Deutsches Institut für Bautechnik
DIBt

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment

ETA-13/0785 of 19 June 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	THOMA Holz 100
Product family to which the construction product belongs	Solid wood slab element - element of dowel jointed timber boards to be used as a structural element in buildings
Manufacturer	Firma Ing. Erwin Thoma Holz GmbH Hasling 35 5622 Goldegg im Pongau ÖSTERREICH
Manufacturing plant	Holz100 Werk Österreich Nr. 195 8862 STADL an der Mur ÖSTERREICH Holz100 Werk Schwarzwald Flugplatz N1 77933 Lahr
This European Technical Assessment contains	9 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 130002-00-0304
This version replaces	ETA-13/0785 issued on 21 June 2013

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Specific part

1 Technical description of the product

THOMA Holz100-Elemente are solid wood slab elements made from parallel, crosswise (rectangular) or under an angle of 45° arranged layers of boards or squared timbers. The single layers are connected by wooden dowels, diameter 20 mm, made from beech wood.

The dowels for the jointing of the layers go through all layers. They are arranged perpendicular to the elements plane in predrilled holes. The density of the beech dowels is at least ρ_k = 630 kg/m³, the amount of skew fibres is within a maximum of 7°. The dowels are arranged at all four edges of the elements in each intersection of the boards in longitudinal and crosswise direction. In the intermediate area they are staggered and arranged evenly distributed over the element.

The wood species of the boards of the layers is European spruce or equivalent softwood (fir, pine, larch, douglas fir). At least 70 % of the load-carrying boards of one layer correspond at least to strength class C24. The remaining 30 % of the boards correspond at least to strength class C16. The single board layers are at least 24 mm thick, the squared timbers are at least 40 mm thick. The boards have a width of at least 100 mm. There are no butt joints between single boards in line. Between two adjacent boards within a layer a gap up to 10 mm is possible.

The outer layers of elements used as floor or roof elements are always arranged in longitudinal direction of the elements. Between the load-carrying layers at least one intermediate layer is arranged under an angle of 45° or 90° to the outer layers.

For elements used as wall elements the outer layers may also be arranged in horizontal direction. Wall elements consist of at least one longitudinal, one cross and one diagonal layer.

Elements can be built-up asymmetrically (e.g. with only one diagonal layer or with different layer thicknesses).

THOMA Holz100-Elemente have a width up to 3,00 m and a length up to 10,00 m and a thickness up to 400 mm.

There is no adhesive used within the products.

The Annexes show the components and the buildup of the products.

The application of wood preservatives or flame retardants is not covered by this European technical assessment.

2 Specification of the intended use in accordance with the applicable European Assessment Document

Thoma Holz100-Elements are intended to be used to carry static and quasi-static loads in or perpendicular to the elements plane in the service classes 1 and 2 according to EN 1995-1-1.

The performances given in Section 3 are only valid if the product is used in compliance with the specifications and conditions given in Annex 3.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the product of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Resistance and Stiffness regarding mechanical actions perpendicular to the solid wood slab element	See Annex 2
Resistance and Stiffness regarding mechanical actions in plane of the solid wood slab element	See Annex 2
Embedment and withdrawal strength	See Annex 2
Creep and duration of load	See Annex 2
Dimensional stability	See Annex 2
Aspects of durability	See Annex 2

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire (without floor)	D-s2,d0*
Reaction to fire - floor	D_{FL}-s1*
Resistance to fire	No performance assessed **

* Classification according to EN 13501-1[1] as stated in Commission Decision 2003/43/EC[2], as amended. The boundary conditions stated in the commission decision have to be attended for this classification.

