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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-04/0013

This ETA replaces the previous ETA with the same number and validity from 2008-08-13 to 2013-08-13

Trade name:	CNA Connector nails, PCR Connector nails and CSA Connector screws
Holder of approval:	SIMPSON STRONG-TIE A/S Hedegaardsvej 4 – 11, Boulstrup DK-8300 Odder Tel. +45 87 81 74 00 Fax +45 87 81 74 09 Internet www.strongtie.dk
Generic type and use of construction product:	Annular ringed shank nails and connector screws
Valid from: to:	2009-08-12 2014-08-12
Manufacturing plant:	SIMPSON STRONG-TIE A/S Hedegaardsvej 4 – 11, Boulstrup DK-8300 Odder
This European Technical Approval contains:	13 pages including 2 annexes which form an integral part of the document

Modifications and additions to the previous ETA-04/0013 valid from 2008-08-13 to 2013-08-13	
Pages	Update
4 and 10	4,0 mm CNA nails, length 35, 40, 50, 60 in stainless steel have been added
6	Overlapping nails in a three-member connection has been added
10	CNA3,1x50, CNA3,7x40 and CNA3,7x60 have been deleted
10	L for CNA4,0 mm has been added 1,5 mm except for CNA4,0x35
11, 12	Height of the screw head has been changed from 2,7 mm to min 2,3 mm
12	CSA5,0x50 is added
13	In table B2 $F_{lat,Rk}$ for CSA 5,0x35 has been reduced

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)].

- Common Understanding of Assessment procedure no. 06.03/05 dated 2003-09-16.

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.

5 Reproduction of this European Technical Approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of ETA-Danmark A/S. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

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.

II SPECIAL CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

General
CNA Connector nails (references to CNA Connector nails also apply to PCR Connector nails) are made from cold-formed steel wire. The shank is cylindrical and made with ribs on part of the shank. The shank has a special conical part under the head. The nail head is cylindrical and the point is pyramid shaped. See annex A, drawing 1.
Further, the CNA Connector nails with a diameter of 4,0 mm and a length from 35 mm to 60 mm inclusive can be produced from stainless steel wire. See annex A, drawing 1.

CSA Connector screws are made from tempered steel and are threaded almost over the total length. The shank just below the head has a cylindrical and a conical part. See annex A, drawing 2.

Range
The dimensions of the nails, d × L, are for d ranging from 3,1 to 6,0 mm and for L ranging from 35 mm to 100 mm. Other dimensions may appear from annex A.

The dimensions of the screws, d × L, are d equal to 5,0 mm and for L ranging from 35 mm to 50 mm.
Other dimensions may appear from annex A.

Intended use
The nails and screws are used for steel and aluminium nailing plates and three-dimensional steel and aluminium nailing plates for connections in load bearing timber structures with members of solid timber, glued laminated timber and similar glued members or wood-based structural members.

Note: The requirement to the material of the wood members can be fulfilled by using the following materials:

- *Solid timber classified to C14-C40 according to EN 338 / EN 14081*
- *Glued members of timber classified to C14 – C40 according to EN 338 / EN 14081.*
- *Glued laminated timber classified to GL24c or better according to EN 1194/EN 14080.*
- *Solid Wood Panels, SWP according to EN 13353.*
- *Laminated Veneer Lumber LVL according to EN 14374*
- *Laminated Strand Lumber, e.g. Parallam and Timber Strand*
- *Plywood according to EN 636*
- *Oriented Strand Board, OSB according to EN 300*

The nails and screws are intended to be used in timber connections for which requirements for mechanical resistance and stability and safety in use in the sense of the Essential Requirements 1 and 4 of Council Directive 89/106/EEC shall be fulfilled.

The design of the timber connections shall be based on the characteristic load-carrying capacities of the nails and screws. The design capacities shall be derived from the characteristic capacities in accordance with Eurocode 5 or a similar national Timber Code.

The zinc-coated fasteners are for use in timber structures subject to dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1:2004, (Eurocode 5).

The nails made from stainless steel are intended for use in outdoor conditions defined by the service classes 3 of EN 1995-1-1:2004, (Eurocode 5).

