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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-23/0340 of 2023/05/26

I 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:	IPEX 0402 Wood screw
Product family to which the above construction product belongs:	Screws for use in timber constructions
Manufacturer:	IPEX Beheer BV Vonderweg 14 NL-7468 DC Enter Internet www.ipex-group.com
Manufacturing plant:	IPEX Beheer BV Held on file by ETA-Danmark AS
This European Technical Assessment contains:	10 pages including 2 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 130118-01-0603 “Screws and threaded rods for timber constructions”
This version replaces:	

II SPECIAL CONDITIONS OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

IPEX screws are self-tapping screws to be used in timber structures. They shall be threaded over a part of the length. The screws shall be produced from carbon or stainless steel wire for nominal diameter 8,0 mm. Where corrosion protection is required, the material or coating shall be declared in accordance with the relevant specification given in Annex A of EN 14592.

Geometry and Material

The nominal diameter (outer thread diameter), d, of IPEX screws is 8,0 mm. The overall length of the screws, ℓ, shall not be less than 40 mm and shall not be greater than 400 mm. Other dimensions are given in Annex A.

The ratio of inner thread diameter to outer thread diameter d_i/d is 0,67.

The screws are threaded over a minimum length ℓ_g of 70 mm (i.e. $\ell_g \geq 4 \cdot d$).

The screws covered by this ETA have a minimum bending angle, α, of $(45/d^{0,7} + 20)$ degrees.

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

The screws are used for connections in load bearing timber structures between softwood members of solid timber, glued laminated timber, cross-laminated timber, similar glued members, wood-based panels, or steel.

Steel plates and wood-based panels except solid wood panels and cross laminated timber shall only be located on the side of the screw head. The following wood-based panels may be used:

- Plywood according to EN 636 or ETA
- Particleboard according to EN 312 or ETA
- Oriented Strand Board, Type OSB/3 and OSB/4 according to EN 300 or ETA
- Fibreboard according to EN 622-2 and 622-3 or ETA (minimum density 650 kg/m³)
- Cement bonded particleboard according to ETA
- Solid wood panels according to EN 13353 and EN 13986, and cross laminated timber according to ETA
- Laminated Veneer Lumber according to EN 14374 or ETA
- Engineered wood products according to ETA if the ETA of the product includes provisions for the use of self-tapping screws, the provisions of the ETA of the engineered wood product apply

The screws shall be driven into softwood without pre-drilling or after pre-drilling with a diameter not larger than the inner thread diameter for the length of the threaded part and with a maximum of the smooth shank diameter for the length of the smooth shank.

The 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 Basic Works Requirements 1 and 4 of Regulation 305/2011 shall be fulfilled.

The design of the connections shall be based on the characteristic load-carrying capacities of the screws. The design capacities shall be derived from the characteristic capacities in accordance with Eurocode 5 or an appropriate national code. Regarding environmental conditions, national provisions at the building site shall apply.

The screws are intended for use for connections subject to static or quasi static loading.

The screws are for use in timber structures subject to service classes 1, 2 and 3 of Eurocode 5. In service class 1 and 2 the corrosion protection is given according to EN1995-1-1, or by equivalent measures. In service class 3 the corrosion protection is given according to EN1995-1-1 or by stainless steel.

The scope of the screws regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions.

The provisions made in this European Technical Assessment are based on an assumed intended working life of the screws of 50 years.

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, 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 Characteristics of product and assessment

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Tensile strength Screws made of carbon steel Screws made of stainless steel	Characteristic value $f_{tens,k}$: Screw d = 8,0 mm: 20 kN Screw d = 8,0 mm: 12 kN
Insertion moment	Ratio of the characteristic torsional strength to the mean insertion moment: $f_{tor,k} / R_{tor,mean} \geq 1,5$
Torsional strength Screws made of carbon steel Screws made of stainless steel	Characteristic value $f_{tor,k}$: Screw d = 8,0 mm: 28 Nm Screw d = 8,0 mm: 18 Nm
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The screws are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364.
3.3 General aspects related to the performance of the product	The screws 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 classes 1 and 2

*) See additional information in section 3.4 – 3.6.

