Material data sheet, polyamide, specific[247][248]

General description		
Certifications/Information	n.a.	
Delivery forms	Granules, fibers, pipes, films, molded parts	
Color	Available in all colors	
Life cycle assessment data Nylon casting (PA 6.6) (GER)		3
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	251,7 MJ	0
Use of freshwater resources (FW)	0,04378 m³	10
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	16,91 Kg CO_2-eqv.	0
Environmental impact Transport, per 1000 kgkm (1140 kg/m³)		6,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	604 MJ	
Use of freshwater resources (FW)	0,03194 m³	
Global Warming Potential (GWP)	44,845 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 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable (> 20 years)	8
Biological reproduction/ recycled material	0 %	0
Circulation potential	100 % (technological)	10
Socially compatible	Yes	9
Total average rating		**6,08**
Processing		

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

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

Mechanically	Very good; with conventional plastic processing machines; drilling, sawing; milling; etc.	
Adhesion	Good; with adhesives for low-energy plastics	
Surface processing	Brushing; Sanding; Painting; Oiling; Embossing	
Resistance	Easy care; water resistant; resistant to fungi and insects	
Properties		
Elongation at break	50,0 %	
Density	1140 kg/m³	
Moisture absorption	2,5 - 3,5 %	
Dielectric strength	25 kV/mm	
Notched impact strength (Charpy)	3,0 kJ/m²	
Thermal properties		
Vicat softening temperature according to DIN EN ISO 306 Vicat B/50	250 °C	
Continuous operating temperature	-30 bis 95 °C	

4.8 Adhesives

According to DIN EN 923, an adhesive is a "non-metallic substance that bonds materials by surface adhesion in such a way that the bond has sufficient internal strength (cohesion).

A qualitatively flawless bonded joint is achieved through optimum interaction between the part to be joined, its surface properties and the adhesive. In addition to the rheological properties of the adhesive, professional process control in terms of temperature, pressure and time are decisive for bonding the parts to be joined. Depending on the type of materials to be bonded, the specific parameters differ. (cf. KALWEIT, A., 2012)

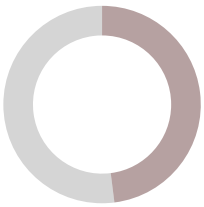
Tab. 4.8: Classification of adhesives according to the chemical basis[249]

Adhesives

Organic compounds		Inorganic compounds	
Natural base	Synthetic base	Silicones	- Silicates - Borates - Phosphates - Metal oxides
- Protein - Carbohydrates - Resins	Carbon compounds in combination with: - Hydrogen - Oxygen - Nitrogen - Chlorine - Sulfur		

[249] HABENICHT, G. (2006) - Adhesive Bonding - Fundamentals, Technologies, Applications (5) Berlin: Springer Verlag

4.8.1 PUR adhesive



48 %

Tab. 4.8.1 A: Material data sheet, PUR adhesive, general[250][251]

Material group	Synthetic material; adhesives; polyurethane adhesives
Name	Polyurethane-Adhesive (GB, US); Polyurethan Klebstoff (D);
Manufacturer	beko GmbH
Manufactured in	Germany (GER)
Version	Fibcon 15
Use	Furniture construction, or similar; joining wood, ODB, MDF, chipboard, fiberboard, coated board, natural stone, artificial stone, concrete, acrylic, ceramics, gypsum board, foam (EPS), rigid foam, insulation, etc.; Indoor and outdoor

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

[251] Beko (2019) - Fibcon 15, Beko <https://www.beko-group.de/Produkte/(location)/1415-260-100-501-Fibcon-PU-Fiber-Glue> Accessed, on 03/02/2019

Tab. 4.8.1 B: Material data sheet, PUR adhesive, specific[252][253]

General description		
Certifications/Information	n.a.	
Emission class (formaldehyde)	Formaldehyde-free, no volatile components	
Delivery forms	Liquid, viscous	
Color	Yellowish	
Texture	Glossy	
Smell	Low smell	
Life cycle assessment data Polyurethane-based adhesives and sealants, unfilled/solvent-free, polyol-containing (GER)		0
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	119 MJ	0
Use of freshwater resources (FW)	2,68 m³	0
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	5,87 Kg CO_2-eqv.	0
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 m³	
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 m³	
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

