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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-19/0244 of 2019/05/20

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:	Rotho Blaas CTC screw
Product family to which the above construction product belongs:	Self-tapping screws for use in wood-concrete slab kits
Manufacturer:	Rotho Blaas s.r.l Via dell'Adige 2/1 IT-39040 Cortaccia (BZ) Tel. + 39 0471 818400 Fax + 39 0471 818484 Internet www.rothoblaas.com
Manufacturing plant:	Rotho Blaas s.r.l Manufacturing plant S1
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:	

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product
This ETA is an assessment of the CTC screws for wood-concrete composite slab kits. The diameter of the CTC screws is 7 mm, 8 mm or 9 mm, the length ranges between 160 mm and 240 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.

Rotho Blaas srl delivers the Rotho Blaas CTC screws 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:

Base Material:
- Timber members, e.g. glued laminated timber or glued solid timber according to EN 14080, solid softwood or hardwood timber according to EN 14081-1, LVL according to EN 14374 or to ETA, cross laminated timber according to ETA or light composite wood-based beams according to ETA.

Moulding:
- In the case of concrete cast at the building site: optional intermediate layer between the concrete and the timber as formwork, e.g. timber boards or wood based panel. Lateral moulding along the edges of the slab. This moulding has no function in the final product
- In the case of prefabricated concrete slab: no intermediate layer between timber and concrete is needed.
- Optional intermediate layer between the concrete and the timber consisting of acoustic interlayer with thickness 5 mm SILENT FLOOR or equivalent resilient under screed foil.
- No essential characteristics are assessed for the moulding.

Finalisation of wood-concrete composite slab kit:
- Concrete slab, according to EN 206-1, and reinforcement according to EN 10080 and national regulations either prefabricated or cast at the building site.
- The concrete slab is not part of the kit. No characteristics are assessed for the concrete slab.

Finished floor or ceiling covering as well as possible sound reducing courses are not part of the kit.

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 which comply with the regulations on the minimum slab depths in the place of use (national regulations) but not less than 50 mm and minimum timber member depths of 100 mm. The maximum concrete flange depth is 70 % of the timber member depth. Typical spans 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 spans also are possible.

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

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

CTC screws 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, depending on national provisions.

The provisions made in this European Technical Assessment are based on an assumed working life of CTC screws for wood-concrete composite floors of 50 years, provided that the conditions laid down in this ETA for the installation, use and maintenance are met.

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 products 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 CTC screws 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 CTC screws 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	CTC screws 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.

*) See additional information in section 3.9 – 3.10.

No other BRW's are relevant for this ETA

3.9 General aspects

Rotho Blaas srl delivers CTC screws intended to be used as components in wood-concrete composite slabs in accordance with the provisions of this European Technical Assessment. The CTC screws are manufactured in the factory in accordance with the provisions of this European Technical Assessment as identified during inspection of the plant.

Rotho Blaas CTC screws 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 screws 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 CTC screws to be in accordance with the design. The manufacturer shall ensure that the information of these provisions is given to those concerned.

3.10 Aspects related to the performance of the product

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

Durability of the CTC screws is provided for by the protective zinc coating for a minimum 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

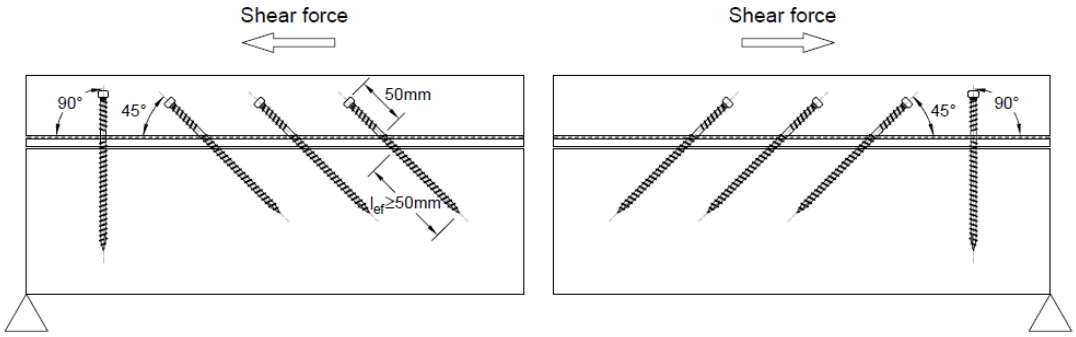
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2019-05-20 by