Assumed working life
The assumed intended working life of the nails and screws for the intended use is 50 years, provided that they are subject to appropriate use and maintenance.

The information on the working life should not be regarded as a guarantee provided by the manufacturer or ETA-Danmark A/S. An “assumed intended working life” means that it is expected that, when this working life has elapsed, the real working life may be, in normal use conditions, considerably longer without major degradation affecting the essential requirements.

2 Characteristics of product and assessment

CUAP para.	Characteristic		Assessment of characteristic
	2.1	**Mechanical resistance and stability*)**	
5.1.1		Withdrawal and lateral load-carrying capacity	See Annex B
5.1.2		Tensile capacity	Nails: 3,1 mm: 4,5 kN 3,7 mm: 6,5 kN 4,0 mm: 7,5 kN 6,0 mm: 17,0 kN Screws: 5,0 mm: Min 6,8 kN
5.1.3		Torsional strength of screws	Characteristic value: $f_{tor,k} \geq 4{,}9 Nm$ $R_{tor,k} \leq \frac{f_{tor,k}}{1{,}5}$
	2.2	**Safety in case of fire**	
5.2.1		Reaction to fire	The nails and screws are made from steel classified as **Euroclass A1**
	2.3	**Hygiene, health and the environment**	
5.3.1		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
	2.7	**Related aspects of serviceability**	
5.7.1		Durability	
5.7.2		Serviceability	See Annex B
5.7.3		Identification	See Annex A

*) See page 5 of this ETA

**) 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.

2.1 Mechanical resistance and stability

The load-carrying capacities for CNA Connector nails and CSA connector screws are applicable to the wooden materials mentioned in clause 1 for intended use. The term timber has been used in the following meaning all materials mentioned under intended use.

The formulas for the load-carrying capacities are restricted to characteristic densities of the wooden materials up to 460 kg/m^3. Even though the wood based material may have a larger density, this must not be used in the formulas.

The formulas are applicable to connections with metal plates of steel or aluminium.

2.1.1 CNA Connector nails

Lateral capacity

The characteristic lateral load-carrying capacity of CNA Connector nails in a metal plate with a thickness of at least 1,0 mm shall be calculated from:

$$F_{lat,Rk} = F_{v,Rk} + 0{,}6 \cdot F_{ax,Rk}$$

where

$F_{v,Rk}$ is the lateral dowel capacity per nail assuming a thick metal plate in N.

$$F_{v,Rk} = \min \begin{cases} f_{h,k}\, t_1\, d \left[\sqrt{2 + \dfrac{4 M_{y,Rk}}{f_{h,k}\, d\, t_1^2}} - 1 \right] & \text{(c)} \\ 2{,}3 \sqrt{M_{y,Rk}\, f_{h,k}\, d} & \text{(d)} \\ f_{h,k}\, t_1\, d & \text{(e)} \end{cases}$$

$f_{h,k}$ is the characteristic embedment strength in the timber member in MPa;

$$f_{h,k} = 0{,}082 \rho_k d^{-0{,}3}$$

ρ_k is the characteristic density of the timber in kg/m^3

t_1 is the timber thickness or penetration in mm;

d is the fastener diameter in mm;

$M_{y,Rk}$ is the characteristic fastener yield moment in Nmm;

$$M_{y,Rk} = 180 d^{2,6}$$

where the tensile capacity of the wire for the nails is 600 MPa

$F_{ax,Rk}$ is the characteristic axial withdrawal capacity of the nail calculated from the formula below.

Nail diameter, mm	Min. thickness, mm
4,0 or less	1,0
4,2	1,2
6,0	2,0

Table 2.1. Minimum thickness of the metal plate for use with nails of a diameter as mentioned in the table. For aluminum plates the minimum thickness is the min. thickness mentioned in table 2.1 + 1,0 mm

In a three-member connection, CNA Connector nails with a diameter less than or equal to 4,2 mm may overlap in the central member provided (t-t_2) is greater than or equal to 2,9d, see figure below

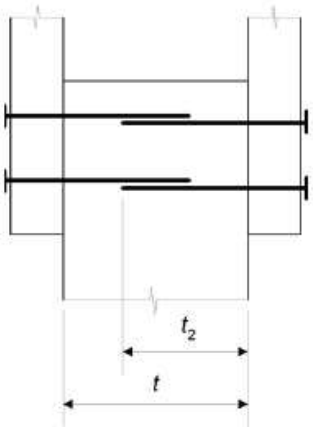


Figure 2.1 Geometry for overlapping nails. t: timber thickness, t_2: point side penetration depth.