3.4 Mechanical resistance and stability

The load-carrying capacities for IPEX screws are applicable to the wood-based materials mentioned in paragraph 1 even though the term timber has been used in the following.

The characteristic lateral load-carrying capacities and the characteristic axial withdrawal capacities of IPEX screws should be used for designs in accordance with Eurocode 5 or an appropriate national code.

Point side penetration length must be $\ell_{ef} \geq 4 \cdot d/\sin\alpha$, where d is the outer thread diameter of the screw and α is the angle between screw axis and grain direction.

ETAs for structural members or wood-based panels must be considered where applicable.

For screws in pre-drilled holes, the drill hole diameter should be considered in the member strength verification, for screws driven without pre-drilling, the inner thread diameter.

Lateral load-carrying capacity
The characteristic lateral load-carrying capacity of IPEX screws shall be calculated according to EN 1995-1-1:2008 (Eurocode 5) using the outer thread diameter d as the nominal diameter of the screw. The contribution from the rope effect may be considered.

The characteristic yield moment shall be assumed as:

402 CF screws:
d = 8,0 mm: $M_{y,k}$ = 28 Nm

402 SA screws:
d = 8,0 mm: $M_{y,k}$ = 18 Nm

The embedding strength for screws in non-pre-drilled holes arranged at an angle between screw axis and grain direction, $30° \leq \alpha \leq 90°$ is:

$$f_{h,k} = \frac{0,082 \cdot \rho_k \cdot d^{-0,3}}{2,5 \cdot \cos^2\alpha + \sin^2\alpha} \quad [\text{MPa}]$$

and accordingly for screws in pre-drilled holes:

$$f_{h,k} = \frac{0,082 \cdot \rho_k \cdot (1 - 0,01 \cdot d)}{2,5 \cdot \cos^2\alpha + \sin^2\alpha} \quad [\text{MPa}]$$

Where
ρ_k characteristic timber density [kg/m³];
d outer thread diameter [mm];
α angle between screw axis and grain direction;

The embedding strength for screws arranged parallel to the plane of cross laminated timber, independent of the angle between screw axis and grain direction, $0° \leq \alpha \leq 90°$, shall be calculated from:

$$f_{h,k} = 20 \cdot d^{-0,5} \quad [\text{MPa}]$$

unless otherwise specified in the technical specification (ETA or hEN) for the cross laminated timber.

Where
d outer thread diameter [mm]

The embedding strength for screws in the wide face of cross laminated timber should be assumed as for solid timber based on the characteristic density of the outer layer. If relevant, the angle between force and grain direction of the outer layer should be taken into account.

The direction of the lateral force shall be perpendicular to the screw axis and parallel to the wide face of the cross laminated timber.

Bending angle
No performance assessed.

Axial withdrawal capacity
The characteristic axial withdrawal capacity of IPEX screws at an angle of $30° \leq \alpha \leq 90°$ to the grain in solid timber, glued laminated timber and cross-laminated timber members shall be calculated according to EN 1995-1-1 from:

$$F_{ax,\alpha,Rk} = n_{ef} \cdot k_{ax} \cdot f_{ax,k} \cdot d \cdot \ell_{ef} \cdot \left(\frac{\rho_k}{350}\right)^{0,8} \quad [\text{N}]$$

Where

$F_{ax,\alpha,RK}$	characteristic withdrawal capacity of the screw at an angle α to the grain [N]
n_{ef}	effective number of screws according to EN 1995-1-1
k_{ax}	Factor, taking into account the angle α between screw axis and grain direction k_{ax} = 1,0 for $45° \leq \alpha < 90°$ $k_{ax} = 0,3 + \frac{0,7 \cdot \alpha}{45}$ for $30° \leq \alpha < 45°$
$f_{ax,k}$	Characteristic withdrawal parameter d = 8 mm: $f_{ax,k}$ = 11 MPa
d	outer thread diameter [mm]
ℓ_{ef}	Penetration length of the threaded part according to EN 1995-1-1 [mm]
α	Angle between grain and screw axis
ρ_k	Characteristic density [kg/m³]

For screws arranged under an angle between screw axis and grain direction of less than 90°, the minimum tip side penetration length is:

$\ell_{ef} \geq \min(4 \cdot d/\sin\alpha ; 20 \cdot d)$

For screws penetrating more than one layer of cross laminated timber, the different layers may be taken into account proportionally.

