

KLH[®]

MADE FOR BUILDING
BUILT FOR LIVING

CROSS-LAMINATED TIMBER

IMPRINT

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CROSS-LAMINATED TIMBER

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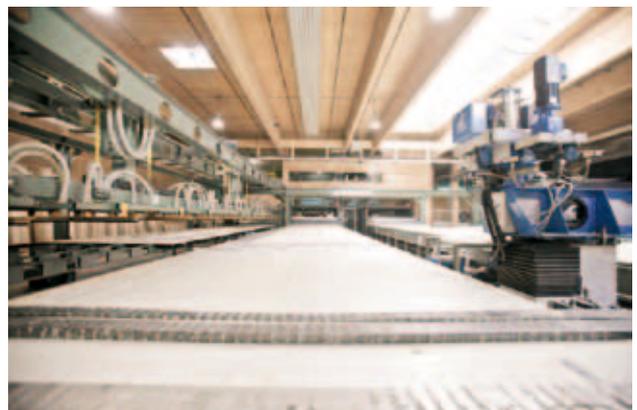
Cross-laminated timber (German abbreviation: KLH) is produced from layers of spruce wood that are arranged crosswise on top of each other and glued to each other with a pressing power of 0.6 N/mm^2 to form large-sized solid wood elements. The crosswise arrangement of the longitudinal and transverse layers reduces the swelling and shrinkage of the wood in the plane of the panel to an insignificant minimum and considerably increases the static load-carrying capacity and dimensional stability.

In order to rule out any damage caused by pests, fungi or insects, in compliance with the European Technical Approval, technically dried wood with a wood moisture of 12% (+/-2%) is used to produce KLH solid wood panels. To achieve our high material characteristics, all timber lamellae undergo internal sorting before being used (in addition to customary quality control).

GLUING

Gluing takes place using solvent-free and formaldehyde-free PUR adhesive which has been tested in accordance with DIN 68141 and other strict criteria of MPA Stuttgart, and approved for the production of load-bearing and non-load-bearing timber components and special constructions in accordance with DIN 1052 and EN 15425.

The glue is applied automatically over the entire surface with an optimised amount of adhesive. A high-quality level of adhesion is achieved as a result of the high pressing power.



PRODUCT DESCRIPTION

MAXIMUM SIZE

Maximum length	16.50 m
Maximum width	2.95 m
Maximum thickness	0.50 m
Minimum production lengths	8.25 m, respectively in 10 cm increments up to the maximum length
Produced widths	2.40 / 2.50 / 2.73 / 2.95 m On request 2.25 m

SURFACES

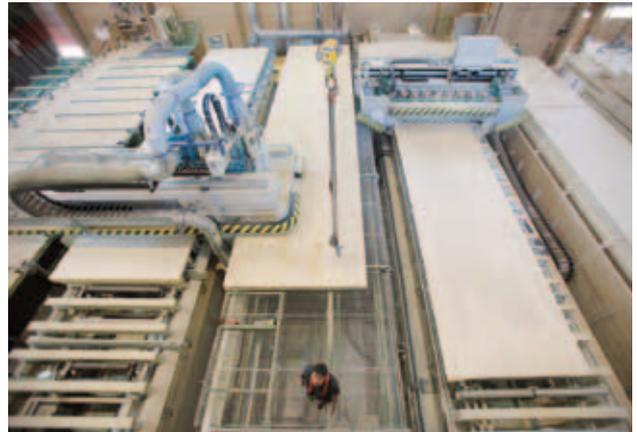
KLH solid wood panels are offered as standard in non-visible quality, industrial visible quality and domestic visible quality. Special surfaces can be provided on request. For further information, as well as quality details about the respective surfaces, see the following pages and www.klh.at.

CNC CUTTING

Factory cutting or beaming takes place using state-of-the-art CNC technology, the basis for which are the production and cutting plans released by the client or the executing company, respectively.