** For the timber members the charring rates given in EN 1995-1-2[3] for solid wood may be assumed.

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Vapour permeability	No performance assessed

3.4 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Impact resistance	No performance assessed

3.5 Protection against noise (BWR 5)

Essential characteristic	Performance
Airborne sound insulation	No performance assessed
Impact sound insulation	No performance assessed
Acoustic absorption	No performance assessed

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1 EN 13501 1:2007+A1:2009 Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

2 Official Journal of the European Communities L 13/35, 18. January 2003

3 EN 1995-1-2:2004 +AC:2006+A1:2008 Eurocode 5: Design of timber structures – Part 1-2: General – Structural fire design

3.6 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal resistance	See below
Thermal inertia	See below
Air tightness	No performance assessed

Design values for the timber elements can be taken from EN ISO 10456[4]. Calculation can be performed according to EN ISO 6946[5] or applicable national standards.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 13-0002-00-03.04 the applicable European legal act is: 97/176/EC[6], amended by decision 2001/596/EC[7] of 8 January 2001.

The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 19 June 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Warns

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[4] EN ISO 10456:2007 + AC:2009 — Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values

[5] EN ISO 6946:2017 — Building components and building elements – Thermal resistance and thermal transmittance – Calculation method

[6] Official Journal of the European Communities L 73 of 17.02.1997

[7] Official Journal of the European Communities L 209/33 of 08.01.2001

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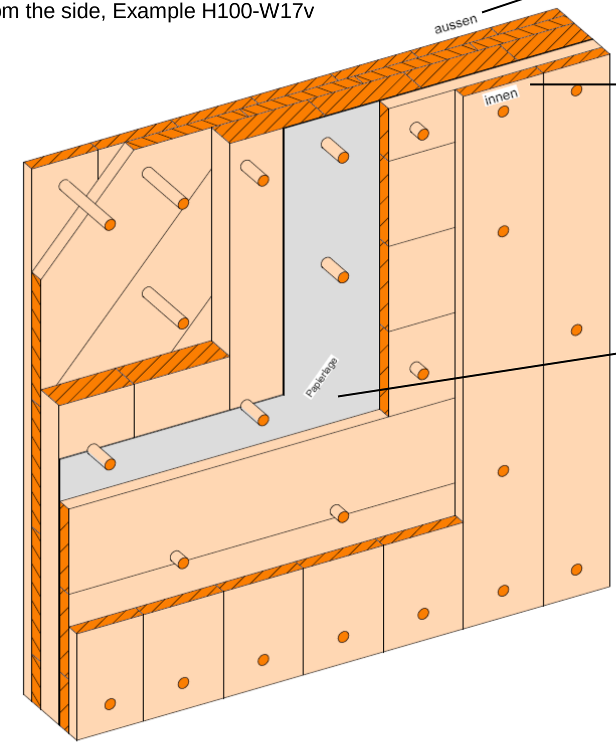
Thoma Holz 100; Examples

View from the side, Example H100-W17v



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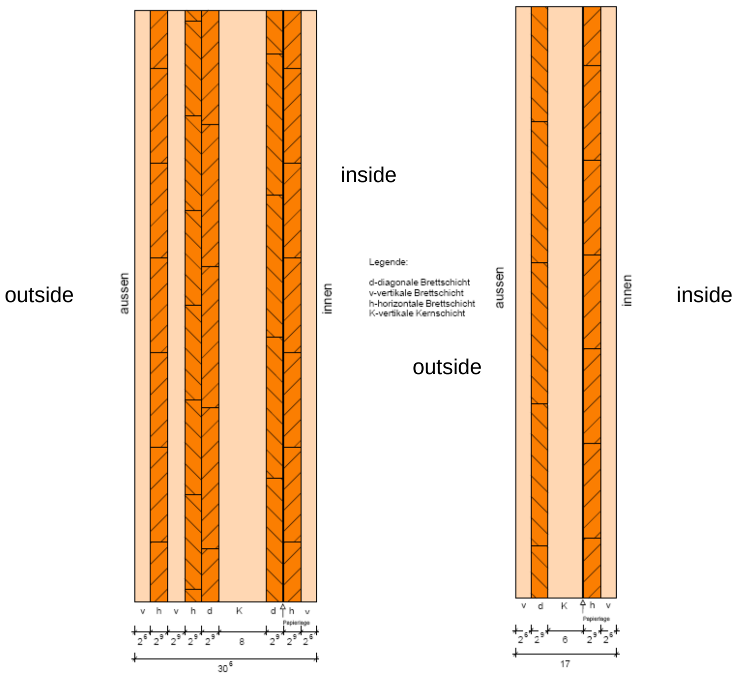

