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Authorised and notified according to Article 10 of the Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products

MEMBER OF EOTA

European Technical Approval ETA-10/0415

Trade name:	HTS-I-Beam
Holder of approval:	Meiser Vogtland OHG Am Lehmteich 3 D-08606 Oelsnitz/Vogtland Tel. +49 3 74 21 5 00 Fax +49 74 21 50 21 20 Internet www.meiser.de
Generic type and use of construction product:	Light composite wood-based beam
Valid from: to:	2011-02-25 2016-02-25
Manufacturing plant:	Meiser Vogtland OHG Am Lehmteich 3 D-08606 Oelsnitz/Vogtland
This European Technical Approval contains:	12 pages including 3 annexes which form an integral part of the document

I LEGAL BASIS AND GENERAL CONDITIONS

1 This European Technical Approval is issued by ETA-Danmark A/S in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1)], as amended by Council Directive 93/68/EEC of 22 July 1993[2)].

- Bekendtgørelse 559 af 27-06-1994 (afløser bekendtgørelse 480 af 25-06-1991) om ikrafttræden af EF direktiv af 21. december 1988 om indbyrdes tilnærmelse af medlemsstaternes love og administrative bestemmelser om byggevarer.

- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC[3)].

- EOTA Guideline ETAG No 011 Guideline for European Technical Approval of Light composite wood-based beams and columns, Edition 2002.

2 ETA-Danmark A/S is authorized to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4 This European Technical Approval may be withdrawn by ETA-Danmark A/S pursuant to Article 5(1) of Council Directive89/106/EEC.

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6 This European Technical Approval is issued by ETA-Danmark A/S in English.
This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1) Official Journal of the European Communities N° L40, 11 Feb 1989, p 12.
2) Official Journal of the European Communities N° L220, 30 Aug 1993, p 1.
3) Official Journal of the European Communities N° L 17, 20 Jan 1994, p 34.

I SPECIAL CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

Definition of the product

HTS-I-beams are light composite wood-based beams with a double symmetrical cross-section. The flanges either consist of softwood of strength class C24 or better according to EN 338:2003, or of glued laminated timber of strength class GL24 or better according to EN 1194:1999. The web is made of corrugated steel grade S550 GD / Z275 MAC according to EN 10326:2004 with $R_e \geq 550$ N/mm and with a zinc coating of 275 g/m². The mechanical connection between the flanges on top and bottom and the web is ensured via tooth-shaped integral fasteners in the web that are forced into the timber flanges during production. The beams have one or two parallel webs.

The HTS-I-beams have an overall height between 210 and 590 mm with dimensions of the flanges and web as listed in Annex A of this European technical approval.

Intended use

HTS-I-beams as structural members are used as beams primarily subjected to bending, shear and concentrated loads at the supports as well as columns primarily subjected to compressive forces in the axial direction, but also to transversal forces. They are defined as slender and with low weight. The use is restricted to service classes 1 and 2 as defined in EN 1995-1-1. They may only be used when there is predominantly static loading.

Assumed working life

The provisions in this European technical approval are based on an assumed working life of the beams of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer or ETA Danmark, 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.

2 Characteristics of product and assessment

ETAG paragraph	Characteristic		Assessment of characteristic
	2.1	**Mechanical resistance and stability*)**	
6.1.1		Numeric values for resistance and stiffness as applicable on the intended use	See chapter 2.1.1
6.1.2		Numeric values for k_{def} and k_{mod}	See chapter 2.1.2
6.1.3		Numeric values for nominal sizes and permissible deviations	See chapter 2.1.3
		Load-displacement curves	No performance determined
	2.2	**Safety in case of fire**	
6.2.1		Reaction to fire	The metal webs are classified as non-combustible and fulfil the requirements of class A1 according to EN 13501-1:2002. The timber flanges are classified as D-s2, d0 according to EN 14081-1:2005.
6.2.2		Resistance to fire	No performance determined
	2.3	**Hygiene, health and the environment**	
6.3.1		Influence on air quality	No dangerous materials *)
	2.4	**Safety in use**	Not relevant
	2.5	**Protection against noise**	Not relevant
	2.6	**Energy economy and heat retention**	Not relevant
6.6.1		Thermal resistance	No performance determined
	2.7	**Related aspects of serviceability**	
6.7.1		Durability	The HTS-I-Beam have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service class 1 and 2
6.7.2		Serviceability	
6.7.3		Identification	See Annex A