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

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

Socially compatible	Yes	9
Total average rating		**4,75**
Processing		
Adhesion	With brush, spatula	
Properties		
Durability	6 months	
Wood moisture	8 - 18	
Consistency	Medium viscosity	
Moisture resistance	Indoor and outdoor	
Heat resistance	- 40 to 120 °C	
Notes	Fiber-reinforced, with "reinforcement", waterproof bonding, resistant to weathering and aging, solvent-free, resistant to many chemicals; can probably cause cancer	

4.8.2 PVAc dispersion adhesive, D3

64 %

Tab. 4.8.2 A: Material data sheet, PVAc dispersion adhesive, D3, general[254][255]

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

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

[255] 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. 4.8.2 B: Material data sheet, PVAc dispersion adhesive, D3, specific[256][257]

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 m³	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 m³	
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 m³	
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

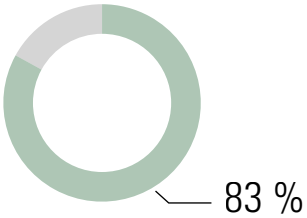
[256] BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

[257] 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/cm³	
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	

4.9 Coating materials

4.9.1 Osmo, hard wax oil



Tab. 4.9.1 A: Material data sheet, Osmo, hard wax oil, general[258][259]

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

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

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

Tab. 4.9.1 B: Material data sheet, Osmo, hard wax oil, specific[260][261]

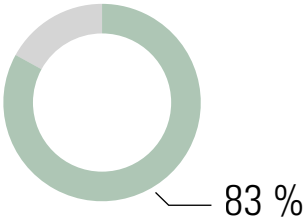
General description		
Certifications/Information	ISO 9001, ISO 14001, ISO 18001	
Emission class (formaldehyde)	Formaldehyde-free	
VOC's	< 500 g/l (volatile components emit during curing)	
Delivery forms	Liquid	
Color	yellowish (transparent/yellowish in cured form)	
Texture	Glossy to matt (cured)	
Contents		
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 m³	
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 m³	
Global Warming Potential (GWP)	296,07 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/repairable (> 20 years, with good care)	10

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

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

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/cm³	
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)	

4.9.2 Osmo, wood wax finish transparent



Tab. 4.9.2 A: Material data sheet, Osmo, wood wax finish transparent, general[262]

Material group	Coating materials; Oils
Name	Wood wax finish transparent (GB, US); Dekorwachs transparent (D)
Manufacturer	Osmo Holz und Color GmbH & Co. KG
Manufactured in	Germany (GER)
Version	Osmo Wood Wax Finish Transparent 3111 (white)
Use	Highly recommended for furniture and children's toys, flooring, walls, ceilings, doors, mouldings, beams and edge-glued panels. Wood Wax Finish results in a water and dirt-resistant surface. It is wipe-proof and stain-resistant

[262] Osmo (2022) - Osmo Wood Wax Finish Transparent 3111 <https://www.osmo.de> Accessed, on 05/31/2022

Tab. 4.9.2 B: Material data sheet, Osmo, wood wax finish transparent, specific[263][264]

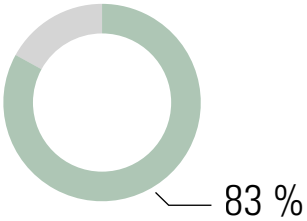
General description		
Certifications/Information	ISO 9001, ISO 14001, ISO 18001	
Emission class (formaldehyde)	Formaldehyde-free	
VOC's	< 400 g/l (volatile components emit during curing)	
Delivery forms	Liquid	
Color	Available in 25 color variations	
Texture	Glossy to matt (cured)	
Contents		
50 - 60 % solids		
Based on natural vegetable oils (sunflower oil, soybean oil, safflower oil) and waxes, kerosenes, egg mustard and organic pigments, titanium dioxide (white pigment), siccatives (drier) and water-repellent additives. De-aromatized white spirit (ben-zole free). EU limit value for the product (cat. 1.e): 400 g/l VOC (2010). This product contains max. 400 g/l VOC		
Life cycle assessment data Osmo, wood wax finish (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 m³	
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 m³	
Global Warming Potential (GWP)	296,07 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/repairable (> 20 years, with good care)	10