The axial withdrawal capacity is limited by the head pull-through capacity and the tensile capacity of the screw.

Head pull-through capacity
The characteristic head pull-through capacity of IPEX screws shall be calculated according to EN 1995-1-1 from:

$$F_{ax,\alpha,Rk} = n_{ef} \cdot f_{head,k} \cdot d_h^2 \cdot \left(\frac{\rho_k}{350}\right)^{0,8} \quad [N]$$

where:

$F_{ax,\alpha,RK}$ Characteristic head pull-through capacity of the connection at an angle $\alpha \geq 30°$ to the grain [N]
n_{ef} Effective number of screws according to EN 1995-1-1:2008
$f_{head,k}$ Characteristic head pull-through parameter [MPa]
d_h Diameter of the screw head or the washer [mm]. Outer diameter of heads or washers $d_k > 25$ mm shall not be taken into account.
ρ_k Characteristic density [kg/m³], for wood-based panels $\rho_k = 380$ kg/m³

Characteristic head pull-through parameter for IPEX screws in connections with timber and in connections with wood-based panels with thicknesses above 20 mm:
$f_{head,k} = 9,4$ MPa

Where d is the outer thread diameter in mm.

Characteristic head pull-through parameter for screws in connections with wood-based panels with thicknesses between 12 mm and 20 mm:
$f_{head,k} = 8$ MPa

Screws in connections with wood-based panels with a thickness below 12 mm (minimum thickness of the wood based panels of 1,2·d with d as outer thread diameter):
$f_{head,k} = 8$ MPa limited to $F_{ax,Rk} = 400$ N

The head diameter d_h shall be greater than $1,8 \cdot d_s$, where d_s is the smooth shank or the wire diameter. Otherwise the characteristic head pull-through capacity $F_{ax,\alpha,Rk} = 0$.

The minimum thickness of wood-based panels according to the clause 3.11 must be observed.

In steel-to-timber connections the head pull-through capacity is not governing.

Tensile capacity
The characteristic tensile strength $f_{tens,k}$ of IPEX screws made of carbon or stainless steel is:

402 CF screws:
d = 8,0 mm: $f_{tens,k} = 20$ kN

402 SA screws:
d = 8,0 mm: $f_{tens,k} = 12$ kN

For screws used in combination with steel plates, the tear-off capacity of the screw head including a washer shall be greater than the tensile capacity of the screw.

Combined laterally and axially loaded screws
For connections subjected to a combination of axial and lateral load, the following expression should be satisfied:

$$\left(\frac{F_{ax,Ed}}{F_{ax,Rd}}\right)^2 + \left(\frac{F_{la,Ed}}{F_{la,Rd}}\right)^2 \leq 1$$

where
$F_{ax,Ed}$ axial design load of the screw
$F_{la,Ed}$ lateral design load of the screw
$F_{ax,Rd}$ design load-carrying capacity of an axially loaded screw
$F_{la,Rd}$ design load-carrying capacity of a laterally loaded screw

Slip modulus
The axial slip modulus K_{ser} of a screw for the serviceability limit state should be taken independent of angle α to the grain as:
$K_{ser} = 25 \cdot d \cdot \ell_{ef}$ [N/mm]
Where
d outer thread diameter [mm]
ℓ_{ef} thread penetration length in the structural member [mm]

3.5 Aspects related to the performance of the product

3.5.1 Corrosion protection in service class 1 and 2.
The IPEX screws are produced from carbon or stainless steel wire. Screws made from carbon steel are electrogalvanised and yellow or blue chromated or could be coated with organic coating. The mean thickness of the zinc coating is 5µm.