*) In accordance with http://europa.eu.int-/comm/enterprise/construction/internal/dangsub/dangmain.htm In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

Safety principles and partial factors

The characteristic load-carrying capacities are based on the characteristic values of the HTS-I-beams. To obtain design values the capacities have to be divided by the partial factors for the material property of timber γ_M and multiplied with the coefficient k_{mod}. In the serviceability limit state the coefficient k_{def} applies.

2.1 Mechanical resistance and stability

2.1.1 Mechanical resistance

In each individual case the design values of the bending and shear capacity have to be calculated according to annex B of EN 1995-1-1 or according to Annex B of this ETA, using the factors K_{ser} or K_u, respectively. In the calculation of the effective bending stiffness of HTS-I-beams the bending stiffness of the web is disregarded. The characteristic capacities for shear loading, pull-out at the connection timber flange to web and concentrated loading at the supports are summarized in Table 3 of Annex B. They should be used for design in accordance with EN 1995-1-1. In Annex C the calculations of the ultimate limit state design values for the HTS-I-beam for the maximum bending stresses and shear forces per unit length along the connection timber flange to steel web are given.

Numeric values for k_{def} and k_{mod}

As coefficients k_{mod} and k_{def} the values for solid timber according to EN 1995-1-1 apply. They are listed in Table 4 and Table 5 of Annex B depending on the load duration class and the service class.

Numeric values for nominal sizes and permissible deviations

The numerical values for nominal sizes and permissible deviations are listed in Table 1 and Table 2 of Annex A with the configuration and the dimensions of the HTS-I-beams displayed in Figure 1.

Load-displacement curves

No performance has been determined in relation to the load-displacement curves to be used in the evaluation of the seismic behaviour of the work.

3 Attestation of Conformity and CE marking

3.1 Attestation of Conformity system

The system of conformity attestation applied to this product shall be that laid down in the Council Directive 89/106/EEC of 21 December 1988, Annex III (2) (i), referred to as System 1. This system provides for.

Certification of the conformity of the product by a notified certification body on the basis of:

a) Tasks for the manufacturer:

(1) Factory production control,
(2) Further testing of samples taken at the factory by the manufacturer in accordance with a control plan[4],

b) Tasks for the notified body:

(1) Initial inspection of the factory and the factory production control,
(2) Initial inspection of factory and factory production control
(3) Continuous surveillance, assessment and approval of factory production control

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer has a factory production control system in the plant and exercises permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer are documented in a systematic manner in the form of written policies and procedures. This production control system ensures that the product is in conformity with the European Technical Approval.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls and tests by the manufacturer before acceptance. Check of materials shall include control of the inspection documents presented by suppliers (comparison with nominal values) by verifying dimension and determining material properties.

The control plan, which is part of the technical documentation of this European Technical Approval, includes details of the extent, nature and frequency of testing and controls to be performed within the factory production control and has been agreed between the approval holder and ETA Danmark.

The results of factory production control are recorded and evaluated. The records include at least the following information:

- Designation of the product, basic material and components;
- Type of control or testing;
- Date of manufacture of the product and date of testing of the product or basic material and components;
- Result of control and testing and, if appropriate, comparison with requirements;
- Signature of person responsible for factory production control.

The records shall be presented to ETA Danmark on request.