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

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

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	0,9 - 1,3 g/cm³	
Viscosity	Thixotropic, creamy	
Consistency	Medium viscosity	
Moisture resistance	Good	
Notes	Number of coats: for a transparent finish, one coat, for an intenstively coloured surface, apply two coats	

4.9.3 Biofa, hard wax oil



Tab. 4.9.3 A: Material data sheet, Biofa, hard wax oil, general[265][266]

Material group	Coating materials; Oils
Name	hard wax oil (GB, US); Hartwachsöl (D)
Manufacturer	BIOFA Naturprodukte W. Hahn GmbH
Manufactured in	Germany (GER)
Version	BIOFA Worktop oil, solvent-free Art. No. 2052
Use	Interior furniture

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

[266] Biofa (2019) - Biofa Worktop Oil 2052 <https://www.biofa-de.com/265/ueber-uns> Accessed, on 1/26/2020

Tab. 4.9.3 B: Material data sheet, Biofa, hard wax oil, specific[267][268]

General description		
Certifications/Information	REACH, Dermatest	
Emission class (formaldehyde)	Formaldehyde-free	
VOC's	0.1 wt % (max. VOC content (EC))	
Delivery forms	Liquid	
Color	yellowish (transparent/yellowish in cured form)	
Texture	Glossy to matt (cured)	
Contents		
99 - 100 % solids	Linseed oil, wood oil linseed oil cooking, ricin oil locophonium resin cooking, micro wax, swelling agent, defoamer, magnane and calcium dryer, antioxidant	
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 m³	
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 m³	
Global Warming Potential (GWP)	296,07 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/repairable (> 20 years, with good care)	10
Biological reproduction/ recycled material	51 - 60 %	6

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

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

Circulation potential	100 % (biodegradable)	10
Socially compatible	Yes	10
Total average rating		**8,33**
Processing		
Apply	With brush, spatula or spray gun	
Storage	Store in a cool, dry and well closed place. Skin formation possible. Remove the skin before using again. Sieve oil if necessary	
Properties		
Density	0,94 g/cm³	
Viscosity	Thixotropic, creamy	
Consistency	Medium viscosity	
Moisture resistance	Good	
Notes	Store work materials and clothing soaked with product in airtight material containers or water and allow to dry spread out on a non-combustible surface - risk of spontaneous combustion!	

4.9.4 Varnish

53 %

Tab. 4.9.4 A: Material data sheet, lacquer, general[269][270]

Material group	Synthetic material; coating materials; varnish
Name	varnish (GB, US); Lack (D)
Manufacturer	ADLER-Werk Lackfabrik Johann Berghofer GmbH & Co KG
Manufactured in	Germany (GER)
Version	ADLER PUR-Antiscratch HQ
Use	For the varnishing of heavily stressed surfaces in furniture and interior finishing, for hotel and school furnishings, for kitchen and sanitary furniture: areas of use II - IV according to ÖNORM A 1610-12

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

[270] ADLER (2019) - ADLER PUR-Antiscratch HQ <https://www.adler-lacke.com/de> Accessed, on 02/03/2019

Tab. 4.9.4 B: Material data sheet, paint, specific[271][272]

General description		
Certifications/Information	ISO 9001, ISO 14001, ISO 50001, A+ (see VOC's), CP65, DIN 4102 B1	
Emission class (formaldehyde)	Formaldehyde-free	
VOC's	approx. 72 % volatile components emitted during curing)	
	French regulation DEVL1104875A on the labeling of construction coating products for their emissions of volatile pollutants: A+	
Delivery forms	Liquid	
Color	Transparent, colorless	
Texture	Glossy to matt (cured)	
Life cycle assessment data n.a. (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 nicht erneuerbare Primärenergie (PENRT)	172,12 MJ	
Einsatz von Süßwasserressourcen (FW)	0,012106 m³	
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 nicht erneuerbare Primärenergie (PENRT)	3624 MJ	
Einsatz von Süßwasserressourcen (FW)	0,19164 m³	
Global Warming Potential (GWP)	296,07 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	0 %	0
Circulation potential	Hazardous waste	0

