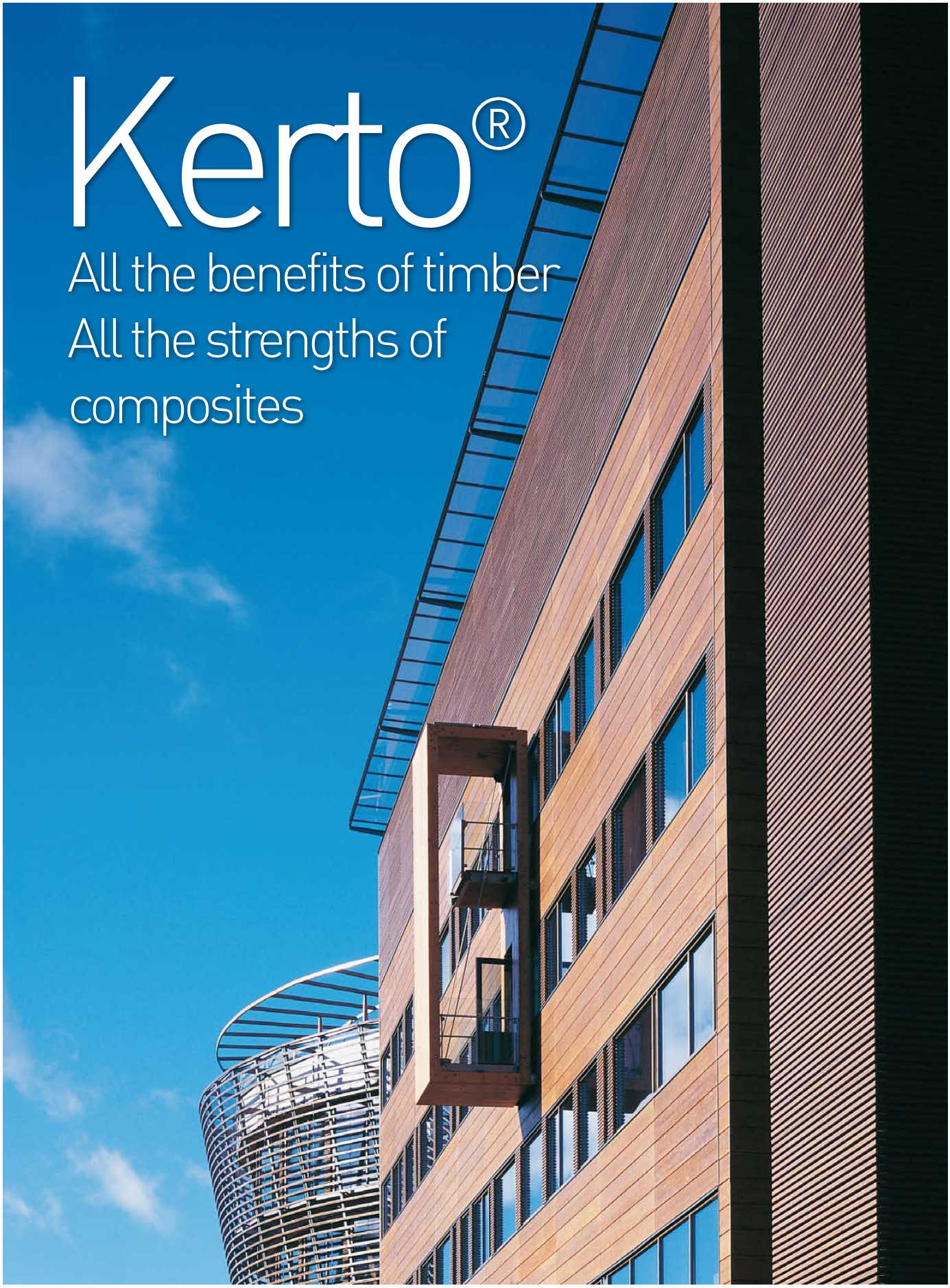
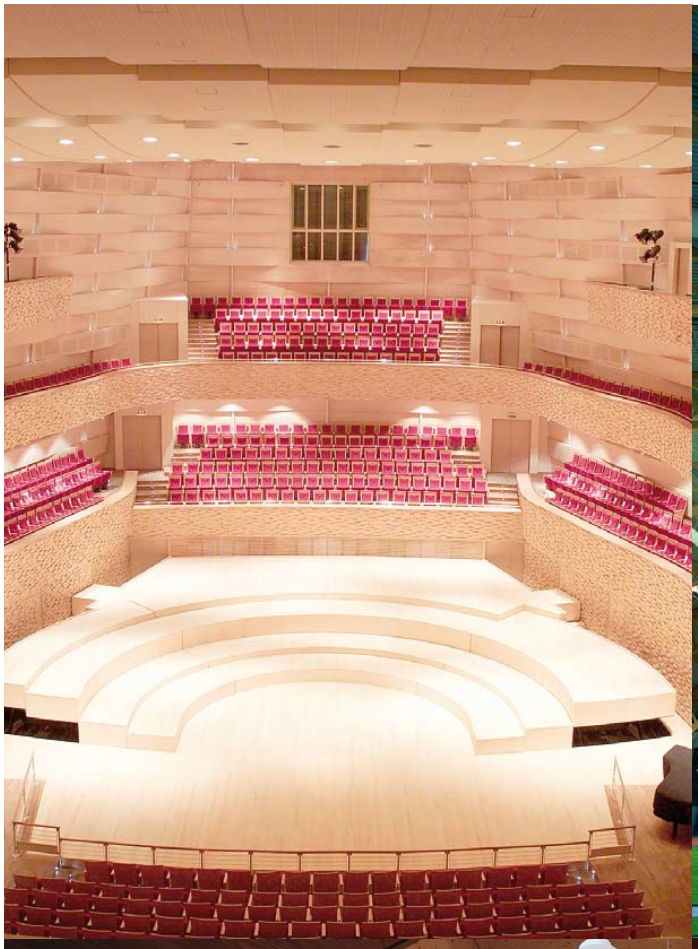