3.5.2 Corrosion protection in service class 3.
The IPEX screws are produced from stainless steel wire.

3.6 General aspects related to the intended use of the product

The screws are manufactured in accordance with the provisions of the European Technical Assessment using the automated manufacturing process and laid down in the technical documentation.

The installation shall be carried out in accordance with Eurocode 5 or an appropriate national code unless otherwise is defined in the following. Instructions from IPEX Group should be considered for installation.

The screws are used for connections in load bearing timber structures between members of solid timber (softwood), glued laminated timber (softwood), cross-laminated timber (softwood), similar glued members (softwood), wood-based panels or steel members.

The screws may be used for connections in load bearing timber structures with structural members according to an associated ETA, if according to the ETA of the structural member a connection in load bearing timber structures with screws according to an ETA is allowed.

A minimum of two screws should be used for connections in load bearing timber structures.

The minimum penetration depth in structural members made of solid, glued or cross-laminated timber is 4·d.

Wood-based panels and steel plates should only be arranged on the side of the screw head. The minimum thickness of wood-based panels should be 1,2·d. Furthermore, the minimum thickness for following wood-based panels should be:

- Plywood, Fibreboards: 6 mm
- Particleboards, OSB, Cement Particleboards: 8 mm
- Solid wood panels: 12 mm

For structural members according to ETA's the terms of the ETA's must be considered.

If screws with an outer thread diameter d = 8 mm are used in load bearing timber structures, the structural solid or glued laminated timber, laminated veneer lumber and similar glued members must be from spruce, pine or fir. This does not apply for screws in pre-drilled holes.

The screws shall be driven into the wood without predrilling or after pre-drilling with a diameter equal or less than the inner thread diameter.

The hole diameter in steel members must be predrilled with a suitable diameter.

Only the equipment prescribed by IPEX Group shall be used for driving the screws.

For structural timber members, minimum spacing and distances for screws are given in EN 1995-1-1 (Eurocode 5) clause 8.3.1.2 and table 8.2 as for nails in predrilled or non-predrilled holes, respectively. Here, the outer thread diameter d must be considered.

For Douglas fir members minimum spacing and distances parallel to the grain shall be increased by 50%.

Minimum distances from the unloaded edge perpendicular to the grain may be reduced to 3·d, if the spacing parallel to the grain and the end distance is at least 25·d.

Unless specified otherwise in the technical specification (ETA or hEN) of cross laminated timber, minimum distances and spacing for screws in the wide face of cross laminated timber members with a minimum thickness t = 10·d may be taken as (see Annex B):

Spacing a_1 parallel to the grain	$a_1 = 4 \cdot d$
Spacing a_2 perpendicular to the grain	$a_2 = 2{,}5 \cdot d$
Distance $a_{3,c}$ from centre of the screw-part in timber to the unloaded end grain	$a_{3,c} = 6 \cdot d$
Distance $a_{3,t}$ from centre of the screw-part in timber to the loaded end grain	$a_{3,t} = 6 \cdot d$
Distance $a_{4,c}$ from centre of the screw-part in timber to the unloaded edge	$a_{4,c} = 2{,}5 \cdot d$
Distance $a_{4,t}$ from centre of the screw-part in timber to the loaded edge	$a_{4,t} = 6 \cdot d$

Unless specified otherwise in the technical specification (ETA or hEN) of cross laminated timber, minimum distances and spacing for screws in the edge surface of cross laminated timber members with a minimum thickness t = 10·d and a minimum penetration depth perpendicular to the edge surface of 10·d may be taken as (see Annex B):

Spacing a_1 parallel to the CLT plane	$a_1 = 10 \cdot d$
Spacing a_2 perpendicular to the CLT plane	$a_2 = 4 \cdot d$
Distance $a_{3,c}$ from centre of the screw-part in timber to the unloaded end	$a_{3,c} = 7 \cdot d$
Distance $a_{3,t}$ from centre of the screw-part in timber to the loaded end	$a_{3,t} = 12 \cdot d$
Distance $a_{4,c}$ from centre of the screw-part in timber to the unloaded edge	$a_{4,c} = 3 \cdot d$
Distance $a_{4,t}$ from centre of the screw-part in timber to the loaded edge	$a_{4,t} = 6 \cdot d$

Minimum thickness for structural members is t = 30 mm for screws with outer thread diameter d = 8 mm.