3.2.1.2 Testing of samples taken at the factory

Testing of samples taken at the factory according to a prescribed test plan is part of the manufacturer's control. The prescribed test plan is based on EN 386. The test plan is deposited at ETA-Danmark and is available to the approved body involved in the attestation of conformity to this European technical approval.

3.2.2. Tasks of notified bodies

3.2.2.1 Initial type testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary initial type testing has to be agreed between ETA-Danmark and the notified body.

3.2.2.2 Initial inspection of the factory and the factory production control

The notified body should ascertain that, in accordance with the control plan, the factory, in particular the staff and equipment, and the factory production control, are suitable to ensure a continuous and orderly manufacturing of the beam with the specifications given in part 2 and in the annexes.

4 The control plan has been deposited at ETA-Danmark and is only made available to the approved bodies involved in the conformity attestation procedure.

3.2.2.2 Continuous surveillance

The notified body shall visit the factory at least once a year for surveillance. It shall be verified that the system of factory production control and the specified manufacturing processes are maintained, taking account of the control plan.

The results of product certification and continuous surveillance shall be made available on demand by the certification body to ETA Danmark. Where the provisions of the European Technical Approval and the control plan are no longer fulfilled, the certificate of conformity shall be withdrawn by the approved body.

3.3 CE marking

The CE marking shall be affixed on the accompanying commercial documents. The initials "CE" shall be followed by the identification number of the notified body and shall be accompanied by the following information:

- Name or identifying mark of the manufacturer
- The last two digits of the year in which the marking was affixed
- Number of the European Technical Approval
- Strength class
- Nominal height and width of the beam
- Number of the ETA Guideline (ETAG no. 011)
- Number of the EC Certificate of Conformity

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The beams are manufactured in accordance with the provisions of this European Technical Approval using the manufacturing processes as identified in the inspection of the plant by the notified inspection body and laid down in the technical documentation

4.2 Installation

4.2.1 Design

The conditions, for design and execution of the HTS-I-beams into the works, shall be taken from the manufacturer's installation guide. The quality and sufficiency of the installation guide shall be assessed, e.g. concerning the following aspects:

a) The manufacturer claims that his beams and columns can be used with for instance joints in the flanges and/or web, holes for installation, reinforcements or other similar equipment.
b) Definition and verification of the size, spacing and minimum length of the support, and demands of serviceability.
c) Fastening of components and eventual restrictions on the application of fixings to the product.
d) Temporary bracing for temporary loads on the construction site during erection.

4.2.2 Packaging, transport and storage

The beams have to be protected against unfavourable moisture content change during transport and storage.
Lifting and storage of the beams have to be executed in such a way that bending of the beams around the weak axis does not cause damage to the beam.
Before the erection it has to be checked, that the beams are not damaged through transport or storage. Damaged beams have to be replaced.
Perforation of the flanges or the web is not allowed without prior design.
The manufacturer has to ensure that these provisions are familiar to all parties involved.

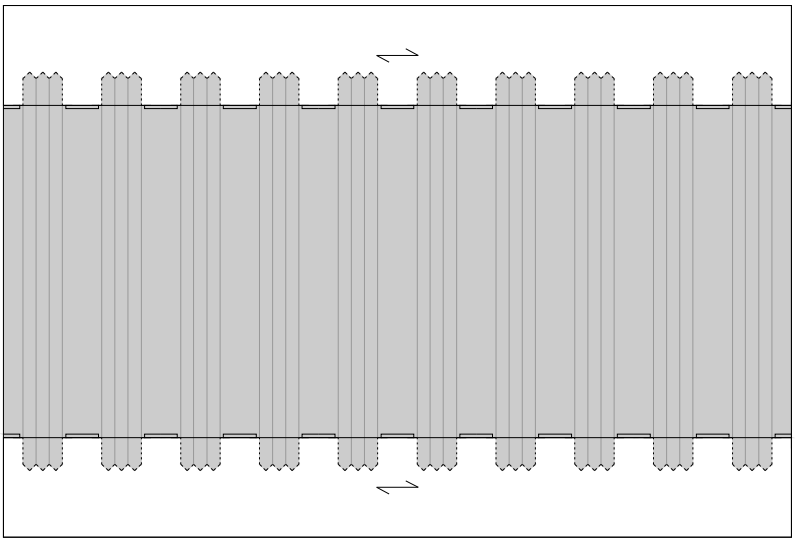
4.3 Maintenance and repair

The assessment of the fitness for use is based on the assumption that maintenance is not required during the assumed intended working life.