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

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

Socially compatible	Yes	9
Total average rating		**5,33**
Processing		
Apply	Spray gun	
Storage	Can be stored up to 5 years with tight closure	
Notes	For hardly combustible or hardly flammable superstructures	

4.9.5 Varnish (moulded plywood)

53 %

Tab. 4.9.5 A: Material data sheet, varnish (moulded plywood), general[273][274]

Material group	Synthetic material; coating materials; varnish
Name	varnish (GB, US); Lack (D)
Manufacturer	Heidelberg Coatings Dr. Rentzsch GmbH
Manufactured in	Germany (GER)
Version	HD-AQUA TOP colorless
Use	For the varnishing of heavily stressed surfaces in furniture and interior finishing, for hotel and school furnishings, for kitchen and sanitary furniture

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

[274] ADLER (2019) - ADLER PUR-Antiscratch HQ <https://www.adler-lacke.com/de> Accessed, on 02/03/2019

Tab. 4.9.5 B: Material data sheet, varnish (moulded plywood), specific[275][276]

General description		
Certifications/Information	DIN EN 71 - 3, DIN 68861 - 1, DIN EN 13501 - 1, DIN 4102 B1	
Emission class (formaldehyde)	Formaldehyde-free	
VOC's	5,76 %	
Delivery forms	Liquid	
Color	Transparent, colorless	
Texture	Glossy to matt (cured)	
Life cycle assessment data n.a. (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 nicht erneuerbare Primärenergie (PENRT)	172,12 MJ	
Einsatz von Süßwasserressourcen (FW)	0,012106 m³	
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 nicht erneuerbare Primärenergie (PENRT)	3624 MJ	
Einsatz von Süßwasserressourcen (FW)	0,19164 m³	
Global Warming Potential (GWP)	296,07 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	0 %	0
Circulation potential	Hazardous waste	0

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

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

Socially compatible	Yes	9
Total average rating		**5,33**
Processing		
Apply	Spray gun	
Storage	Can be stored up to 5 years with tight closure	
Notes	For hardly combustible or hardly flammable superstructures	

4.9.6 Stain

52 %

Tab. 4.9.6 A: Material data sheet, stain, general[277][278]

Material group	Synthetic material; coating materials; stain
Name	Stain (GB, US); Beize (D)
Manufacturer	Hesse GmbH & Co. KG
Manufactured in	Germany (GER)
Version	Hesse Hydro Multi-stain
Use	For furniture production and interior finishing on common European hardwoods. This stain is adjusted for spraying without driving out

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

[278] HESSE (2019) - HESSE HYDRO MULTIBEIZE <www.hesse-lignal.de> Accessed, on 02/05/2019

Tab. 4.9.6 B: Material data sheet, stain, specific[279][280]

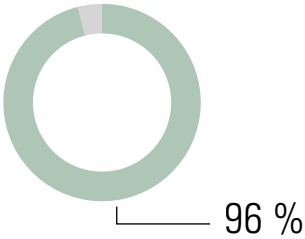
General description		
Certifications/Information	DIN EN ISO 9001, ISO 14001, ISO 50001, DIN 4102 B1	
Emission class (formaldehyde)	Formaldehyde-free	
VOC's	1 %	
Delivery forms	Liquid	
Color	13 different ZEITRAUM color stains	
Texture	matt (cured)	
Life cycle assessment data n.a. (GER)		5
Resource input 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. 500 km	A4	10
Total non-renewable primary energy (PENRT)	604 MJ	
Use of freshwater resources (FW)	0,03194 m³	
Global Warming Potential (GWP)	44,845 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 m³	
Global Warming Potential (GWP)	296,07 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Very durable (> 20 years)	8
Biological reproduction/ recycled material	0 %	0
Circulation potential	Hazardous waste	0

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

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

Socially compatible	Yes	9
Total average rating		**5,16**
Processing		
Apply	Spray gun	
Substrate preparation	The wood must be dry, free of dust and grease	
Underground sanding	P 120 - 180	
Note sanding	Takes place in gradation. Quality of the stain result depends largely on the sanding of the wood. Watering the wood after sanding is recommended	
Application quantity	30 - 80 g/m²	
Drying time	2 hours, 20 °C	
Storage/transport temperature	Frost-free - up to max. 35 °C	
Storage	5 - 30 °C	
Notes	Staining result depends on the substrate	

