ETA-Danmark A/S
Göteborg Plads 1
DK-2150 Nordhavn
Tel. +45 72 24 59 00
Fax +45 72 24 59 04
Internet www.etadanmark.dk

Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

European Technical Assessment ETA-16/0864 of 2022/05/17

General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:	TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors
Product family to which the above construction product belongs:	Self-tapping screws for use in wood-concrete slab kits
Manufacturer:	E.u.r.o. Tec GmbH Unter dem Hofe 5 D-58099 Hagen Tel. +49 2331 / 6245 - 0 Fax +49 2331 / 6245 - 200 Internet www.eurotec.team
Manufacturing plant:	Held on file by ETA-Danmark A/S
This European Technical Assessment contains:	11 pages including 3 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	European Assessment Document (EAD) no EAD 130090-00-0303 “Wood-concrete composite slab with dowel-type fasteners”
This version replaces:	The ETA with the same number issued on 2016-11-29

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

This ETA is an assessment of the TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors for wood-concrete composite slab kits. The diameter of the TCC-II Ø7,3x150 connectors is 7,3 mm, the length is 150 mm. The diameter of the TCC-II Ø9,0x180 connectors is 9,0 mm, the length is 180 mm. Shape and tolerances of the screws are given in Annex 3.

The kits are individually designed to meet the requirements put on the works.

E.u.r.o. Tec GmbH delivers the TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors for the composite action to be used as kit components. The composite members may be prefabricated at factory, or they may be composed at the building site. The proper function of the wood-concrete composite slabs provides for the following components to be added in the factory or at the building site:

- Concrete slab, according to EN 206-1, and reinforcement according to EN 10080 and national regulations either prefabricated or cast at the building site.
- In the case of concrete cast at the building site: formwork, e.g. timber boards or wood based panel. This is an optional intermediate layer between the concrete and the timber. When the concrete slabs are prefabricated, no intermediate layer between timber and concrete is needed.
- In the case of concrete cast at the building site: lateral moulding along the edges of the slab.
- Timber members, e.g. glulam according to EN 14080, sawn softwood timber according to EN 14081-1, LVL according to EN 14374 or cross laminated timber according to ETA.

The concrete flange is loaded in compression. The timber members are usually parallel or almost parallel.

This ETA covers screws for composite members with minimum concrete flange depths of 50 mm and minimum timber member depths of 100 mm. The maximum concrete flange depth is 70 % of the timber member depth. Typical span widths for the construction are up to 8 m with sawn softwood timber members, 10 m with LVL members and 14 m with glulam members but larger span widths also are possible.

A typical composite member is shown in figure 1.1a of Annex 1. Screws are shown in figure 1.1b.

2 Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors are intended to be used in structural composite members such as floor, roof, or wall constructions in service classes 1 and 2 as defined in EN 1995-1-1 subject to static or quasi static loading. In addition, use class 3.1 as defined in EN 335-1 (exterior, above ground, protected) is possible, as balconies.

The verification and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life for the screw of at least 50 years for the TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors.

The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

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

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability (BWR 1)*)	
Structural performance	Wood-concrete composite slabs including TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors are used and manufactured according to an individual design made by a structural engineer responsible for the design of works on a case by case basis. Wood-concrete composite floors may function as directly load bearing and structural bracing members. The structural performance of them shall be considered in accordance with the limit state design principles specified in Eurocodes. The performance of the composite slab is outside of this ETA. The screws are made of case hardened steel as specified in the control plan and corrosion protected with a zinc coating. Geometry of the screws is defined in Annex 3. Mechanical properties of TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors and applicable creep and duration of load factors for composite members are given in Annex 2.
3.2 Safety in case of fire (BWR 2)	
Reaction to fire	TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors including the zinc coating are classified non-combustible in accordance with EC Decision 2000/147/EC and fulfil the requirements of class A1 according to EN 13501-1.
3.3 Hygiene, health and the environment (BWR 3)	
Influence on air quality	The product does not contain/release dangerous substances specified in TR 034, dated March 2012.