Axial withdrawal capacity

The characteristic axial withdrawal capacity of a nail shall be calculated from:

$$F_{ax,Rk} = f_{ax,k} d l_{thr}$$

Where $f_{ax,k}$ is minimum of

$$f_{ax,k} = 6{,}125\left(1+\frac{1{,}5d}{l_{thr}}\right)\left(\frac{\rho_k}{350}\right) \text{ and}$$

$$f_{ax,k} = (10{,}92 - 0{,}0158d - 0{,}0968 l_{thr})\left(\frac{\rho_k}{320}\right)^2$$

d diameter of the nail, mm

l_{thr} the threaded length in the point side member in mm.
Max. threaded length = L_1 -1,5d in mm.
L_1 is the length of thread and point in mm, see annex A.

ρ_k characteristic density of the timber member in kg/m^3

For the relevant nail sizes and timber densities Annex B states the characteristic load-carrying capacities.

2.1.2 CSA Connector screws

The characteristic lateral load-carrying capacities of CSA Connector screws in a metal plate with a thickness of at least 1,0 mm (2,0 mm for aluminium) are stated in Annex B.

The characteristic axial withdrawal capacities of CSA Connector screws are stated in Annex B.

Annex B states the characteristic load-carrying capacities for relevant densities of the timber members.

3 Attestation of Conformity and CE marking

3.1 Attestation of Conformity system

According to Decision 97/176 of the European Commission for structural timber products and ancillaries the system of attestation of conformity is 3 described in Council Directive 89/106/EEC (Construction Products Directive) Annex III.

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 prescribed test plan.

b) Tasks for the notified body:

(1) Initial type testing of the product,

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[1]. 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, e.g. tensile strength, hardness, surface finishes.

The manufactured components shall be subjected to the following checks:

Head diameter and thickness
Thread diameter of screws
Core diameter
Length
Mechanical tests (torsional strength of screws)

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 A/S.

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 A/S on request

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 A/S and the notified body

3.3 CE marking

The CE marking shall be affixed on each packaging of nails and screws. The initials "CE" shall be followed by the identification number of the certification 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
- Name and size of product

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

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

4.1 Manufacturing

The nails and screws are manufactured in accordance with the provisions of the European Technical Approval using the automated manufacturing process as identified during the inspection of the plant by ETA-Danmark A/S and the approved body and laid down in the technical documentation.

4.2 Installation

The nails shall be driven into the wood by a hammer or a similar tool. The requirements for the holes in the metal plate depending on the diameter, d, of the nail is given in table 4.1

Nail diameter, d mm	Min. nominal hole diameter, mm	Max. nominal hole diameter, mm
3,1	3,4	4,0
3,7	4,1	4,7
4,0	4,4	5,0
4,2	4,7	5,3
6,0	6,5	7,5

Table 4.1 Min and max nominal diameter of the holes en the metal plate depending on the diameter, d, of the nails

The screws shall be screwed into the wood by a screwdriver or a screwing machine without pre drilling. The holes in the metal plate shall have a nominal diameter of 5,0 mm.

Minimum spacings and distances for connector screws: As stated in Eurocode 5, clause 8.7.1, paragraph (4) smooth shank screws of a diameter less than 6 mm can be treated as nails. Since the 5,0 mm connector screws have an inner diameter of 3,15 mm they can be treated as nails with an effective diameter as defined in clause 8.7.1, paragraph (3). That the smooth shank just below the head is 5,0 mm is of no essential importance. The reason why is that according to Eurocode 5, clause 8.7.1, paragraph (3) an effective diameter of screws with a thread over the whole length shall be used instead of the diameter of a smooth shank.