4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 97/176/EC of the European Commission1, as amended, the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) is 3.

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

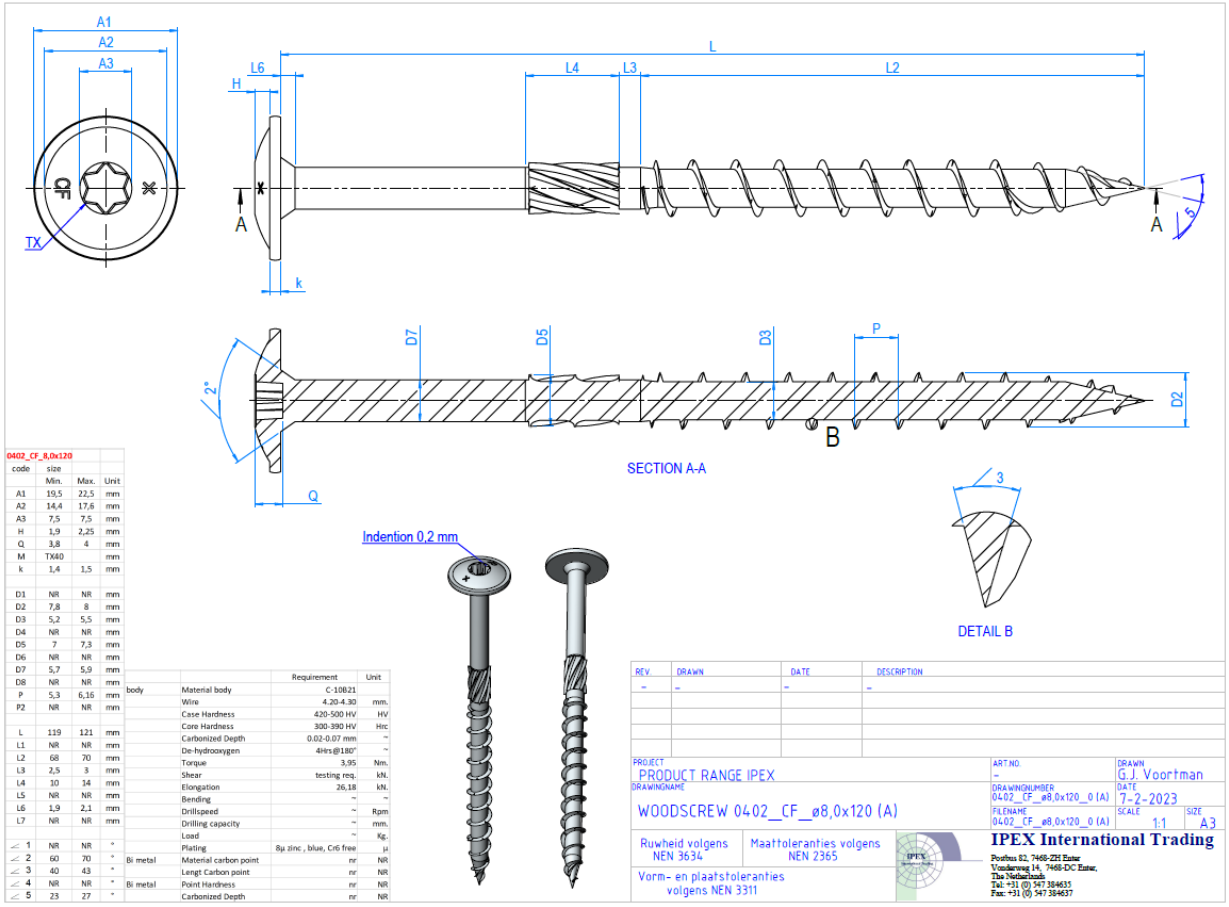
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA Danmark prior to CE marking.