Thomas Bruun
Manager, ETA-Danmark

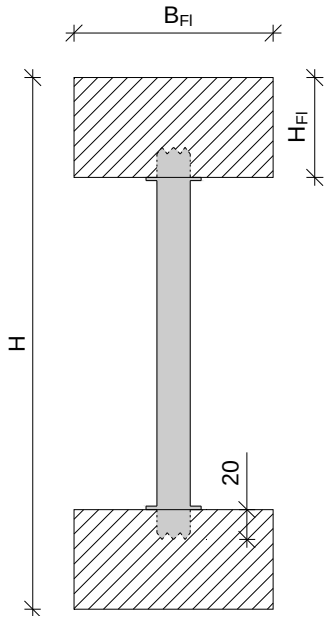
Annex A
Product details definitions

Elevation

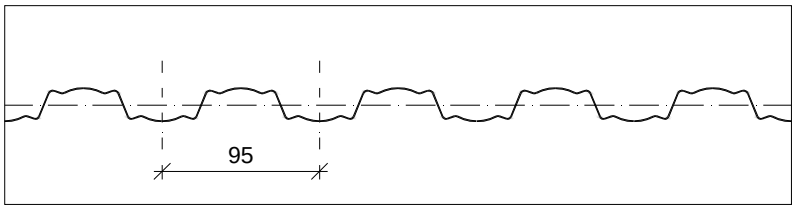


Thickness of the web: t=0,5mm

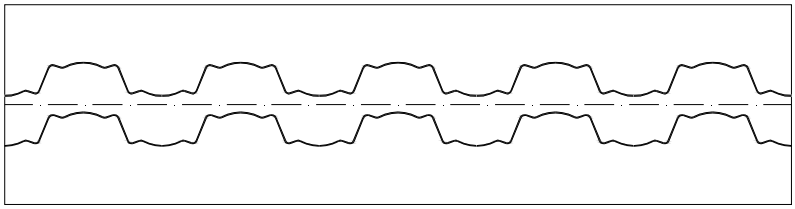
Cross section
(single web)



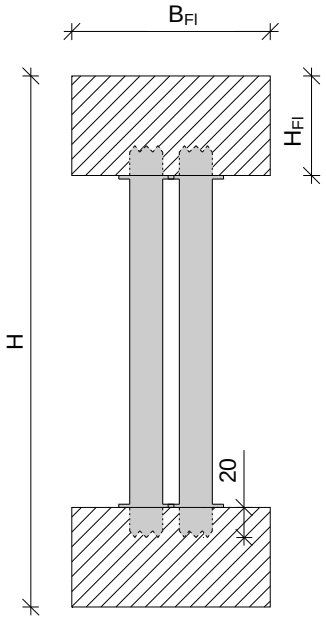
Longitudinal section
(single web)



Longitudinal section
(double web)



Cross section
(double web)



Dimensions in [mm]

Figure 1: Configuration and dimensions of HTS-I-beams

Table 1: Materials specification and range of sizes

Type	Thickness t/ Width B_{Fl} [mm]	Depth H_W /H_{Fl} [mm]	Minimum material specification	Coating specification
Steel web	0,5	110 to 350	S550 GD	Z 275
Timber flanges	80 to 200	50 to 120	C24 or GL24	-