*) See additional information in section 3.4 – 3.5.

In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, 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 Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

3.4 General aspects

E.u.r.o. Tec GmbH delivers TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors intended to be component in wood-concrete composite slabs in accordance with the provisions of this European Technical Assessment. TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors are manufactured in the factory in accordance with the provisions of this European Technical Assessment.

TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors shall be installed on the basis of a specific structural design for each composite slab installation. Load bearing capacities to be used in the design are given in Annex 2.

The design also shall take into account any aspects regarding installation of the kit components, as any temporary bracing and supporting. Wood-concrete composite slabs shall be installed by appropriately qualified personnel, following the installation plan. Only TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors without any defects are allowed to be used. Before concrete is poured, the person responsible for the design of the works shall check the set of the TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors to be in accordance with the design. The manufacturer shall ensure that the information of these provisions is given to those concerned.

3.5 Aspects related to the performance of the product

3.5.1 Corrosion protection in service class 1 and 2.
Durability of the finished composite slab is not covered by this ETA.

Durability of the TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors is provided for by the protective zinc coating for a mean thickness of 5 µm

4 Assessment and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 2000/447/EC of the European Commission, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 1.

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2022-05-17 by

Thomas Bruun
Managing Director, ETA-Danmark

ANNEX 1
WOOD-CONCRETE COMPOSITE SLAB COMPOSED WITH TCC-II Ø7,3X150 AND TCC-II Ø9,0X180 MM CONNECTORS

Figure 1.1a Elevation on (left) and cross-section through (right) a composite member with TCC-II Ø7,3x150 and TCC-II 9x180 mm screws