Legend:

d= diagonal layer of boards
v=vertical layer of boards
h=horizontal layer of boards
k=vertical core layer

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THOMA Holz 100	Annex 1 Page 1
Technical description and examples	

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Table 1: product characteristics with regard to mechanical resistance and stability

Essential characteristic	Assessment Method	Level / Class / Description
Mechanical resistance and stability - properties		
Strength class of boards	EN 338	C24
Creep and duration of load	For the factor k_{mod} the value for solid timber applies. The factor k_{def} for the slip modulus of the beech wood dowels can be assumed to be 2,0 x k_{def} for solid timber.	
Dimensional stability Moisture content during service shall not change to such an extent that adverse deformation may occur. It is recommended, that the product is used in conditions where the equilibrium moisture content of the elements does not increase by more than 10 %.		
Embedment and withdrawal strength	According to EN 1995-1-1. The direction of the grain of the cover board is usually taken as reference. It is assumed, that only nails, screws, staples, bolts, dowels and connectors are used and that the gaps between the boards are considered as edges of the structural component. For axially loaded self-tapping screws with a diameter of $d_1 \geq 8$ mm the gaps between the boards may, however, be disregarded.	
Durability The properties of the timber elements shall not adversely be affected by the action of moisture. Depending on the application, the timber elements shall be protected from moisture.		

Table 2: Tolerances

Thickness (depth)	h	± 2 mm
Length	l	± 3 mm
Width	b	± 3 mm
Camber		1:500

THOMA Holz 100	Annex 2 Page 1
Product characteristics with regard to mechanical resistance and stability	

Notes for the design calculation

General

Thoma Holz100-Elemente are intended to be used as loadbearing or non-loadbearing wall-, roof- or floor-elements in building structures.

Design and execution is assumed to be performed according to EN 1995-1-1 with actions applied according to EN 1991-1-1.

Actions in plane

For THOMA Holz100-Elemente used as shear walls an effective shear stiffness value of $GA = 4{,}0 \cdot 10^6$ N per m wall length may be used for the serviceability state design.

If at least two longitudinal, two cross and two diagonal layers are present, an effective shear stiffness $(GA)_{ef} = 8{,}0 \cdot 10^6$ N per m of wall length may be assumed.

A maximum displacement of the height of the wall should not be exceeded in the serviceability state. This limit will in general be governing.

In serviceability state design the horizontal displacement of the wall should be limited. For a maximum displacement of, for example, 1/500 of the wall height, the horizontal load $F_{V,ser}$ per m wall is limited to:

$$F_{V,ser} \leq \frac{(GA)_{ef}}{500}$$

The characteristic load bearing capacity of a wall under horizontal load may be assumed with $F_{V,Rk} = 50$ kN/m.

For elements with at least two longitudinal, two cross and two diagonal layers $F_{V,Rk} = 100$ kN/m may be assumed.

If THOMA Holz100-Elemente are used as beams, the boards of the longitudinal layers shall be assumed as independent. The bending capacity hence is the sum of the bending capacities of the single boards of the longitudinal layers.

If THOMA Holz100-Elemente are used as columns, only the cross-sectional area of the boards of the longitudinal layers without cross- or diagonal layers shall be considered.

When calculating the effective bending stiffness, the slip between the longitudinal layers due to the deformation of the beech dowel connection should be taken into account.

Initial deflections taking into account geometrical and structural imperfections may be assumed as for glulam members.

Buckling may be calculated according to EN 1995-1-1 taking into account the slip in the wooden dowel connections. Furthermore an effective width for concentrated forces may be assumed.