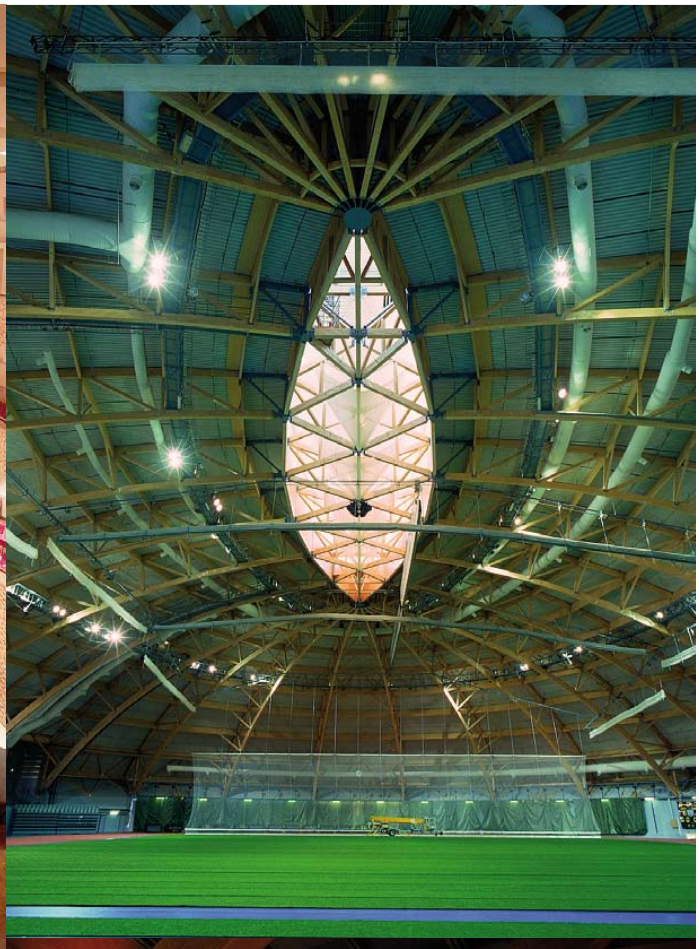