The cutting accuracy is within the range of tolerances in building construction – according to DIN 18203/Part 3 for wall, floor, ceiling and roof panels made of timber materials. In addition, for element sizes of > 1 m², an accuracy of +/- 2 mm for standard cutting services and panel types and wood moisture of 12% can be assumed.

Please also pay attention to the tolerances in panel cutting indicated by us at www.klh.at.



ASSEMBLY

The cut-to-size KLH solid wood elements are delivered to the construction site just before they are needed, and there they are assembled by expert timber construction companies or construction firms using a building crane in the shortest possible construction period.

The links created between tradition, well-founded craftsmanship and state-of-the-art timber construction technology enable individual construction with lasting value and a particular focus on the environment and energy consumption.



PRODUCT ADVANTAGES – AREAS OF APPLICATION

PRODUCT ADVANTAGES

- Ecologically sustainable building material
- Recommended in terms of building biology
- Positive ecobalance
- Healthy, comfortable room climate
- Solid wood construction with lasting value
- Freedom in architectural implementation
- Flexible design without a grid pattern
- Compatible with steel, glass and other materials
- Excellent static properties
- Increasing space thanks to slender construction elements
- Technically approved and CE certified building product
- Quality controlled production
- Prefabricated elements with high dimensional accuracy
- CNC controlled cutting of the elements
- Delivery directly to the construction site
- Easy to install
- Short construction period
- Dry construction method
- Buildings are ready for occupancy in a short time

AREAS OF APPLICATION

KLH solid wood panels are used both as load-bearing, reinforcing elements and non-load-bearing elements.

- Detached houses and apartment buildings
- Multi-storey residential buildings
- Public buildings
- Hotels and restaurants
- Old people's homes
- Schools and kindergartens
- Office and administrative buildings
- Event halls
- Industrial and commercial buildings
- Reconstructions and extensions
- Bridges
- ...





TECHNICAL DETAILS

PRODUCT	Large-sized solid wood panel with crosswise glued lamellae
PRODUCT NAME/BRAND	KLH
OTHER PRODUCT NAMES	Cross-laminated timber (CLT), plywood boards (PBs), X-Lam
USE	Structural elements for walls, ceilings and roofs
DURABILITY	Service classes 1 and 2 according to EN 1995-1-1
WOOD TYPES	Spruce (pine, fir, stone pine and other wood types on request)
PANEL STRUCTURE	3, 5, 7 or more layers depending on static requirements
LAMELLAE	Thickness 10 to 45 mm, technically dried, quality-sorted and finger-jointed (with additional internal sorting to ensure compliance with our high material specifications)
STRENGTH CLASS	C 24 according to EN 338, maximum 10% C 16 permitted (compare ETA-06/0138)
GLUING	Formaldehyde-free PUR adhesive, approved for load-bearing and non-load-bearing components indoors and outdoors according to EN 15425
LAMINATING PRESSURE	At least 0.6 N/mm ²
WOOD MOISTURE	12% (+/- 2%) on delivery
MAXIMUM DIMENSIONS	Length 16.50 m / width 2.95 m / thickness 0.50 m
PRODUCED WIDTHS	2.40 / 2.50 / 2.73 / 2.95 m
SURFACES/QUALITY CATEGORIES	Non-visible quality (NVQ) / Industrial visible quality (IVQ) / Domestic visible quality (DVQ)
WEIGHT	5.5 kN/m ³ according to ÖNORM B 1991-1-1:2011 for structural analysis 500 kg/m ³ for determination of transport weight
DEFORMATION RATE	In panel plane 0.01% per % change in wood moisture content, perpendicular to panel plane (panel thickness direction) 0.24% per % change in wood moisture content
THERMAL CONDUCTIVITY	$\lambda = 0.13 \text{ W/(m}^*\text{K)}$ according to EN ISO 10456
HEAT CAPACITY	$c_p = 1600 \text{ J/(kg}^*\text{K)}$ according to EN ISO 10456
DIFFUSION RESISTANCE	$\mu = 25 \text{ to } 50$ according to EN ISO 10456
AIR TIGHTNESS	KLH solid wood panels can generally be used as airtight layers. Connections to other components, butt joints, penetrations, etc. must be sealed appropriately.
REACTION TO FIRE	Euro class D-s2, d0
CHARRING RATE	According to ETA - 06/0138