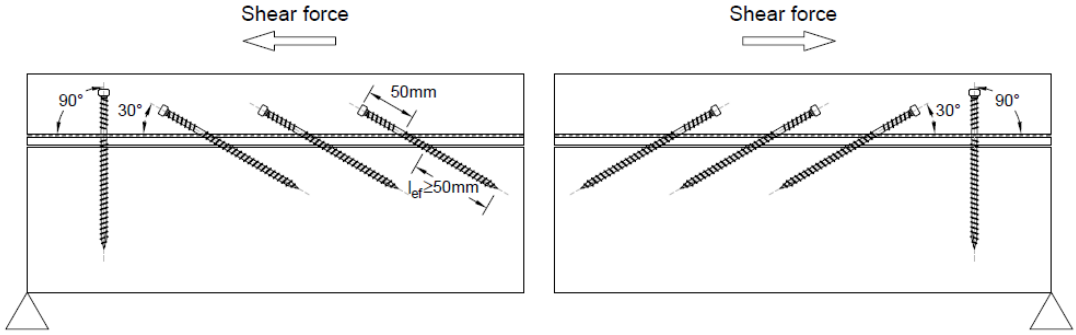
Thomas Bruun
Managing Director, ETA-Danmark

ANNEX 1
WOOD-CONCRETE COMPOSITE SLAB COMPOSED WITH CTC SCREWS

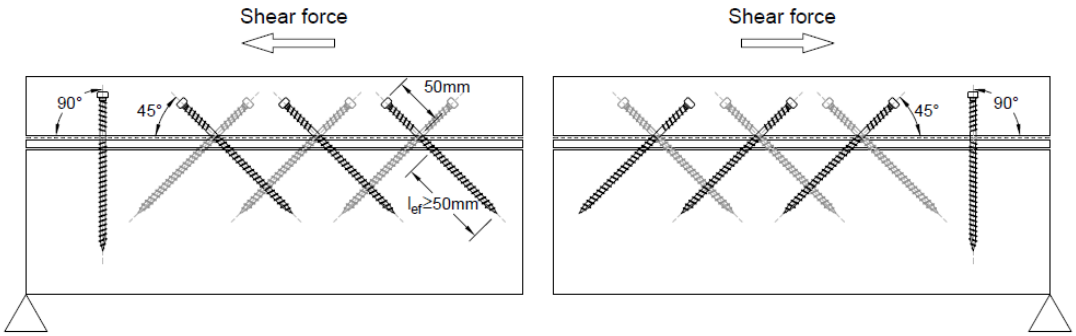
Figure 1.1a Elevation on a composite member with CTC screws



Screws orientation: 45°



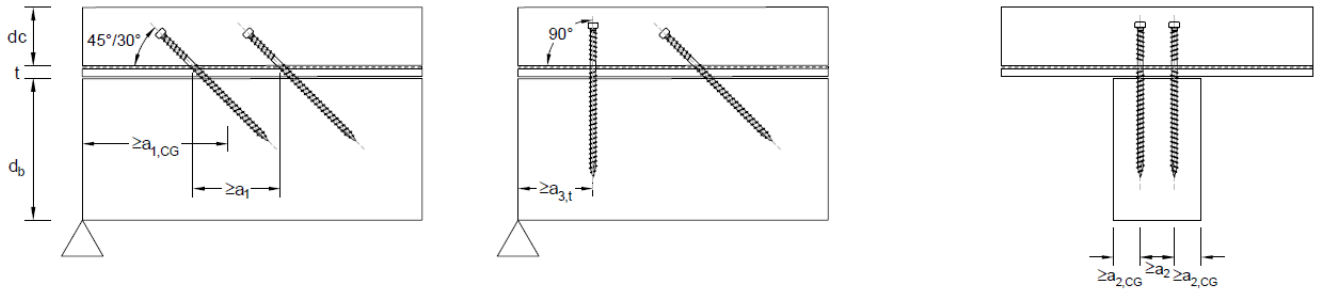
Screws orientation: 30°



Screws orientation: crossed screws at 45°

Screws arranged at 90° are optional

Figure 1.1a Elevation on a composite member with CTC screws



d_c = concrete flange depth (50 mm ≤ d_c ≤ 0.7 d_b)
t = interlayer thickness (e.g. formwork / resilient soundproofing foils)
d_b = timber member depth (d_b ≥ 100 mm)

Screws orientation: 30°, 45° and 90°

Screws orientation: crossed screws at 45°

Figure 1.1b CTC screw

Table 1.1 – Minimum spacing, end and edge distances for CTC screws in mm

CTC screw	d = 7 mm	d = 8 mm	d = 9 mm
Spacing parallel to grain a_1	130 · sin α	130 · sin α	130 · sin α
Spacing perpendicular to grain a_2	35	40	45
End distance $a_{1,CG}$	85	85	85
Edge distance $a_{2,CG}$	32	35	37
End distance $a_{3,t}$	105	120	135
Spacing between the two screws of a crossed screw couple a_{cross}	11	12	14

The composition of the screw materials is deposited at ETA Danmark.

The length and diameter of the screws is given in Annex 3.