Kerto®

All the benefits of timber
All the strengths of composites

Finnforest





All the benefits of timber, all the strengths of composites

Kerto is a laminated veneer lumber (LVL) product used in all construction jobs, from new buildings to renovation and repair. Kerto is strong and dimensionally stable, and it does not warp or twist. It derives its high strength from the homogeneous bonded structure which also keeps the effects of any defective single veneers down to a minimum.

Kerto is produced from 3 mm thick, rotary-peeled softwood veneers that are glued together to form a continuous billet. The billet is cut to length and sawn into beams, planks or panels in the sizes that customers require.

Kerto products are CE marked and certified by VTT Technical Research Centre of Finland, no 184/03.

Examples of use

- Beams
- Joists
- Trusses
- Frames
- Components of roof, floor and wall elements
- Components for the door and vehicle industry
- Concrete formwork
- Scaffold planking

Environmentally friendly construction material

Renewable and recyclable wood is a highly eco-effective building material throughout its life cycle. Wood raw material comes from the sustainably managed and PEFC-certified forests of Metsäliitto's Finnish forest owner members, ensuring that the origin of the raw material is traceable.

The manufacture of wood products consumes less energy and results in less carbon dioxide and other emissions than the manufacture of other building materials. In addition, wooden structures operate as carbon sinks. The manufacturing is mainly based on renewable energy, and the energy and material efficiency of the production processes is continuously being improved.

The products are lightweight, which means that transportation also has a small environmental impact.

CE PEFC PEFC/02-31-03

Kerto-S permits long spans

One of the notable features of Kerto-S is that the grains run longitudinally through all the layers. The fi nished panel is cross-cut and rip-sawn to order. Kerto-S is normally supplied in the form of straight beams but it can also be specially cut and shaped as required.

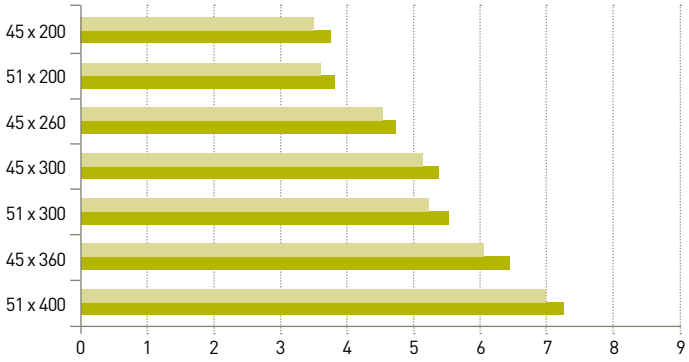
Kerto-S combines excellent technical performance with ease of use. Its essential qualities include strength, dimensional precision and stability. It is the ideal choice for beams whenever long spans and minimal deflections are required.

Kerto-S beams are suitable for all roof shapes, also performing well as joists and lintels, intrussed constructions and frames. Kerto-S is also a widely used material in the manufacture of prefabricated components.

Kerto's light weight is of great advantage in repair and renovation work. Erection and installation can be carried out by fitters, without any heavy hoisting machinery, even in confined spaces. Kerto-S can be coated, to blend in with the rest of the architecture, thus making a harmonious whole.

KERTO-S: STANDARD SIZES									
Thickness (mm)	**Height (mm)**								
	200	225	260	300	360	400	450	500	600
27	•	•							
33	•	•	•						
39	•	•	•	•					
45	•	•	•	•	•				
51	•	•	•	•	•	•			
57	•	•	•	•	•	•	•		
63	•	•	•	•	•	•	•	•	
75	•	•	•	•	•	•	•	•	•

Maximum spans (m) of Kerto-S floor joists

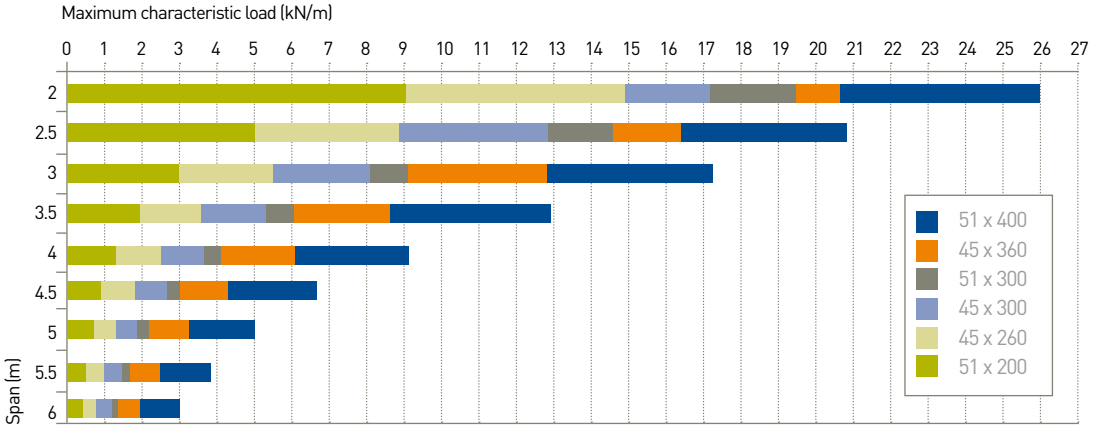


Design calculations according to EC 5, the Finnish National Annex and the Finnish Design Instructions RIL 205-1-2007. Loading: self-weight 0.6 kN/m², imposed load 2.0 kN/m². C/c spacing of joists 400 mm. Vibration settings: one transverse bracing line at mid-span, a square floor layout and the floor structure supported at four edges. Deflection criteria: final deflection $w_{fin} \leq L/300$, instantaneous deflection $w_{inst} \leq L/400$. Support length ≥ 120 mm. Service class 1-2.