STANDARD PANELS AND PANEL STRUCTURES

KLH STANDARD PANEL TYPES AND STRUCTURES

COVERING LAYER IN THE TRANSVERSE PANEL DIRECTION TT (WALL)

Nominal thickness in mm	in layers	Lamella structure [mm]					Standard panel widths [m]	Maximum panel lengths [m]
		T	L	T	L	T		
KLH 57 mm	3 I TT	19	19	19			2.40 / 2.50 / 2.73 / 2.95	16.50
* KLH 88 mm	3 I TT	27	34	27			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 94 mm	3 I TT	30	34	30			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 100 mm	3 I TT	30	40	30			2.40 / 2.50 / 2.73 / 2.95	16.50
* KLH 120 mm	3 I TT	40	40	40			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 95 mm	5 I TT	19	19	19	19	19	2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 128 mm	5 I TT	30	19	30	19	30	2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 140 mm	5 I TT	19	40	22	40	19	2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 158 mm	5 I TT	30	34	30	34	30	2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 180 mm	5 I TT	30	40	40	40	30	2.40 / 2.50 / 2.73 / 2.95	16.50
* KLH 200 mm	5 I TT	40	40	40	40	40	2.40 / 2.50 / 2.73 / 2.95	16.50

COVERING LAYER IN THE LONGITUDINAL PANEL DIRECTION TL (CEILING/ROOF)

Nominal thickness in mm	in layers	Lamella structure [mm]							Standard panel widths [m]	Maximum panel lengths [m]
		L	T	L	T	L	T	L		
KLH 60 mm	3 I TL	19	22	19					2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 78 mm	3 I TL	19	40	19					2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 90 mm	3 I TL	34	22	34					2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 95 mm	3 I TL	34	27	34					2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 108 mm	3 I TL	34	40	34					2.40 / 2.50 / 2.73 / 2.95	16.50
** KLH 120 mm	3 I TL	40	40	40					2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 95 mm	5 I TL	19	19	19	19	19			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 100 mm	5 I TL	19	21.5	19	21.5	19			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 117 mm	5 I TL	19	30	19	30	19			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 125 mm	5 I TL	19	34	19	34	19			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 140 mm	5 I TL	34	19	34	19	34			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 145 mm	5 I TL	34	21.5	34	21.5	34			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 162 mm	5 I TL	34	30	34	30	34			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 182 mm	5 I TL	34	40	34	40	34			2.40 / 2.50 / 2.73 / 2.95	16.50
** KLH 200 mm	5 I TL	40	40	40	40	40			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 201 mm	7 I TL	34	21.5	34	22	34	21.5	34	2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 226 mm	7 I TL	34	30	34	30	34	30	34	2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 208 mm	7 II TL	68	19	34	19	68			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 230 mm	7 II TL	68	30	34	30	68			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 248 mm	7 II TL	74	30	40	30	74			2.40 / 2.50 / 2.73 / 2.95	16.50
** KLH 260 mm	7 II TL	80	30	40	30	80			2.40 / 2.50 / 2.73 / 2.95	16.50
** KLH 280 mm	7 II TL	80	40	40	40	80			2.40 / 2.50 / 2.73 / 2.95	16.50
KLH 247 mm	8 II TL	68	21.5	68	21.5	68			2.40 / 2.50 / 2.73 / 2.95	16.50
** KLH 300 mm	8 II TL	80	30	80	30	80			2.40 / 2.50 / 2.73 / 2.95	16.50
** KLH 320 mm	8 II TL	80	40	80	40	80			2.40 / 2.50 / 2.73 / 2.95	16.50

Note:

Standard panel types without any identification are available in non-visible quality, industrial visible quality and domestic visible quality.

Standard panel types identified with ** in non-visible and industrial visible quality, identified with * only in non-visible quality.