For the connector screws the core diameter is 3,15 mm, so according to clause 8.7.1, paragraph (3) the effective diameter becomes 3,46 mm which is smaller than the 4,0 mm of a connector nail. Therefore, if you can use 4,0 mm nails in the connectors you will also fulfil the minimum distances and spacings when you use 5,0 mm connector screws.

The installation shall be carried out in accordance with the instructions from Simpson Strong - Tie A/S.

4.3 Maintenance and repair

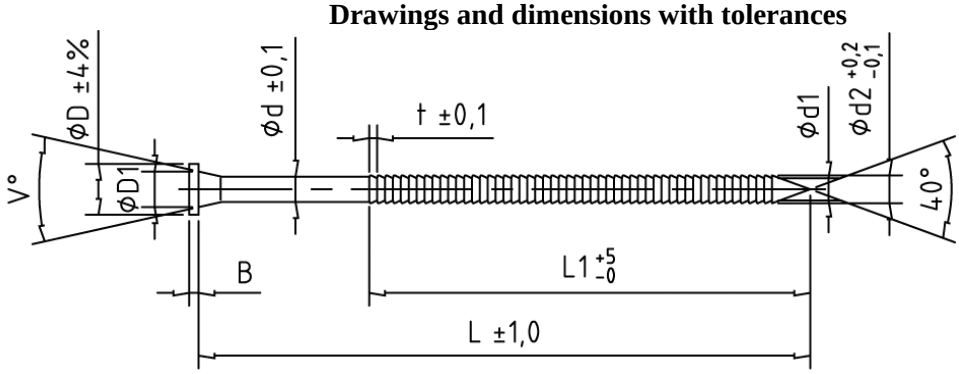
The nails and screws are maintenance free.



Thomas Bruun
Manager, ETA-Danmark

Annex A

Drawings and dimensions with tolerances



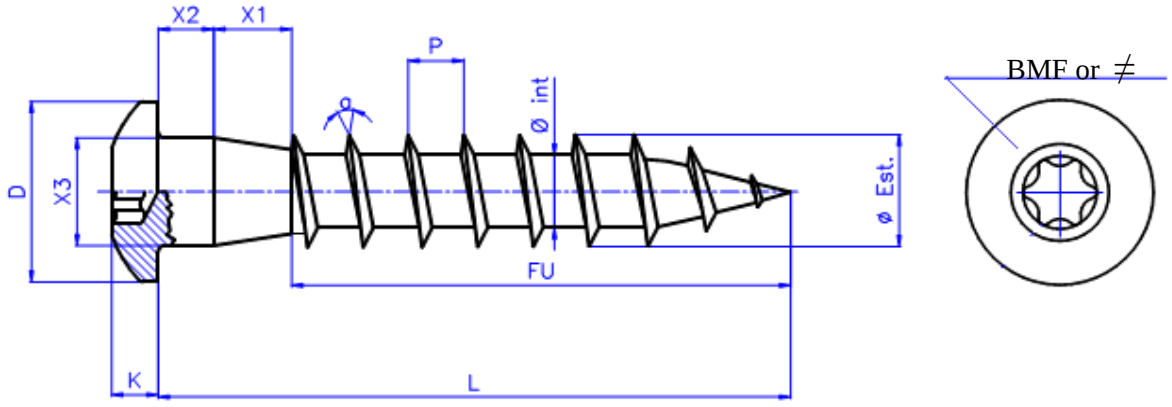
Dim L - d	L	L1	d	d1	d2	t	D	D1	B	d2-d1	V
6,0x100	100	70	6,0	5,5	6,5	1,5	12,0	8,0	2,0	0,8-1,2	40 °
6,0x80	80	70	6,0	5,5	6,5	1,5	12,0	8,0	2,0	0,8-1,2	40 °
6,0x60	60	50	6,0	5,5	6,5	1,5	12,0	8,0	2,0	0,8-1,2	40 °
4,2x60	60	50	4,2	3,9	4,7	1,5	8,0	5,5	1,6	0,6-1,0	20 °
4,2x50	50	40	4,2	3,9	4,7	1,5	8,0	5,5	1,6	0,6-1,0	20 °
4,2x35	35	25	4,2	3,9	4,7	1,5	8,0	5,5	1,6	0,6-1,0	20 °
4,0x100	100	70	4,0	3,6	4,4	1,25	8,0	5,6	1,5	0,6-1,0	25 °
4,0x75	75	65	4,0	3,6	4,4	1,25	8,0	5,6	1,5	0,6-1,0	25 °
4,0x60	60	50	4,0	3,6	4,4	1,25	8,0	5,6	1,5	0,6-1,0	25 °
4,0x50	50	40	4,0	3,6	4,4	1,25	8,0	5,6	1,5	0,6-1,0	25 °
4,0x40	40	30	4,0	3,6	4,4	1,25	8,0	5,6	1,5	0,6-1,0	25 °
4,0x35	35	25	4,0	3,6	4,4	1,25	8,0	5,6	1,5	0,6-1,0	25 °
3,7x50	50	40	3,7	3,3	4,1	1,25	7,4	5,4	1,4	0,6-1,0	40 °
3,1x60	60	50	3,1	2,7	3,4	1,25	6,2	4,6	1,0	0,5-0,9	40 °
3,1x40	40	30	3,1	2,7	3,4	1,25	6,2	4,6	1,0	0,5-0,9	40 °