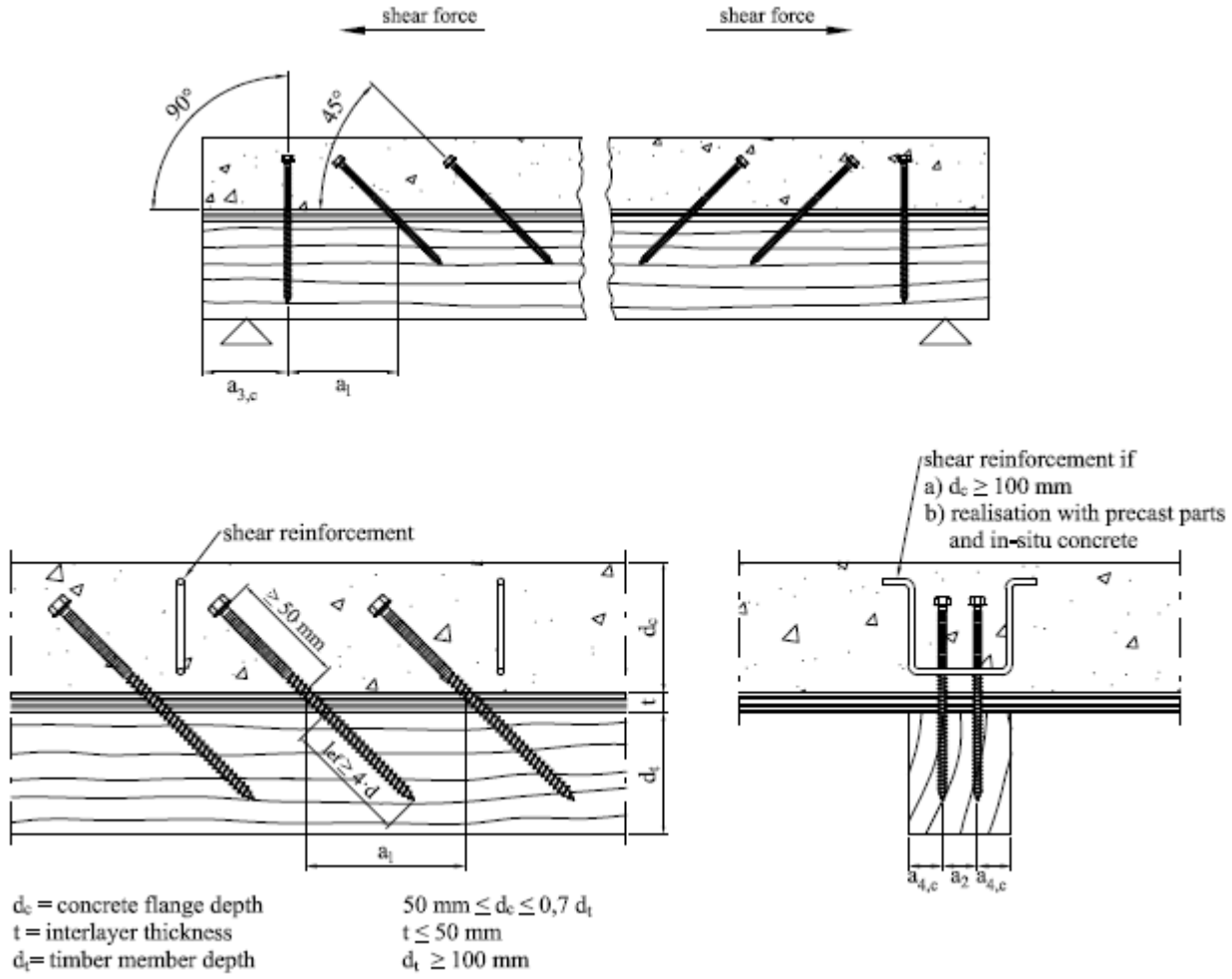

Table 1.1 – Minimum spacing, end and edge distances for TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm screws in mm

	TCC-II Ø7,3x150	TCC-II Ø9,0x180 mm
Spacing parallel to grain a_1	80	100
Spacing perpendicular to grain a_2	30	45
End distance $a_{3,c}$	80	100
Edge distance $a_{4,c}$	30	36

The composition of the screw materials is deposited at ETA Danmark.
The length and diameter of the screws is given in Annex 3. More exact description of the shape and tolerances of the screws are referred to under 3.2.2.1 in the Control plan.

ANNEX 2
MECHANICAL PROPERTIES

Resistance and stiffness

Structural model

Composite members with TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors are to be designed taking into account the influence of the slip occurring in the joints. A method for the calculation of the load bearing capacity and the deformation of mechanically jointed beams or columns is given in Annexes B and C of Eurocode 5 Part 1-1: General – Common rules and rules for buildings. Calculations should be carried out assuming a linear relationship between force and slip. Alternative methods for the calculation based on numerical models are also applicable.

For the determination of the internal forces and moments an elastic behaviour of the concrete may be assumed if the tensile stress in the concrete does not exceed twice the concrete tensile strength.

Friction between timber and concrete may be taken into account, if the friction coefficient may be assumed as $\mu = 0,25$.

In order to apply the friction between the concrete slab and the timber beam for the calculation of the system, the following conditions shall be fulfilled:

- Static system as single span or continuous girder
- Predominantly static load
- Screws arranged unidirectional with systematically existing compression force between wood and concrete for reasons of equilibrium

Apart from the design of the composite member, the load-carrying-capacity of the concrete layer spanning between the timber beams and the shear capacity of the timber member in the perimeter area around the screws should be checked.

The timber beam may only be arranged on top of the concrete slab, if tensile forces perpendicular to the joint line between timber and concrete are transferred by screws arranged perpendicular to the joint line.

The support of the wood concrete composite elements shall be carried out via the lower cross-sectional part either directly by contact or by appropriate connections.

Design of the wood-concrete composite slab

The design of the wood-concrete composite slab in the ultimate and the serviceability limit states shall take into account the influence of creep, concrete shrinkage and moisture changes. The verification of the limit states is to be performed both for the initial state (t = 0) and the final state (t = ∞). The influence of creep and moisture changes may be taken into account by reducing the modulus of elasticity of the timber and concrete and the slip modulus to be used in calculations analogous with EN 1995-1-1. The values of the deformation factors k_{def} given in Table 2.1 should be used. For prefabricated concrete slabs, the concrete shrinkage may be disregarded.