Special panel structures are available on request. By using double layers, for example the longitudinal or transverse rigidity of the panel can be further enhanced. The fire resistance of the KLH solid wood panel can also be influenced by modifying the structures and can eventually be improved in relation to specific project requirements.



TECHNICAL APPROVALS AND CERTIFICATES

EUROPEAN TECHNICAL APPROVAL

ETA - 06/0138



GENERAL BUILDING APPROVAL FOR GERMANY

Z-9.1-482



TECHNICAL APPROVAL FOR FRANCE

AT-3/12-731



TECHNICAL APPROVAL FOR SPAIN

AITIM 31-01



QUALITY MANAGEMENT

In accordance with ISO EN 9001:2008



EN ISO 9001
Zertifikat Nr. 20 100 102005046
www.tuv.at

ENVIRONMENTAL MANAGEMENT

In accordance with ISO EN 14001:2004



EN ISO 14001
Zertifikat Nr. 20 104 102005188
www.tuv.at

ENVIRONMENTAL PRODUCT DECLARATION (EPD)

In accordance with ISO 14025



Institut Bauen
und Umwelt e.V.

PEFC CERTIFICATION



PEFC™
PEFC/06-34-110

Promoting Sustainable
Forest Management

www.pefc.co.uk

DOWNLOAD OF CERTIFICATES

All approvals and certificates are available for download at www.klh.at.
By request, we would be pleased to send them to you in printed form.

SURFACES



Architect: Hiendl Schineis Architektenpartnerschaft
 Eckhart Matthäus Fotografie

KLH solid wood panels are available in the qualities ‘non-visible’ (NVQ), ‘visible industrial’ (IVQ) and ‘visible domestic’ (DVQ), depending on application and use. Special surfaces and/or other wood types are available on request.

The appearance of the wood quality on the surface is described in the following table, “Surface quality of KLH solid wood panels – characteristics”.

The quality definitions listed below for visible quality surfaces generally refer to the single-sided visible surface. Double-sided visible surfaces produced in the same and/or different surfaces (e.g. IVQ/DVQ – one side industrial quality, one side domestic quality) are available on request and following a consultation.

Please note that minor damage may result from the manipulation of elements during the double-sided production of visible surfaces.

Please note the relevant information on the following pages

- Surface quality of KLH solid wood panels - characteristics
- Quality definitions for KLH solid wood panels
- Instructions for use of KLH solid wood panels in visible quality

This information, as well as quality definitions, is also available for downloading at www.klh.at.

SURFACE QUALITY OF KLH SOLID WOOD PANELS - CHARACTERISTICS

FEATURES	GRADES		
	A	B	C
Wood type mixture	Not permitted	Not permitted; in case of spruce, 10% fir permitted	Permitted
Appearance and colour	Well-balanced colour and texture	Largely balanced colour and texture	No specifications
Knots and black knots	Healthy, intergrown knots in spruce up to 40mm diameter permitted; individual black knots permitted	Healthy, intergrown knots and individual black knots permitted	Permitted
Plugs	Permitted	Permitted	Permitted
Resin pockets	Occasional, up to 3mm x 40mm permitted	Occasional, up to 5mm x 60mm permitted	Permitted
Repaired resin pockets	Permitted	Permitted	Permitted
Bark pockets	Not permitted	Occasional pockets permitted	Permitted
Cracks	Occasional surface cracks permitted	Occasional cracks permitted	Occasional cracks permitted
Pith	Occasional piths up to a length of 400 mm permitted	Permitted	Permitted
Compression wood	Occasional occurrences permitted	Permitted	Permitted
Insect infestation	Not permitted	Not permitted	Occasional small holes of non-active larvae permitted
Discolouration (blue/brown stain)	Not permitted	Slight discolouration permitted	Permitted
Decay	Not permitted	Not permitted	Not permitted
Sapwood	Permitted in pine and larch, narrow strips up to 20% of lamella width permitted	Permitted	Permitted
Quality of surface finish	Occasional small faults permitted	Occasional faults permitted	No specifications
Surface post-processing	Permitted	Permitted	Permitted

QUALITY DEFINITIONS FOR KLH SOLID WOOD PANELS

NON-VISIBLE QUALITY in spruce (NVQ)

KLH solid wood panels in non-visible quality are suitable for use as load-bearing components which are generally panelled following assembly. There are therefore no

special requirements on the surface appearance. Wood grading is carried out on the basis of strength class C 24 with a low proportion of C 18.