Table 2: Tolerances of HTS-I-beams

		Unit	Tolerance
Total height	H	[mm]	± 2
Total length	ℓ	[mm]	± 5
Flanges	B_{Fl}	[mm]	± 2
Alignment flange – web	-	[mm]	± 5

Annex B
Characteristic load-carrying capacities

Table 3: Characteristic values for HTS-I-beams

Type	Symbol	Unit	Value
Slip modulus (serviceability limit state)	K_{ser}	[N/mm]	2500
Slip modulus (ultimate limit state)	K_u	[N/mm]	1700
Characteristic shear resistances – single web	$f_{v,k}$	[N/mm]	33
Characteristic shear resistances – double web	$f_{v,k}$	[N/mm]	60
Characteristic resistances against pull-out	$f_{ax,k}$	[N/mm]	1,0
Characteristic bearing capacity against concentrated loading at an end support	$F_{V,E,Rk}$	[kN]	15
Characteristic bearing capacity against concentrated loading at an intermediate support	$F_{V,in,Rk}$	[kN]	42
Fastener spacing – single web	s	[mm]	47,5
Fastener spacing – double web	s	[mm]	23,75

Design values are calculated as characteristic values, multiplied by k_{mod} and divided by γ_M for timber.

Effective bending stiffness of HTS-I-beams

The effective bending stiffness of the HTS-I-beams may be calculated as follows (with the symbols as defined in Table 1 to Table 3 and Figure 1):

$$I_{ef} = 2 \cdot I + 2 \cdot \gamma \cdot A \cdot a_1^2$$

where:

$$I = \frac{B_{Fl} \cdot H_{Fl}^3}{12}$$

$$A = B_{Fl} \cdot H_{Fl}$$

B_{Fl} is the flange width

H_{Fl} is the flange depth

$$a_1 = 0,5 \cdot \left(H - H_{Fl}\right)$$

$$\gamma = \left[1 + \frac{\pi^2 \cdot E \cdot A \cdot s}{K_i \cdot \ell^2}\right]^{-1}$$

$K_i = K_{ser}$ for serviceability limit state calculations

$K_i = K_u$ for ultimate limit state calculations

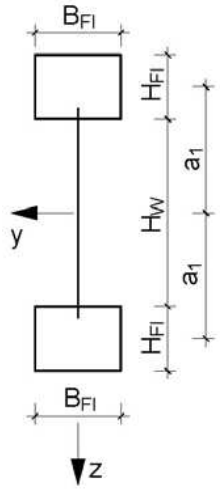


Table 4: Values of modification factors k_{mod} for service classes 1 and 2

Load duration class	Modification factor k_{mod}	Load duration class	Modification factor k_{mod}
Permanent	0,60	Short-term	0,90
Long-term	0,70	Instantaneous	1,10
Medium-term	0,80		

Table 5: Values of deformation factors k_{def}

Service class	Deformation factor k_{def}	Service class	Deformation factor k_{def}
1	0,60	2	0,80

Annex C
Ultimate limit state design values for bending and shear stresses

The ultimate limit state design stresses for the HTS-I-beam calculate as follows (with the symbols as defined in the preceding annexes). The maximum bending stress due to an external momentum is given by:

$$\sigma_{m,d} = \pm \frac{M_d}{I_{ef}} \cdot \left(\gamma \cdot a_1 + \frac{H_{Fl}}{2} \right)$$

where:

M_d = design value of external moment

The tensile and compression stresses in the centre line of the flanges due to an external momentum are given by:

$\sigma_{a1,t,d} = (M_d/I_{ef}) \cdot \gamma \cdot a_1$

$\sigma_{a1,c,d} = - (M_d/I_{ef}) \cdot \gamma \cdot a_1$

The maximum shear force per unit length along the intersection timber flange to steel web due to the maximum shear force in the beam is given by:

$$t_{inter,d} = \frac{V_{max,d} \cdot \gamma \cdot A \cdot a_1}{I_{ef}}$$

where:

$V_{max,d}$ = design value of maximum shear force