Under concentrated forces the buckling load may be calculated with an effective width of up to $b_{ef} = 5$ b up to a maximum of H/2 (b = width of the contact area of a concentrated load; b and b_{ef} in longitudinal direction of the wall; H = Height of the element).

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Actions perpendicular to the plane

The verification of the stress distribution and the internal forces and moments in the THOMA Holz100-Elemente in case of actions perpendicular to the plane of the element is to be made in accordance with the theory for composite structures. In addition shear deformation between the layers shall be considered, e.g. according to EN 1995-1-1, sections 9.1.3 and 9.1.4.

Elements with two or three longitudinal layers may be calculated using the method of mechanically jointed beams given in Eurocode 5. For an element with more than three longitudinal layers other calculation methods such as the "shear analogy method" are also applicable.

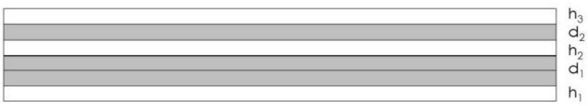
For the ultimate limit state design a slip modulus per dowel and shear plane between two adjacent board layers of K_u = 2000 N/mm shall be used. For roof and ceiling elements with outer layers with a thickness of at least 60 mm, the design a slip modulus per dowel and shear plane can be assumed to be K_u = 2700 N/mm.

The characteristic lateral load-carrying capacity of a wooden dowel, d = 20 mm, can be assumed to be $R_{i,k}$ = 3800 N.

For the serviceability limit state design a slip modulus of K_{ser} = 3000 N/mm should be used. For roof and ceiling elements with outer layers with a thickness of at least 60 mm, the slip modulus per dowel and shear plane can be assumed to be K_{ser} = 4000 N/mm per dowel and shear plane.

THOMA Holz100-Elemente are only used as floor and roof elements where the span is parallel to the direction of the cover(outer)-layers. However, for concentrated forces a load distribution perpendicular to the cover layers may be assumed. An effective width of 70 % of the total width, but not more than 700 mm can be assumed hereby.

<u>Example for the calculation: Arrangement with three longitudinal layers</u>



$$I_{ef} = I_1 + I_2 + I_3 + \gamma_1 a_1^2 A_1 + \gamma_2 a_2^2 A_2 + \gamma_3 a_3^2 A_3$$

$$a_2 = \frac{\gamma_1 A_1 \cdot (\frac{h_1}{2} + d_1 + \frac{h_2}{2}) - \gamma_3 A_3 \cdot (\frac{h_2}{2} + d_2 + \frac{h_3}{2})}{\gamma_1 A_1 + \gamma_2 A_2 + \gamma_3 A_3}$$

$$a_1 = (\frac{h_1}{2} + d_2 + \frac{h_2}{2}) - a_2$$

$$a_3 = (\frac{h_2}{2} + d_2 + \frac{h_2}{2}) + a_2$$

$$\gamma_1 = \left(1 + \frac{\pi^2 E_1 A_1 \cdot s_1}{\ell^2 \quad K_{ef,1}} \right)^{-1}$$

$$\gamma_2 = 1$$

$$\gamma_3 = \left(1 + \frac{\pi^2 E_3 A_3 \cdot s_3}{\ell^2 \quad K_{ef,2}} \right)^{-1}$$

legend:

E_i =	Modul of Elasticity of the element part
A_i =	Area of the cross section
$K_{ef,i}$ /s_i =	effective stiffness of the joints within cross-sectional layer i
	Cross sectional layer d_2 of a board layer with two joints: $K_{ef,2}$ = K/2
	Cross sectional layer d_2 of a board layer with three joints: $K_{ef,1}$ = K/3
K =	slip module between two adjacent layers
s =	distance between the fasteners, assumed to be uplined in a row
h_i =	thickness of longitudinal layers
d_i =	overall thickness of cross-sectional layers
ℓ =	effektive span

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