The tolerance for d2-d1 is -15% + 25%.
The nails are electroplated Fe/Zn12C according to EN ISO 2081.
The head of the nails are marked either

 or 

Nails with diameter 3,1mm to 4,2 mm are manufactured from steel wire AISI 1008 = grade 005 according to ASTM A510-03.
Nails with a diameter of 6,0 mm are manufactured from steel wire AISI 1012 = grade 008 according to ASTM A510-03.
Nails with a diameter of 4,0 mm and a length from 35 mm to 60 mm inclusive can also be manufactured from stainless steel wire number 1.4401 according to EN 10088-3:2006 with Rm min. 600 N/mm^2 or AISI 316 with Rm min. 600 N/mm^2

Drawing 1: CNA Connector nails



DIMENSIONAL CHARACTERISTICS:

Ø Nom.	D	K	X2	X1	X3	TX
5	8,30 ± 0,10	min 2,3 ± 0,10	2,50 ± 0,20	3,50 -0,50 / +0,20	4,90 -0,20 / +0,10	2,00 ± 0,20

Ø Nom.	Ø Est.	Ø Int	□Fil	P
5	4,85 ± 0,15	3,15 ± 0,25	40° ± 5°	2,30 ± 0,20

Length. Nom	Length	Length FU
35	35,00 ± 0,40	29,00 ± 0,40
40	40,00 ± 0,40	34,00 ± 0,40
50	50,00 ± 0,40	44,00 ± 0,40

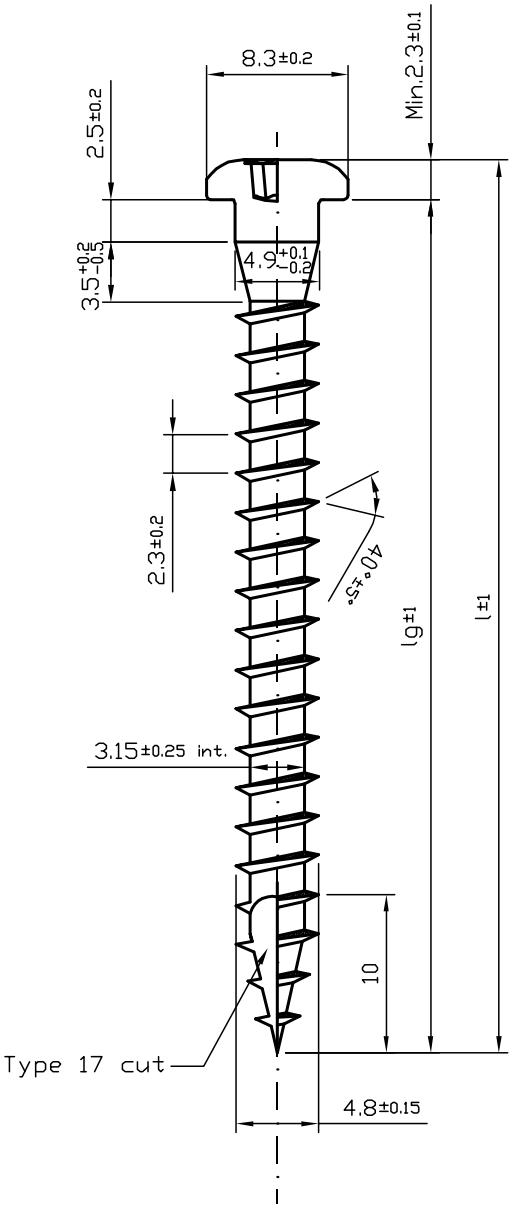
RAW MATERIAL CHARACTERISTICS (acc our specification " C17B" ediz. 0 del 11/98)

