MOISTURE BEHAVIOR

MOISTURE CONTENT

When leaving our factory, the moisture content ω of Kerto® products is approximately 8 to 10%. Due to changes in temperature and relative humidity of the surrounding conditions, the moisture content of the product will continuously alter. In service class 1 the moisture content usually varies between 6 and 10%, while in service class 2 it usually varies between 10% and 16%.

Product's moisture content ω is defined as follows:

$$\omega = \frac{m_\omega - m_0}{m_0} \qquad (1)$$

where:
m_ω is the product's mass in corresponding moisture content ω
m_0 is the product's dry mass

Moisture meters based on an electrical resistance give somewhat too high results due to the glue lines of the Kerto products. For exact determination of moisture content in a Kerto sample an oven drying can be conducted according to EN 322.

A non-invasive moisture meter should be used to measure the moisture content of Kerto products. Measurements of moisture content should be taken from the face veneers and perpendicular to the grain direction. To get the most reliable results the moisture meter should be calibrated using samples of known moisture content, for example with oven drying.

Some examples of suitable non-invasive moisture meters that can be used to measure Kerto products moisture content are Delta 2000H (setup: H3 Spruce) and Doser Messgerät HD5 (setup: material group 3).

KERTO WEATHERGUARD® - TERMOPORARY PROTECTION AGAINST RAIN

Kerto WeatherGuard is a Kerto product with a hydrophobic surface coating. The surface coating rejects rainwater and therefore reduces the amount of moisture absorbed by the product while at the same time allowing water vapour movements from and to the product. The reduced moisture absorption further improves the dimensional stability and reduces the swelling of the treated Kerto product during the construction time. WeatherGuard does not affect the product's strength properties. WeatherGuard treated Kerto products are delivered like non-coated products and can be finished afterwards with, for example paint.

Figure 1. Water droplets on WeatherGuard coated Kerto product

DIMENSIONAL CHANGES

Kerto products swell when the moisture content increases and shrink when the moisture content decreases. The extent of these dimensional changes depends on the grain direction. Wetting of the product may cause permanent deformations, problems with the surface veneers and falling of knots.

Product's dimensional change ΔL due to variation in moisture can be calculated as follows:

$$\Delta L = \Delta\omega \cdot \alpha_H \cdot L \qquad (2)$$

where:
$\Delta\omega$ is the change of product's moisture content [%]
α_H is the product's dimensional variation coefficient, see Table 1 for values and Figure 4 for directions
L is the product's dimension in corresponding direction

TABLE 1. DIMENSIONAL VARIATION COEFFICIENTS α_H

	Kerto-S Kerto-T	Kerto-Q Kerto-Qp
Thickness	0.0024	0.0024
Width	0.0032	0.0003 [1)]
Length	0.0001	0.0001

[1)] For Kerto-Qp with widths of 500 mm and more

MetsäWood

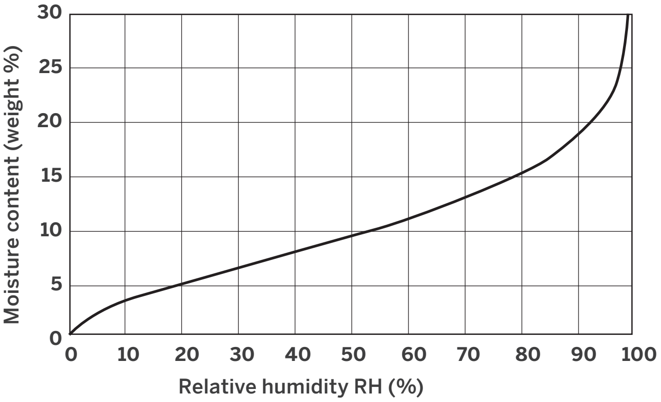

Figure 2. Average moisture content of Kerto in different relative humidity and temperature of 20°C. (Source: TKK Laboratory of Structural Engineering and Building Physics, report 60, Puuviilulevyjen tasapainokosteus, 1997).