Chipboard 22 mm as upper floor plate, no composite action between the plate and the joists (in vibration design)

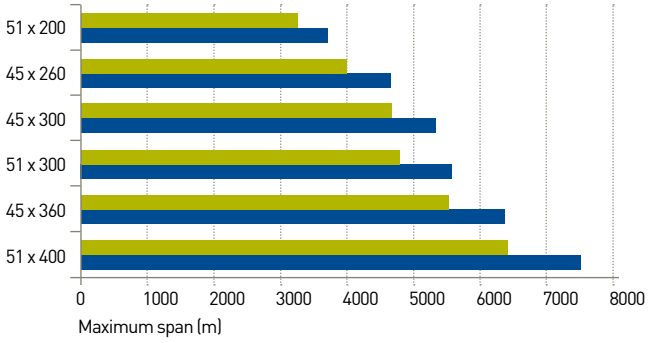
Chipboard 22 mm as upper floor plate, gluing on site (50% composite action in vibration design)

Span table of Kerto-S main floor beam



Design calculations according to EC 5 and the Finnish National Annex. Percentage of self-weight 20%. Service class 1-2. Support length ≥ 120 mm. Deflection criteria: final deflection $w_{fin} \leq L/300$, instantaneous deflection $w_{inst} \leq L/400$.

Maximum spans (m) of Kerto-S roof rafters

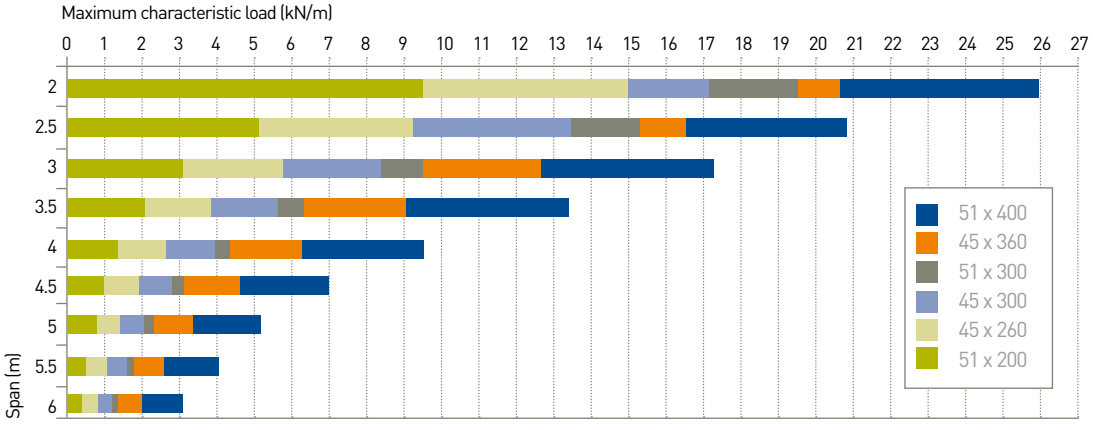


Snow load Sk = 1.0 kN/m²

Snow load Sk = 2.5 kN/m²

Design calculations according to EC 5 and the Finnish National Annex. C/c spacing of rafters 900 mm. Support length ≥ 120 mm. Roof slope 1:3. Self-weight of the roof 0,9 kN/m². Spacing of upper lateral torsional buckling supports ≤ 400. Deflection criterion: final deflection $w_{fin} \leq L/200$.

Span table of Kerto-S main roof beam



Design calculations according to EC 5 and the Finnish National Annex. Percentage of self-weight 20%. Service class 1-2. Support length ≥ 120 mm. Wind loads not taken into account in the calculations. Deflection criterion: final deflection $w_{fin} \leq L/300$.