4.10 Linoleum



Tab. 4.10 A: Material data sheet, linoleum, general[281][282]

Material group	Synthetic material; coating materials; linoleum
Name	linoleum (GB, US); Linoleum (D)
Manufacturer	Forbo
Manufactured in	Germany (GER)
Version	Linoleum is available in all colors; delivery form: sheets
Use	Predominantly used as flooring indoors; In fine arts (linocut); As flooring in furniture, especially for work surfaces, bulletin boards, and decorative cabinet elements; Acoustical flooring

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

[282] Forbo (2019) - Forbo, Linoleum <https://www.forbo.com/flooring/de-de/> Accessed, on 02/03/2019

Tab. 4.10 B: Material data sheet, linoleum, specific[283][284]

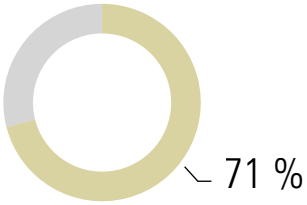
General description		
Certifications/Information	Blue Angel; Cradle-To-Cradle; Indoor Air Comfort; Austrian Eco-Label, ISO 9001, ISO 14001	
Emission class (formaldehyde)	Formaldehyde-free	
Length	Up to 32 m	
Width	2 m	
Thickness	2,5 - 4 mm	
Color	Natural color scheme: beige brown, mottled; Available in all color variations; Material is dyed through	
Texture	Smooth; plain to marbled; matte	
Basic materials/auxiliary materials		
Organic fillers (wood and cork flour)	ca. 40 %	
Inorganic fillers (lime powder, pigments)	ca. 20 %	
Natural resins (rosin, copal)	ca. 8 %	
Linseed oil	ca. 32 %	
Life cycle assessment data linoleum flooring (GER)		10
Resource use per m²	**A1-A3**	
Total non-renewable primary energy (PENRT)	32,243 MJ	10
Use of freshwater resources (FW)	0,0168	10
Environmental impact per m²	**A1-A3**	
Global Warming Potential (GWP)	1,376 Kg CO_2-eqv.	10
Environmental impact Transport, per 1000 kgkm		9,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	604 MJ	
Use of freshwater resources (FW)	0,03194 m³	
Global Warming Potential (GWP)	44,845 Kg CO_2-eqv.	
Hauptrohstoff-Ursprung: k.A./Herstellungsort		
n.a. - ø 1500 km	A4	9

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

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

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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	81 - 90 %	9
Circulation potential	100 % (biodegradable if natural pigments are used)	10
Socially compatible	Yes	10
Total average rating		**9,58**
Processing		
Mechanically	Very good; cutting, punching and bending possible with suitable machines	
Adhesion	good; easily possible with dispersion adhesives	
Surface finishing	Sanding; Polishing; Embossing; Impregnating; Oiling; Waxing; Sealing	
Other	antistatic; molding and postforming possible; cleaning with water or neutral detergents	
Resistance	Elastic and abrasion resistant; conditionally moisture resistant; avoid moisture build-up	
Alkali resistance	Up to about pH 9	
Acid resistance EN 423	Resistant to light acids on short-term exposure	
Physical properties		
Weight per unit area (2 mm)	2,1 kg/m^2	
Notes	Under high mechanical stress, pressure marks recede almost completely; linoleum can be used in hygienic areas such as hospitals due to its natural antibacterial, antistatic effect	

4.11 Ceramics, porcelain



Tab. 4.11 A: Material data sheet, ceramic, porcelain, general[285]

Material group	Natural material; non-metallic, inorganic metal; fine ceramics; porcelain
Name	porcelain (GB, US); Porzellan (D)
Manufactured in	Italy
Origin	Italy (clay and loam deposits are found worldwide)
Use	Porcelain is used for the production of tableware, works of art, jewelry, in the sanitary and electrical sectors, as well as for laboratory equipment or technical application areas

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

Tab. 4.11 B: Material data sheet, ceramic; porcelain, specific[286][287]