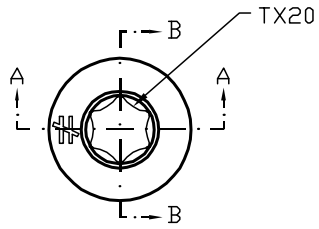
CHEMICAL COMPOSITION	%C	% Si MAX	% Mn	% B
	0,15 – 0,18	< 0,10	0,60 – 0,90	< 0,0060

STRENGTH AND STIFFNESS	Rm (N/mm^2)	Re (N/mm^2)	A % (mm)	Z % (mm)	HV (max)
	380 – 530	Min 440	16	65	145

***HEAT TREATMENT*:** Carbonitrided
***TYPE OF PLATING*:** Zinc electroplated 12 micron.

Drawing 2: CSA1 Connector screw





Model no. Electroplated	l	lg
CSA5,0X35	35	29
CSA5,0X40	40	34
CSA5,0X50	50	44

Material:
Steel wire: AISI 1018 according to ASTM A510-03.
Heat treatment for hardness.

Finish:
Electroplated Fe/Zn12/C according to EN ISO 2081.

Drawing 3: CSA2 Connector screw

Annex B

Characteristic capacities

Table B1: Characteristic capacities of CNA Connector nails for a characteristic density of the wood members as indicated in the table. The fastener shall be driven completely into the wood or wood based material, which shall have a thickness of at least the length of the fastener.

Connector nails	Density							
	290 kg/m^3		320 kg/m^3		350 kg/m^3		380 kg/m^3	
	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]
3,1 x 40	470	1230	520	1330	570	1410	620	1490
3,1 x 60	750	1420	870	1540	950	1640	1030	1730
3,7 x 50	750	1750	830	1870	910	1980	980	2080
4,0 x 35	510	1430	560	1550	610	1680	670	1800
4,0 x 40	610	1560	670	1700	740	1830	800	1970
4,0 x 50	810	1890	900	2070	980	2220	1060	2330
4,0 x 60	950	2050	1120	2230	1230	2360	1330	2490
4,0 x 75	1000	2080	1210	2290	1450	2500	1710	2720
4,0 x 100	980	2070	1190	2270	1430	2480	1680	2710
4,2 x 35	530	1510	590	1640	640	1770	700	1890
4,2 x 50	850	2020	940	2210	1030	2380	1120	2510
4,2 x 60	1000	2210	1180	2390	1290	2540	1400	2680
6,0 x 60	1390	3280	1680	3670	1840	3970	2000	4270
6,0 x 80	1480	3780	1800	4120	2150	4470	2540	4840
6,0 x 100	1480	3780	1800	4120	2150	4470	2540	4840

Table B2: Characteristic capacities of CSA Connector screws for a characteristic density of the wood members as indicated in the table. The fastener shall be driven completely into the wood or wood based material, which shall have a thickness of at least the length of the fastener.

Connector screws	Density							
	290 kg/m^3		320 kg/m^3		350 kg/m^3		380 kg/m^3	
	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]	$F_{ax,Rk}$ [N]	$F_{lat,Rk}$ [N]
5,0 x 35	1380	1670	1520	1760	1660	1840	1800	1920
5,0 x 40	1810	2100	1990	2210	2180	2310	2370	2410
5,0 x 50	2540	2280	2800	2400	3060	2510	3320	2620