Table 2.1 – Values of k_{def} for timber, concrete and TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors

Material	Service class	
	1	2
Solid timber, EN 14081-1	0,6	2,0
Glued Laminated timber, EN 14080	0,6	2,0
LVL, EN 14374	0,6	2,0
Cross laminated timber, ETA	0,8	2,0
Concrete, EN 206-1	2,5	2,5
TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors connection	0,6	4,0

For timber-concrete composite joints made with TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors the slip modulus K_{ser} per fastener under service load parallel to the shear plane should be taken from Table 2.2 with ℓ_{ef} in mm.

Table 2.2 – Values of K_{ser} for timber-concrete-joints with TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors

Connector orientation	K_{ser} in N/mm			
	With interlayer		Direct contact between timber and concrete	
	d = 7,3 mm	d = 9,0 mm	d = 7,3 mm	d = 9,0 mm
90°	600	700	1800	2200
45°	110 ℓ_{ef}	110 ℓ_{ef}	110 ℓ_{ef}	110 ℓ_{ef}

For timber-concrete composite joints made with TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors the characteristic load bearing capacity per fastener F_{Rk} parallel to the shear plane should be taken from Table 2.3 with ρ_k in kg/m³ and d and ℓ_{ef} in mm. Characteristic yield moment M_{yk} is given in Table 2.4.

Table 2.3 – Values of F_{Rk} for timber-concrete-joints with TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors.

Connector orientation	F_{Rk} in N	
	With interlayer	Direct contact between timber and concrete
$\alpha = 90°$	$f_{h,2,k} \cdot d \cdot t \left[\sqrt{1 + \frac{4 \cdot M_{y,k}}{f_{h,2,k} \cdot d \cdot t^2} + \frac{f_{h,1,k}}{2 \cdot f_{h,2,k}}} - 1 \right]$	$\sqrt{4 \cdot M_{y,k} \cdot f_{h,2,k} \cdot d}$
$\alpha = 45°$	$(\cos\alpha + \mu \cdot \sin\alpha) \cdot \min \begin{cases} 1{,}2 \cdot F_{ax,\alpha,Rk} \\ f_{tens,k} \end{cases}$	

where:

F_{Rk}	is the characteristic load-carrying capacity per conenctor in N;
t	is the interlayer thickness in mm;
$f_{h,1,k}$	is the characteristic embedment strength in the interlayer in MPa;
$f_{h,2,k}$	is the characteristic embedment strength in the timber member in MPa;
d	is the conenctor diameter in mm;
$M_{y,k}$	is the characteristic fastener yield moment in Nmm;
$F_{ax,\alpha,Rk}$	is the characteristic withdrawal capacity in N; $F_{ax,\alpha,Rk} = f_{ax,k} \times d \times \ell_{ef} \times \left(\frac{\rho_k}{350}\right)^{0,8}$
ℓ_{ef}	is the penetration depth of the connector in the timber member in mm;
ρ_k	is the characteristic timber member density in kg/m³;
μ	Friction coefficient; $\mu = 0{,}25$

Table 2.4 – Properties of TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors

TCC-II conenctor with diameter	d = 7,3 mm	d = 9,0 mm
Yield moment $M_{y,k}$ [Nm]	25	34
Tensile capacity $f_{tens,k}$ [kN]	23	30
Withdrawal parameter $f_{ax,k}$ [N/mm²]	12,6	11,5

Resistance to fire

Simplified rules in EN 1995-1-2 for calculation of resistance to fire in case of screws are applicable for constructions made by TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors.

Thus, in design of works, fire resistance of the timber members may be determined according to EN 1995-1-2 and the fire resistance of the concrete flange according to EN 1992-1-2, if the national rules allow for calculation.

ANNEX 3
Drawing of the TCC-II Ø7,3x150 and TCC-II Ø9,0x180 mm Connectors
Tolerances held on file by ETA-Danmark A/S