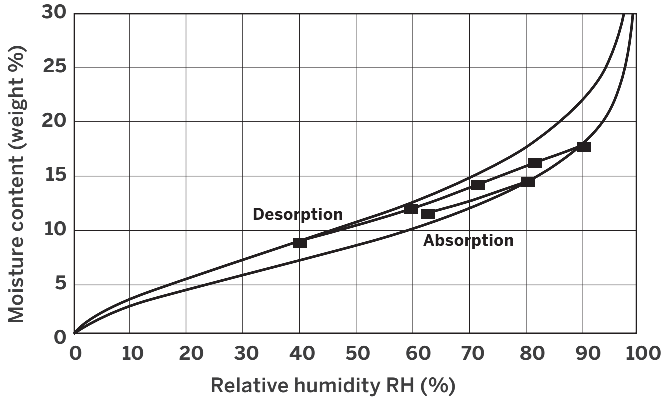

Figure 3. Isotherms of Kerto in absorption and desorption and temperature of 20°C and a curve based on a weather cycling test RH 65% –> 92% –> 40%. (Source: TKK Laboratory of Structural Engineering and Building Physics, report 60, Puuviilulevyjen tasapainokosteus, 1997)

EXAMPLE:

If the relative humidity changes from 50% to 85% the moisture content of a Kerto-S beam increases approximately 7%.
This changes the beam's dimensions correspondingly:

Thickness:
45 mm –> 45 + (7 × 0.0024 × 45) = 45.8 mm
Width:
300 mm –> 300 + (7 × 0.0032 × 300) = 306.7 mm
Length:
3000 mm –> 3000 + (7 × 0.0001 × 3000) = 3002.1 mm

Kerto products may warp when the moisture content of the opposite surfaces is not equal, for example, when one surface is exposed to a higher relative humidity than the other. Kerto-S and Kerto-T products are more sensitive to such warping effect, especially if the height ofthe product is more than 8 times the width (h > 8b).

ABSORPTION AND DESOPRTION

The moisture content of Kerto products is dependent on the relative humidity (RH %) and the direction of the moisture content change (drying/wetting). The extreme equilibrium moisture content values are described by sorption isotherms, see Figure 3. When wood is drying (desorption) the equilibrium moisture content is higher in the same relative humidity than when wood is wetting (absorption).

PERMANENT SWELLING

When Kerto products get wet and dry for the first time there will be a permanent swelling in direction of thickness due to the manufacturing process.

The nominal thickness of the product should be used in the design.

WATER VAPOR RESISTANCE

Water vapor resistance factor μ and water vapor diffusion coefficient in air δ_p for Kerto products are given in Table 2. Figure 4 describes the different directions.

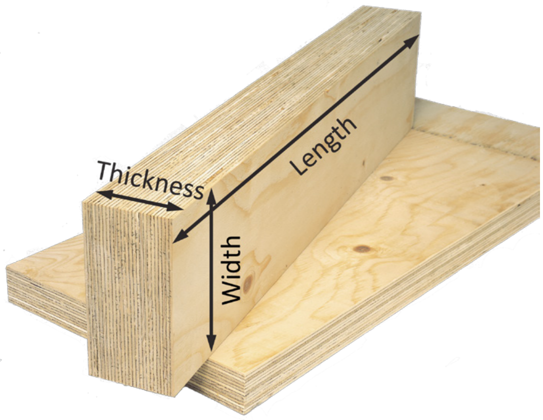

Figure 4. Directions for the coefficient factors in Table 1 and Table 2

TABLE 2: WATER VAPOR RESISTANCE OF KERTO

	Kerto-S	Kerto-Q	Kerto-S	Kerto-Q	
	μ [-]		δ_p [kg / (Pa · s · m)]		Conditions
In direction of thickness	200		$0.96 \cdot 10^{-12}$		Dry Cup 1)
	70		$2.7 \cdot 10^{-12}$		Wet Cup 1)
	80	62	$2.4 \cdot 10^{-12}$	$3.0 \cdot 10^{-12}$	20°C - 50/75RH%
In direction of width	82	9.5	$2.3 \cdot 10^{-12}$	$20 \cdot 10^{-12}$	20°C - 50/75RH%
Longitudinal	3.9	4.7	$49 \cdot 10^{-12}$	$40 \cdot 10^{-12}$	20°C - 50/75RH%

1) The dry cup values are tested in 23°C - 0/50RH% and apply when the mean relative humidity across the material is less than 70 %. The wet cup values are tested in 23°C - 50/93RH% and apply when the mean relative humidity across the material is greater than or equal to 70 %.

Make the most of Metsä Wood