Issued in Copenhagen on 2023-05-26 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A

Drawings of IPEX screws



0402_CF_8,0x120			
code	size		
	Min.	Max.	Unit
A1	19,5	22,5	mm
A2	14,4	17,6	mm
A3	7,5	7,5	mm
H	1,9	2,25	mm
Q	3,8	4	mm
M	TX40		mm
k	1,4	1,5	mm
D1	NR	NR	mm
D2	7,8	8	mm
D3	5,2	5,5	mm
D4	NR	NR	mm
D5	7	7,3	mm
D6	NR	NR	mm
D7	5,7	5,9	mm
D8	NR	NR	mm
P	5,3	6,16	mm
P2	NR	NR	mm
L	119	121	mm
L1	NR	NR	mm
L2	68	70	mm
L3	2,5	3	mm
L4	10	14	mm
L5	NR	NR	mm
L6	1,9	2,1	mm
L7	NR	NR	mm
∠ 1	NR	NR	°
∠ 2	60	70	°
∠ 3	40	43	°
∠ 4	NR	NR	°
∠ 5	23	27	°

		Requirement	Unit
body	Material body	C-10B21	
	Wire	4.20-4.30	mm.
	Case Hardness	420-500 HV	HV
	Core Hardness	300-390 HV	Hrc
	Carbonized Depth	0.02-0.07 mm	~
	De-hydrooxygen	4Hrs@180°	~
	Torque	3,95	Nm.
	Shear	testing req.	kN.
	Elongation	26,18	kN.
	Bending	~	~
	Drillspeed	~	Rpm
	Drilling capacity	~	mm.
	Load	~	Kg.
	Plating	8µ zinc , blue, Cr6 free	µ
Bi metal	Material carbon point	nr	NR
	Lengt Carbon point	nr	NR
Bi metal	Point Hardness	nr	NR
	Carbonized Depth	nr	NR

REV.	DRAWN	DATE	DESCRIPTION
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DRAWN: G.J. Voortman
DATE: 7-2-2023
SCALE: 1:1
SIZE: A3

Ruwheid volgens NEN 3634 | Maattoleranties volgens NEN 2365 | Vorm- en plaatstoleranties volgens NEN 3311