ANNEX 2
MECHANICAL PROPERTIES

Resistance and stiffness

Structural model

Composite members with CTC screws 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 no acoustic interlayer is placed between timber and concrete and if the screws are inclined and not crossed. The friction coefficient may in this case be assumed as $\mu = 0{,}25$.

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.

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 ($t = \infty$). 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 and EN 1992-1-1.. 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 CTC screws

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 or ETA	0,6	2,0
Cross laminated timber, ETA	0,8	2,0
Concrete, EN 206-1	2,5	2,5
CTC screw connection	0,6	4,0

For timber-concrete composite joints made with CTC screws 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. For screws inclined under 45° or 30° an intermediate layer as formwork, e.g. timber boards or wood based panel between the concrete and the timber does not influence the slip modulus K_{ser}.

Table 2.2 – Values of K_{ser} for timber-concrete-joints with CTC screws

	K_{ser} in N/mm					
CTC screw orientation	With interlayer			Direct contact between timber and concrete		
	d = 7 mm	d = 8 mm	d = 9 mm	d = 7 mm	d = 8 mm	d = 9 mm
90°	600	650	700	1800	2000	2200
	K_{ser} in N/mm					
CTC screw orientation	With acoustic interlayer SILENT FLOOR			Without acoustic interlayer SILENT FLOOR		
	d = 7 mm	d = 8 mm	d = 9 mm	d = 7 mm	d = 8 mm	d = 9 mm
45° parallel	16 ℓ_{ef}	19 ℓ_{ef}	22 ℓ_{ef}	48 ℓ_{ef}	56 ℓ_{ef}	60 ℓ_{ef}
45° crossed	70 ℓ_{ef}	85 ℓ_{ef}	100 ℓ_{ef}	70 ℓ_{ef}	85 ℓ_{ef}	100 ℓ_{ef}
30° parallel	48 ℓ_{ef}	48 ℓ_{ef}	48 ℓ_{ef}	80 ℓ_{ef}	80 ℓ_{ef}	80 ℓ_{ef}

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

Table 2.3 – Properties of CTC screws.

CTC screw	d = 7 mm	d = 8 mm	d = 9 mm
Yield moment $M_{y,k}$ [Nm]	20	28	38
Tensile capacity $f_{tens,k}$ [kN]	20	25	30
Withdrawal parameter $f_{ax,k}$ [MPa]	11,3	11,3	11,3

Table 2.4 – Values of FRk for timber-concrete-joints with CTC screws

CTC screw orientation	F_{Rk} in N	
	With interlayer	Direct contact between timber and concrete
$\alpha = 90°$	$f_{h,2,k} \cdot d \cdot t \left[\sqrt{1 + \frac{4 \cdot M_{y,k}}{f_{h,2,k} \cdot d \cdot t^2} + \frac{f_{h,1,k}}{2 \cdot f_{h,2,k}}} - 1 \right]$	$\sqrt{4 \cdot M_{y,k} \cdot f_{h,2,k} \cdot d}$
$\alpha = 30°$ $\alpha = 45°$	$(\cos\alpha + \mu \cdot \sin\alpha) \cdot \min\{F_{ax,\alpha,Rk}; f_{tens,k}; F_{ax,concrete,Rk}\}$	

where:

F_{Rk}	is the characteristic load-carrying capacity per CTC screw 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 CTC screw's 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; $F_{ax,\alpha,Rk} = k_{ax} \cdot 11{,}3 \cdot d \cdot \ell_{ef} \cdot \left(\frac{\rho_k}{350} \right)^{0,8}$
k_{ax}	$k_{ax} = 1{,}0$ for $45° \le \alpha < 90°$ $k_{ax} = 0{,}3 + \frac{0{,}7 \cdot \alpha}{45°}$ for $30° \le \alpha < 45°$
ℓ_{ef}	is the penetration depth of the CTC screw in the timber member in mm;
ρ_k	is the characteristic timber member density in kg/m³, $\rho_k \le 590$ kg/m³;
$F_{ax,concrete,Rk}$	is the characteristic withdrawal capacity from the concrete in N; $F_{ax,concrete,Rk}$ = 15 kN for connections with inclined screws at $\alpha = 45°$ without acoustic interlayer SILENT FLOOR, $F_{ax,concrete,Rk}$ = 10 kN for connections with inclined screws at $\alpha = 30°$ or crossed screws or connections with acoustic interlayer SILENT FLOOR
μ	Friction coefficient; $\mu = 0{,}25$ for connections with inclined screws without acoustic interlayer SILENT FLOOR, $\mu = 0$ for connections with crossed screws or with acoustic interlayer SILENT FLOOR.

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 CTC screws.