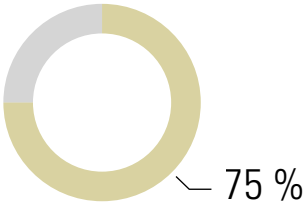
General description		
Certifications/Information	ISO 9001, ISO 14001, ISO/TS 16949	
Surface	smooth, hard	
Color	White	
Basic materials		
Kaolin	ca. 50 - 60 %	
Quartz	ca. 10 - 20 %	
Field chip	ca. 20 - 25 %	
Life cycle assessment data		5
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (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		9,5
Production site: Italy/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	604 MJ	
Use of freshwater resources (FW)	0,03194 m^3	
Global Warming Potential (GWP)	44,845 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		
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/moderately repairable (> 20 years)	9
Biological reproduction/ recycled material	n.a.	0
Circulation potential	100 % (technological)	10

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

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

Socially compatible	Yes	9
Total average rating		**7,08**
Processing (for ZEITRAUM)		
Molding process: Slip casting (hollow casting)	This is an industrial molding process. In this process, the " slurry " is first poured into a plaster mold. The water in the "slurry" can slowly escape via the absorbent wall - the outer layer dries. The mold geometry shrinks due to the removal of water. In the production of hollow bodies, the excess material is poured off.	
Durability	Heat resistant, corrosion and heat resistant, current insulating property, chemical moisture resistant and aging resistant	
General properties		
Compressive strength	approx. 5 tons per cm^2	
Mohs hardness	8	

4.12 Float glass, mirror glass



Tab. 4.12 A: Material data sheet, float glass; mirror glass in general[288]

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

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

Tab. 4.12 B: Material data sheet, float glass; mirror glass, specific[289][290][291]

General description		
Certifications/Information	CE (EN 1036-2)	
Surface	smooth, hard	
Basic materials		
Silver coated float glass		
Life cycle assessment data		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: Belgium/ZEITRAUM		
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		
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**

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

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

[291] 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/mm²	
Notes	The life cycle assessment of glass improves the more often the material has been recycled or the proportion of recycled material increases	

4.13 SILENT rubber bearings

64 %

Tab. 4.13 A: Material data sheet, SILENT rubber bearings, general

Material group	Thermoplastic rubber
Name	Thermoplastic Rubber (GB); thermoplastisches Kautschuk (D)
Manufactured in	Germany (GER)
Origin	n.a.
Further processed in	Germany (GER)
Use	Due to its excellent rebound capacity, this material is particularly suitable for end point bearing production. The durability while retaining the specific material properties should be particularly noted

Tab. 4.13 B: Material data sheet, SILENT rubber bearings, specific[292][293]

General description		
Certifications/Information	REACH	
Emission class (formaldehyde)	Formaldehyde-free	
Surface	smooth	
Color	beige	
Basic materials		
Life cycle assessment data		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		6,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	845,6 MJ	
Use of freshwater resources (FW)	0,044716 m^3	
Global Warming Potential (GWP)	62,783 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 (> 20 years)	8
Biological reproduction/ recycled material	n.a.	0
Circulation potential	100 % (technological)	10
Socially compatible	Yes	9
Total average rating		**6,41**

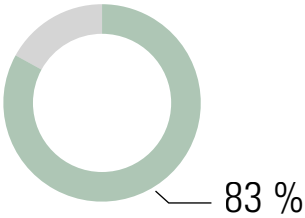
[292] BMI 2021: Oekobaudat. Database <https://www.oekobaudat.de/no_cache/en/database/search.html> Accessed, on 10/27/2021

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

Notes	- Extremely high elasticity - High fatigue strength and bending elasticity - Absolutely free of PVC	

4.14 Packaging

4.14.1 Cardboard, beds, tables & storage



Tab. 4.14.1 A: Material data sheet, cardboard, beds, tables & storage, general

Material group	Packaging
Name	Cardboard (GB, US); Karton (D)
Manufacturer	Monowell GmbH & Co. KG
Manufactured in	Germany (GER)
Use	Packing material for individual wrapping of the furniture

Tab. 4.14.1 B: Material data sheet, cardboard, beds, tables & storage, specific[294][295]