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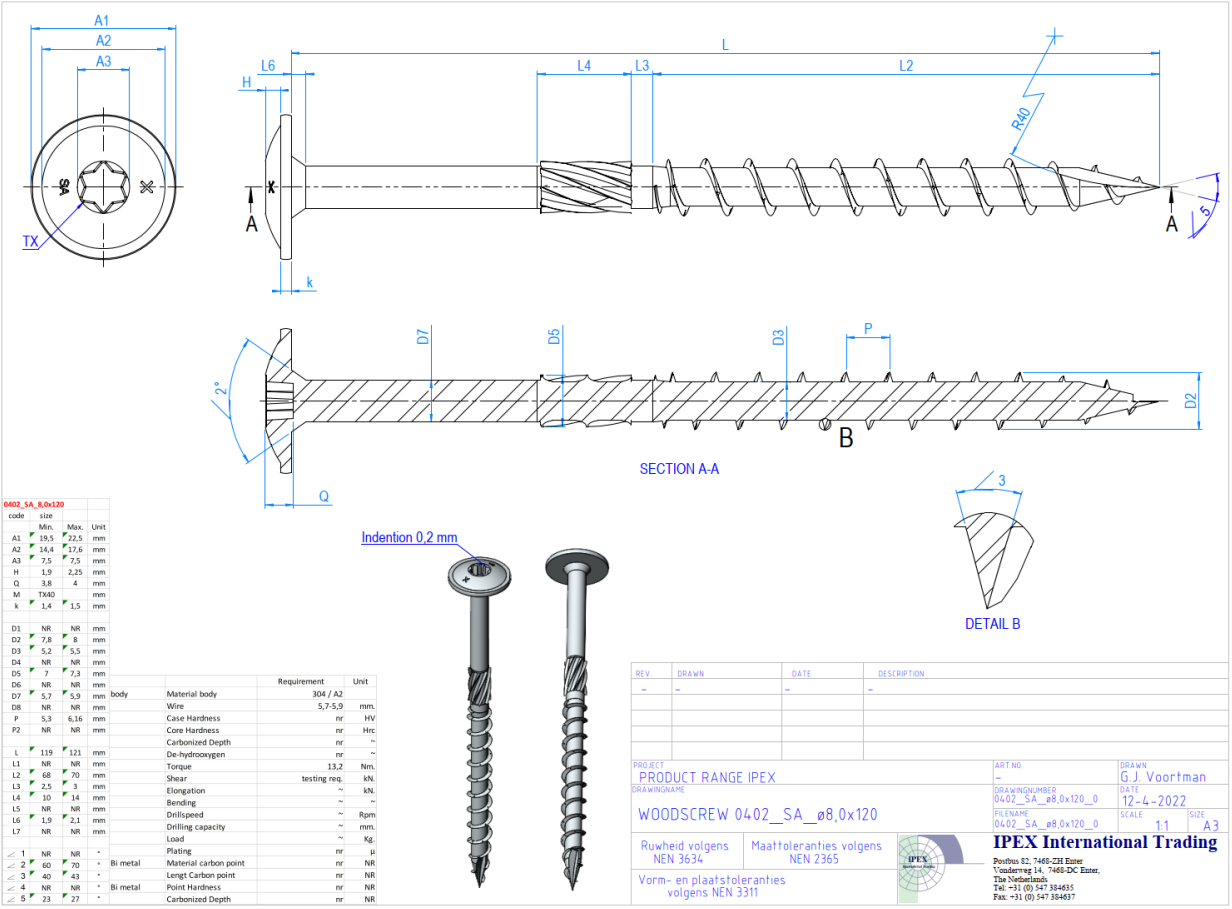

0402_SA_8,0x120			
code	size		
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Q	3,8	4	mm
M	TX40		mm
k	1,4	1,5	mm
D1	NR	NR	mm
D2	7,8	8	mm
D3	5,2	5,5	mm
D4	NR	NR	mm
D5	7	7,3	mm
D6	NR	NR	mm
D7	5,7	5,9	mm
D8	NR	NR	mm
P	5,3	6,16	mm
P2	NR	NR	mm
L	119	121	mm
L1	NR	NR	mm
L2	68	70	mm
L3	2,5	3	mm
L4	10	14	mm
L5	NR	NR	mm
L6	1,9	2,1	mm
L7	NR	NR	mm
∠ 1	NR	NR	°
∠ 2	60	70	°
∠ 3	40	43	°
∠ 4	NR	NR	°
∠ 5	23	27	°

		Requirement	Unit
body	Material body	304 / A2	
	Wire	5,7-5,9	mm.
	Case Hardness	nr	HV
	Core Hardness	nr	Hrc
	Carbonized Depth	nr	~
	De-hydrooxygen	nr	~
	Torque	13,2	Nm.
	Shear	testing req.	kN.
	Elongation	~	kN.
	Bending	~	~
	Drillspeed	~	Rpm
	Drilling capacity	~	mm.
	Load	~	Kg.
	Plating	nr	µ
Bi metal	Material carbon point	nr	NR
	Lengt Carbon point	nr	NR
Bi metal	Point Hardness	nr	NR
	Carbonized Depth	nr	NR

REV.	DRAWN	DATE	DESCRIPTION
-	-	-	-

PROJECT: PRODUCT RANGE IPEX
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DRAWN: G.J. Voortman
DATE: 12-4-2022
SCALE: 1:1
SIZE: A3

Ruwheid volgens NEN 3634 | Maattoleranties volgens NEN 2365 | Vorm- en plaatstoleranties volgens NEN 3311