INDUSTRIAL VISIBLE QUALITY in spruce, single-sided (IVQ)

KLH solid wood panels in industrial visible quality are suitable for industrial buildings with low requirements on surfaces (for example as ceiling elements in industrial buildings). Industrial visible quality is not suitable for visible surfaces in residential buildings. The surface appearance corresponds to appearance class B of table “Surface quality of KLH solid wood panels – characteristics”. The lamellae are sometimes finger-jointed, depending on the orientation of the covering layer (TL/TT).

The surface is planed, machined and selectively lightly smoothed; occasional rough spots and slight chunking may appear as a result of planing. If treating the surface with paint, varnish, etc., we recommend the use of domestic visible quality. The maximum joint width for wood moisture of 12% (+/- 2%) is 4 mm. The width of individual lamellae is decided at the manufacturer’s discretion.

INDUSTRIAL VISIBLE QUALITY in spruce, fully smoothed, single-sided (IVQ, smoothed)

Surface quality as for IVQ, with the difference that the surface is planed and fully smoothed.

IMPORTANT NOTE

We strongly advise against using industrial visible quality instead of domestic visible quality for visible surfaces in living areas for cost reasons – please inform all those involved in the project and pass on the quality definition if necessary.

A small proportion of the costs for any reworking should be taken into account in the assembly price.

QUALITY DEFINITIONS FOR KLH SOLID WOOD PANELS

DOMESTIC VISIBLE QUALITY in spruce, single-sided (DVQ)

KLH solid wood panels in domestic visible quality are suitable for use as permanently visible surfaces in residential buildings.

For TT panels in domestic visible quality, edge-glued laminated single-ply boards are used. For TL panels, breadthways-glued, finger-jointed lamellae are used. The surface is planed and smoothed. The surface appearance corresponds to appearance class AB (mixed range AB) of table “Surface quality of KLH solid wood panels – characteristics”. The maximum joint width for wood moisture of 12% (+/- 2%) is 2 mm. All transitions for widthways board joints are bevelled during the cutting process.



DOMESTIC VISIBLE QUALITY in spruce, brushed surface, single-sided production (DVQ, brushed))

Surface quality as for DVQ, with the difference that the surface is planed and brushed.



IMPORTANT NOTE

Elements which are produced in domestic visible quality require special care – in this context, please also note the user information for the installation of visible surfaces, available at www.klh.at.

A small proportion of the costs for any reworking should be taken into account in the assembly price.



Planning/interior design: Karl Dreer GmbH
 Architect/design: Bombé Felix & Sebastian Dellinger
 © Dirk Wilhelmy

INSTRUCTIONS FOR USE OF KLH SOLID WOOD PANELS IN VISIBLE QUALITY

GENERAL INFORMATION ON WOOD AS A CONSTRUCTION MATERIAL

Wood as a construction material can look back on an ancient tradition and is highly valued because of its properties and the room climate it brings about. Comfort, well-being, a feeling of security and harmony with nature in addition to its positive effects on the environment are important arguments both for private and public building owners.

WOOD IS ALWAYS UNIQUE

Among other things, wood has hygroscopic properties and is not homogenous in its structure and visual appearance – every wood lamella is therefore unique. Thanks to technical progress and the most diverse production technologies, there are now many different possibilities to use wood – be it as a 50-year old, directly weathered shingle on a roof, as a statically effective supporting structure of an 8-storey building or as the finest veneer with a thickness of 0.8 mm for the furniture industry.

Independent of the manner, wood is processed and manufactured – its properties always remain the same.