Kerto-Q stabilises structures

Kerto-Q is cross-bonded Kerto. This means that one-fifth of the veneers are glued crosswise. This structure improves the lateral bending strength and stiffness of the panel, thus increasing the shear strength when used as a beam. With crossbonded veneers, there is an essential reduction in moisture-dependent variations across the width of the panel. Kerto-Q comes in the same dimensions and lengths as Kerto-S, except that its maximum thickness is 69 mm.

Full-length Kerto-Q is a popular material in floor and wall panels because it stabilizes the whole structure, and good fire resistance is achieved with a properly chosen thickness. Kerto-Q panels are also appreciated for their natural beauty. Kerto-Q provides a functional solution in structural components, also when a high shear strength is one of the requirements. Like all Kerto products, Kerto-Q is known for its strength, straightness and dimensional stability.

Kerto-Q is available in the same standard widths as Kerto-S. Additionally, the widths of 900, 1200, 1800 and 2500 mm are available.

The thickness range is 27-69 mm in steps of 6 mm.

KERTO-Q: VENEER STRUCTURE

Thickness (mm)	Z	X	Veneer structure
	qty	qty	
27	7	2	II-III-II
33	9	2	II-IIIII-II
39	10	3	II-III-III-II
45	12	3	II-IIII-IIII-II
51	14	3	II-IIIII-IIIII-II
57	15	4	II-III-IIIII-III-II
63	16	5	II-III-III-III-III-II
69	18	5	II-IIII-III-III-IIII-II

Z = veneer running longitudinally to main panel direction I
X = veneer running crosswise to main panel direction -

Kerto-T for wall studs

Kerto-T is just like Kerto-S, but it is made from lighter veneers. Nevertheless, its straightness and dimensional stability are as good as with Kerto-S. This makes it ideal for studs to be used as load-bearing and non-bearing structures in external and internall walls.

With Kerto-T it is easy to construct high walls, which can be counted on to remain straight. Kerto-T can be used with any sheet materials that are easily fi xed without special tools.

KERTO-T: TYPICAL SIZES		
Thickness	Width	Length
mainly 39–45 mm	mainly < 200 mm	mainly < 8.5 m

Kerto for industrial applications

Because of it's strength, straightness and dimensional accuracy, Kerto is an excellent material to use in a wide variety of industrial applications.

- Roofing and flooring panels for the construction industry
- Components for the pre-fab housing industry
- Door frames
- Composite windows
- Floor, wall and roof battens
- Scaffolding planks
- Concrete form beams
- Vehicle industry
- Stair stringers

Kerto at a glance

Design values [N/mm²] ja and physical properties

PROPERTY	Symbol	Kerto-S [1] 21-90 mm	Kerto-Q [1] 27-69 mm	Kerto-T [2]
Bending strength				
Edgewise	$f_{m,0,edge,k}$	44.0	32.0	$(300/h)^{s}*27.0$
Size effect parameter	s	0.12	0.12	0.15
Flatwise, parallel to grain	$f_{m,0,flat,k}$	50.0	36.0	32.0
Flatwise, perpendicular to grain	$f_{m,90,flat,k}$	-	8.0	-
Tensile strength				
Parallel to grain	$f_{t,0,k}$	35.0	26.0	$(3000/L)^{s/2}*24.0$
Perpendicular to grain, edgewise	$f_{t,90,edge,k}$	0.8	6.0	-
Compressive strength				
Parallel to grain	$f_{c,0,k}$	35.0	26.0	26.0
Perpendicular to grain, edgewise	$f_{c,90,edge,k}$	6.0	9.0	4.0
Perpendicular to grain, flatwise	$f_{c,90,flat,k}$	1.8	2.2	1.0
Shear strength				
Edgewise	$f_{v,0,edge,k}$	4.1	4.5	2.4
Parallel to grain, flatwise	$f_{v,0,flat,k}$	2.3	1.3	1.3
Perpendicular to grain, flatwise	$f_{v,90,flat,k}$	-	0.6	-
Modulus of elasticity				
Parallel to grain	$E_{0,mean}$	13,800	10,500	10,000
Compression, perpendicular to grain edgewise	$E_{c,90,edge,mean}$	430	2,400	-
Compression, perpendicular to grain, flatwise	$E_{c,90,flat,mean}$	130	130	-
Bending, perpendicular to grain of surface veneer	$E_{m,90,mean}$	-	2,000	-
Shear modulus				
Edgewise	$G_{0,edge,mean}$	600	600	400
Flatwise, parallel to grain	$G_{0,flat,mean}$	600	120	400
Density, kg/m³	ρ_k	480	480	410
Moisture content (when leaving the mill)		10 %	10 %	10 %
Dimensional variation coefficient [3]				
Thickness		0.0024	0.0024	0.0024
Width/height		0.0032	0.0003	0.0032
Length		0.0001	0.0001	0.0001
Average density (kg/m³)		510	510	440
Fire resistance, charring rate (mm/min.)		β_n = 0.70	β_n = 0.70	β_n = 0.75
Reaction to fire		D-s1,d0	D-s1, d0	D-s1, d0