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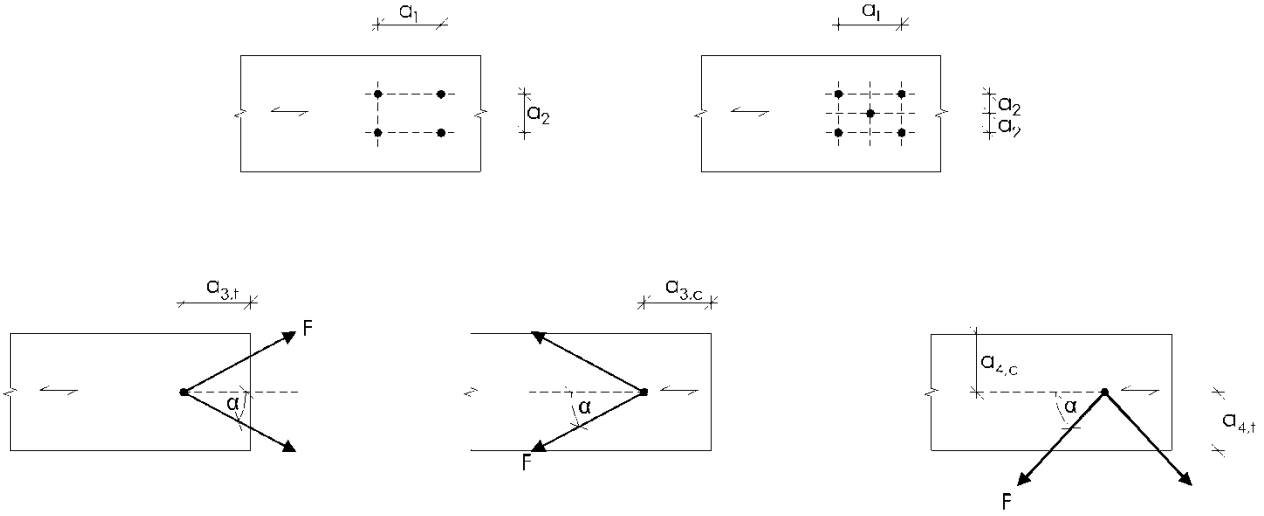
Annex B

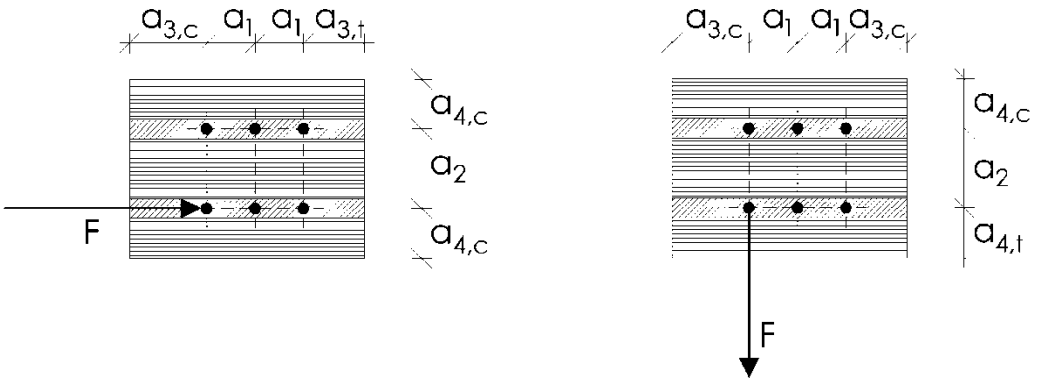
Minimum distances and spacing

Axially or laterally loaded screws in the plane or edge surface of cross laminated timber

Definition of spacing, end and edge distances in the plane surface unless otherwise specified in the technical specification (ETA or hEN) for the cross laminated timber:



Definition of spacing, end and edge distances in the edge surface unless otherwise specified in the technical specification (ETA or hEN) for the cross laminated timber:



For screws in the edge surface, a_1 and a_3 are parallel to the CLT plane face, a_2 and a_4 perpendicular to CLT plane face.