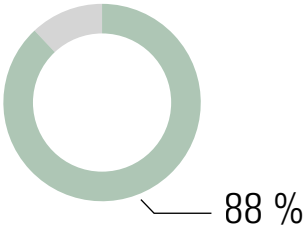
General description		
Certifications/Information	ISO 9001, ISO 50001, ISO 22000 DE, ISO 22000 EN, FSC	
Color	Brown	
Contents		
60 %	Recycled paper	
40 %	Primary raw material	
Life cycle assessment data „Kraftpapier" (GER)		10
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	5,888 MJ	
Use of freshwater resources (FW)	0,004899 m³	
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	-0,8973 Kg CO_2-eqv.	
Environmental impact Transport, per 1000 kgkm		9,5
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 m³	
Global Warming Potential (GWP)	12,822 Kg CO_2-eqv.	
Main raw material origin: Germany, Central Europe/Production site		
Truck - ca. 1500 km	A4	9
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Moderately durable/repairable (< 10 years)	4
Biological reproduction/ recycled material	60 %	6
Circulation potential	100 % (technological)	10
Socially compatible	Yes	10

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

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

Total average rating		**8,25**
Disposal note	Waste paper	

4.14.2 Cardboard, chairs



Tab. 4.14.2 A: Material data sheet, cardboard, chairs, general

Material group	Packaging
Name	Cardboard (GB, US); Karton (D)
Manufacturer	Schuhmacher Packaging GmbH
Manufactured in	Germany (GER)
Use	Packaging material for the production of cardboard boxes

Tab. 4.14.2 B: Material data sheet, cardboard chairs, specific[296][297]

General description		
Certifications/Information	ISO 9001, ISO 50001, DIN ISO 22000, DIN EN ISO 14001, EMAS, ISO 28000;2007, FSC	
Color	Brown	
Contents		
85 %	Recycled paper	
15 %	Primary raw material	
Life cycle assessment data „Kraftpapier" (GER)		10
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	5,888 MJ	
Use of freshwater resources (FW)	0,004899 m³	
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	-0,8973 Kg CO_2-eqv.	
Environmental impact Transport, per 1000 kgkm		9,5
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 m³	
Global Warming Potential (GWP)	12,822 Kg CO_2-eqv.	
Main raw material origin: Germany, Central Europe/Production site		
Truck - ca. 1500 km	A4	9
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Moderately durable/repairable (< 10 years)	4
Biological reproduction/ recycled material	85 %	9
Circulation potential	100 % (technological)	10

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

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

Socially compatible	Yes	10
Total average rating		**8,75**
Disposal note	Waste paper	

4.14.3 Polyester fleece

56 %

Tab. 4.14.3 A: Material data sheet, polyester fleece, general

Material group	Packaging
Name	Polyester fleece (GB); Polyestervlies (D)
Material abbreviation	PES
Manufactured in	Germany (GER)
Use	Packing material for protection

Tab. 4.12.3 B: Material data sheet, polyester fleece, specific[298][299]

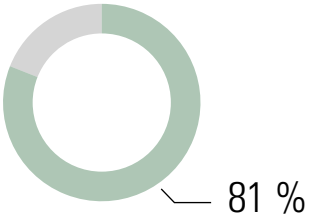
General description		
Certifications/Information	n.a.	
Delivery form	Mats, wadding, etc.	
Texture	soft, fibrous	
Life cycle assessment data Comparative material for PE wadding (no data available) - PE nonwoven (GER)		3
Resource input per kg	**A1-A3**	
Total non-renewable primary energy (PENRT)	22 MJ	
Use of freshwater resources (FW)	0,00252 m³	
Environmental impact per kg	**A1-A3**	
Global Warming Potential (GWP)	0,73 Kg CO_2-eqv.	
Environmental impact Transport, per 1000 kgkm (approx. 0.5 kg/m²)		6,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	0,030265 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	0 %	0
Circulation potential	100 % (technological)	10
Socially compatible	Yes	9
Total average rating		**5,58**

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

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

Disposal note	Recyclable waste	

4.14.4 Recycling polyester fleece



Tab. 4.14.4 A: Material data sheet, recycling polyester fleece, general

Material group	Packaging
Name	Recycling polyester fleece (GB); Recycling Polyestervlies (D)
Material abbreviation	RePES
Manufactured in	Germany (GER)
Use	Packing material for protection

Tab. 4.14.4 B: Material data sheet, recycling polyester fleece, specific[300][301]