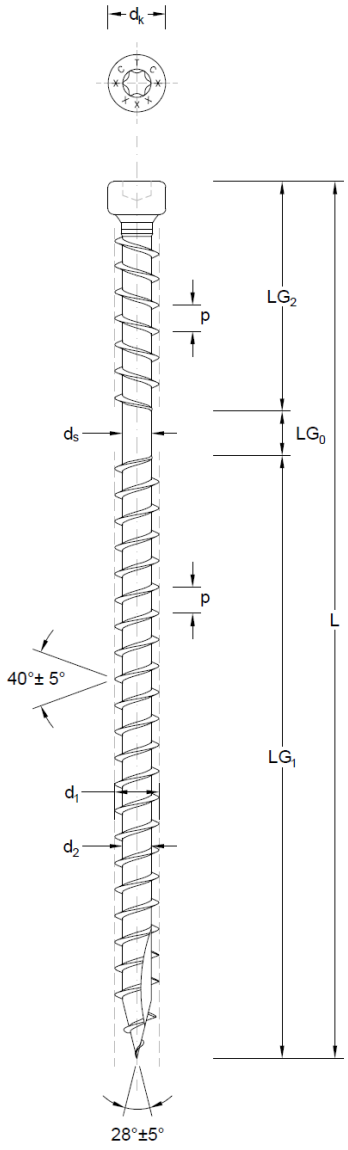
Thus, in design of works, fire resistance of the timber members may be determined according to EN 1995-1-2 and the fire resistance of the concrete flange according to EN 1992-1-2, if the national rules allow for calculation.

ANNEX 3

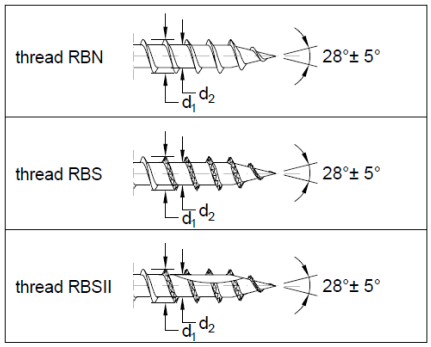
ROTHO BLAAS CTC SCREWS
(alternative product name: ROTHO BLAAS CLC SCREWS)

d_1	d_2	d_s	d_k cylindrical head	p
7.00 ±0.18	4.60 ±0.12	5.00 ±0.13	9.50 ±0.24	4.80 ±10%
8.00 ±0.20	5.20 ±0.13	5.80 ±0.15	10.50 ±0.26	7.00 ±10%
9.00 ±0.23	5.90 ±0.15	6.50 ±0.16	11.50 ±0.29	5.40 ±10%

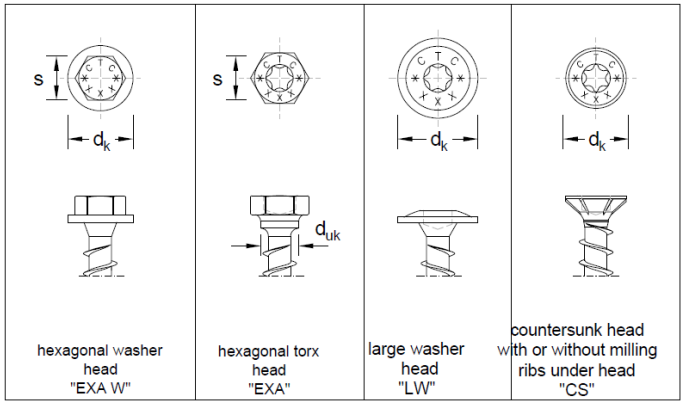
Design with and without cutting edges possible.



Alternative thread tip types:



Alternative head types:



Headstamp (supplier head mark "CTC" or "CLC" and specific lenght) optional.

	head "EXA W"		head "EXA"		head "LW"	head "CS"
d_1	d_k	s	d_{uk}	s	d_k	d_k
7.00	14.50 ±0.36	10.00 +0/-0.25	8.00 ±0.20	10.00 +0/-0.25	17.25 ±0.43	13.00 ±0.33
8.00	16.00 ±0.40	10.00 +0/-0.25	9.00 ±0.23	12.00 +0/-0.30	19.00 ±0.48	14.50 ±0.36
9.00	17.50 ±0.44	12.00 +0/-0.30	11.00 ±0.28	15.00 +0/-0.40	22.00 ±0.55	16.00 ±0.40

Lenghts and Thread Lenghts

L	LG_2	LG_0	LG_1
160.0	40.0	10.0	110.0
160.0	50.0	0.0	110.0
240.0	40.0	10.0	190.0
240.0	50.0	0.0	190.0

Tolerance (L and LG): + 2.00 mm - 1.00 mm / Intermediate lengths (L) and thread lengths (LG_0 / LG_1 / LG_2) are possible.
All dimensions in [mm].