IMPACTS OF THE HYGROSCOPIC PROPERTIES

The hygroscopic property is, on the one hand, an essential factor for a comfortable room climate, but on the other hand, it is also responsible for wood changing its volume when absorbing or releasing humidity. This is called swelling and shrinking of wood.

CHANGE OF WOOD MOISTURE AND IMPACTS ON THE VISIBLE SURFACE

In the production of KLH solid wood panels, the process of swelling and shrinking is reduced to a virtually negligible extent through the crosswise gluing of technically dried wood lamellae with a wood moisture of 12% (+/- 2%). During assembly or in the building shell construction phase, KLH solid wood panels are subject to seasonal and construction-site-specific climate fluctuations. Depending on the duration of this phase, the wood moisture of KLH solid wood panels may therefore vary.

As soon as a building is used, the wood moisture of the KLH solid wood panels will adjust to an average of about 8 – 11%, depending on the air humidity prevailing in the building.

This process, which can take up to 3 years, has no influence on the load-bearing capacity of the elements. It can, however, result in a visual change in the appearance of the surface due to the properties of wood as a natural construction material. Cracks and/or gaps may appear.

INTERACTION BETWEEN PANEL STRUCTURE, LOAD-BEARING CAPACITY AND THICKNESS OF THE COVER LAMELLA

KLH solid wood panels are used as structural construction elements for walls, ceilings and roofs.

As such they meet the essential static and structural-physical requirements.

The visible surface is a possible additional aesthetic aspect.

INSTRUCTIONS FOR USE OF KLH SOLID WOOD PANELS IN VISIBLE QUALITY

The thicker the edge or cover lamella, the higher the load-bearing capacity of the KLH component. This is the reason why cover lamellae of 19 – 34 mm are used for surfaces of domestic visible quality, depending on the type of panel that is used. What has a positive effect on the load-bearing capacity may have a negative effect on the appearance because of possible formation of cracks or gaps.

Essentially, the same applies as in the furniture industry – the thinner the edge or cover lamella, the more uniform the appearance in the visible surface.

As KLH elements are mainly used as load-bearing construction components, visible surfaces of KLH solid wood panels cannot be compared with visible surfaces from the furniture industry.

FLUCTUATIONS IN THE ROOM CLIMATE

When there are fluctuations in the room climate (e.g. change of air humidity or indoor temperature), wood as a construction material assumes a compensating function – either by absorbing air humidity or by releasing wood moisture.

In case of abrupt fluctuations, it may happen that more moisture is released on the surface than can actually be supplied to the outside from within the core of the panel. This results in tensions on the surface that can lead to gaps and/or cracks – depending on the thickness of the edge or cover lamella. Especially with surfaces glazed in a light colour (white), there is a more pronounced contrast in the appearance of cracks and/or gaps.

RECOMMENDATIONS FROM KLH MASSIVHOLZ GMBH

- Wood is a natural, non-homogenous construction material – please advise building owners accordingly
- The greatest possible care is required when handling and assembling such elements, especially KLH elements with visible surfaces
- Instruct all subsequent trades during the construction phase accordingly
- High fluctuations in the room climate are to be avoided as much as possible, both during the construction phase and at the start of building utilisation
- Keep air humidity in the building at 40 – 60% to preserve the 12% (+/- 2%) wood moisture in the KLH solid wood panels (e.g. by using humidifiers, indoor fountains, plants ...)
- The formation of cracks and/or gaps cannot be excluded even if the greatest of care is applied in handling KLH solid wood panels; particularly with light and/or white glazed surfaces, there may be an undesired contrast due to crack/gap formation

NOTE

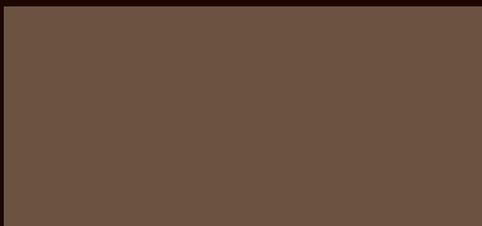
These instructions for use are intended for architects/planners as well as building contractors. Please pass on relevant information to builders or refer them to our website www.klh.at



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For love of nature



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