General description		
Certifications/Information	n.a.	
Delivery form	Mats, wadding, etc.	
Texture	soft, fibrous	
Life cycle assessment data Comparative material for PE wadding (no data available) - PE nonwoven (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 (approx. 0.5 kg/m²)		9,5
Production site: Germany/ZEITRAUM		
Truck - ca. 500 km	A4	10
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	0,030265 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: Germany, Central Europe/Production site		
Truck - ca. 1500 km	A4	9
Total non-renewable primary energy (PENRT)	1812 MJ	
Use of freshwater resources (FW)	0,09582 m³	
Global Warming Potential (GWP)	134,535 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	100 %	10
Circulation potential	100 % (technological)	10
Socially compatible	Yes	9
Total average rating		**8,08**

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

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

Disposal note	Recyclable waste	

4.14.5 Polyester foam edge protection, NOMAPACK®

65 %

Tab. 4.14.5 A: Material data sheet, NOMAPACK®, general

Material group	Packaging
Name	NOMAPACK®
Material abbreviation	PE LD foam
Manufacturer	NMC
Manufactured in	Germany (GER)
Use	Packing material for protection

Tab. 4.12.5 B: Material data sheet, NOMAPACK®, specific[302][303]

General description		
Certifications/Information	ISO 9001, ISO 14001	
Life cycle assessment data Comparative material for PE wadding (no data available) - PE nonwoven (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 (approx. 0.5 kg/m²)		6
Production site: Belgium/ZEITRAUM		
Truck - ca. 1000 km	A4	9
Total non-renewable primary energy (PENRT)	860,6 MJ	
Use of freshwater resources (FW)	0,06053 m³	
Global Warming Potential (GWP)	64,12 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	30 %	3
Circulation potential	100 % (technological)	10
Socially compatible	Yes	10
Total average rating		**6,5**
Disposal note	Recyclable waste	

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

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

4.14.6 PE foil

50 %

Tab. 4.14.6 A: Material data sheet, PE foil, general

Material group	Packaging
Material abbreviation	PE foil (polyethelene)
Manufactured in	Germany (GER)
Use	Packing material for protection

Tab. 4.12.6 B: Material data sheet, PE foil, specific[304][305]

General description		
Certifications/Information	n.a.	
Life cycle assessment data Comparative material for PE foil (no data available) (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 (approx. 0.5 kg/m²)		6
Production site: Germany/ZEITRAUM		
Truck - ca. 1000 km	A4	9
Total non-renewable primary energy (PENRT)	430,3 MJ	
Use of freshwater resources (FW)	0,030265 m³	
Global Warming Potential (GWP)	32,055 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Not durable (< 3 years)	0
Biological reproduction/ recycled material	0 %	0
Circulation potential	100 % (technological)	10
Socially compatible	Yes	9
Total average rating		**5**
Disposal note	Recyclable waste	

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

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

4.14.7 PP strapping

61 %

Tab. 4.14.7 A: Material data sheet, PP strapping, general

Material group	Packaging
Name	TEWE® Polypropylene strapping
Material abbreviation	PP
Manufacturer	Teufelberger
Manufactured in	Austria (AT)
Use	Packing material for protection

Tab. 4.12.7 B: Material data sheet, PP strapping, specific[306][307]

General description		
Certifications/Information	ISO 9001, ISO 14001	
Life cycle assessment data Comparative material for PP (no data available) (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 (approx. 0.5 kg/m²)		6,5
Production site: Austria/ZEITRAUM		
Truck - ca. 300 km	A4	10
Total non-renewable primary energy (PENRT)	362,4 MJ	
Use of freshwater resources (FW)	0,019164 m³	
Global Warming Potential (GWP)	26,907 Kg CO_2-eqv.	
Main raw material origin: n.a./production site		3
n.a. - ø > 7000 km	A4	
Total non-renewable primary energy (PENRT)	8456 MJ	
Use of freshwater resources (FW)	0,44716 m³	
Global Warming Potential (GWP)	627,83 Kg CO_2-eqv.	
Sustainability Assessment		
Longevity	Durable (10 - 20 years)	5
Biological reproduction/ recycled material	0 %	0
Circulation potential	100 % (technological)	10
Socially compatible	Yes	10
Total average rating		**6,08**
Disposal note	Recyclable waste	

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

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