[1] VTT certificate 184/03

[2] VTT certificate VTT-C-1781-21-07

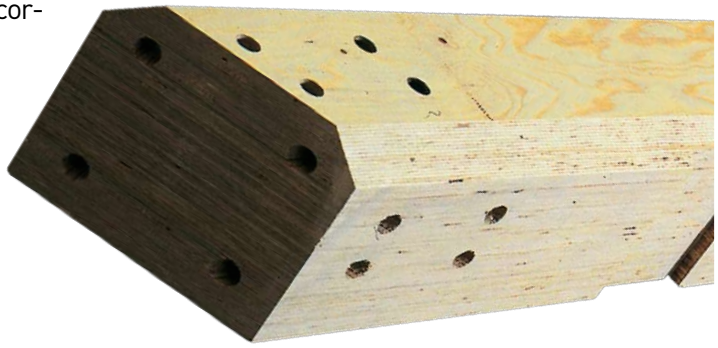
[3] Dimensional variation of cross-section due to moisture content (change of moisture content in % x dimensional variation coefficient x cross-section in mm)

Tolerances for Kerto products (moisture content 10 %)

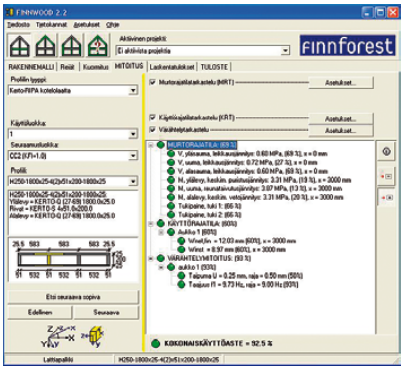
Thickness	+1/-2 mm
Height < 200 mm 200...600 mm > 600 mm	 +/- 1 mm +/- 2 mm +/- 0.5 %
Length	+/- 5 mm

Further processing

Kerto can be further processed in many different ways according to its end-use and the customer's particular wishes. The further processing service is an integral part of the customer service and supply chain. Further processing takes place at the production plant or at a service centre in a particular country, whichever is more competitive and economically efficient for the customer.



- Sanding: optical or calibrating
- Profiling of the beam edge, e.g, tonguing and grooving
- Special sawing: both straight and tapered shapes
- Gluing: re-gluing for increased thicknesses
- CNC machining: drilling, end sloping, edge easing, notching
- Build-up, e.g, box slabs and roof trusses
- Protective treatments, e.g, against mould



Finnwood software

Individual structures made of Kerto and other Finnforest products can be dimensioned with Finnwood software. The user-friendly interface makes designing structural members such as floor joists and roof beams fast and effective. Finnwood designs according to Eurocode 5, and its national annexes.

Finnwood can be obtained free of charge from the country websites of Finnforest.

Ideas for inspiration

Cafeteria of Jean-Baptiste Corot school in Savigny-sur-Orge, France

Base ball stadium, Kuopio, Finland

Kindergarden and school Leskenlehti, Helsinki, Finland

Martin Nadaud gymnasium, Saint Pierre des Corps, France

The versatile Kerto is an ideal material for a constructor. Examples of innovative uses have been gathered from around the world during the thirty-year history of Kerto. Kerto was awarded the Schweighofer Prize, Europe's top innovation prize, in 2007.

Find more inspiring ideas from our website: www.finnforest.com.

Finnforest Kerto®

Finnforest Glulam

Finnforest ThermoWood®

Finnforest Spruce Plywood

Finnforest Birch Plywood

Finnforest Kesto Plus Impregnated Timber

For more information and contacts

→ www.finnforest.com

Finnforest is a leading supplier of eco-efficient wood-based solutions. Its building and furnishing products are energy-efficient throughout their entire life cycle and enhance the built environment and the quality of living. The products and supply chain are continuously developed in close cooperation with the construction industry, other industrial customers, and the retail sector.

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6/2010