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European Technical Assessment ETA-12/0481 of 2019/02/04

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:

RAMPA A, B, BL, BV, C, CV, SK, SK330, SKL and SKL330 inserts

Product family to which the above construction product belongs:

Inserts for use in timber constructions

Manufacturer:

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This European Technical Assessment contains:

17 pages including 2 annexes which form an integral part of the document

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This version replaces:

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product and intended use

Technical description of the product

RAMPAA, B, BL, BV, C, CV, SK, SK330, SKL and SKL330 inserts are inserts to be used in timber structures. RAMPAA, B, BL, BV, C and CV inserts shall be threaded over the full length, RAMPAA SK, SK330, SKL and SKL330 shall be threaded over a part of the length. The inserts are produced from carbon steel No. 1.0301 according to EN 10277-2, No. 1.0718 according to EN 10277-3 or stainless-steel No.1.4571 according to EN 10088-3, No. 1.4305 or 1.4404 according to EN 10088-5. 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 , shall not be less than 8,0 mm and shall not be greater than 30,0 mm. The overall length, L , of inserts shall not be less than 10 mm and shall not be greater than 100 mm. Other dimensions are given in Annex A.

The ratio of inner thread diameter to outer thread diameter d_1/D ranges from 0,75 to 0,86.

The inserts are threaded over a minimum length ℓ_g of $1,2 \cdot D$ (i.e. $\ell_g \geq 1,2 \cdot d$).

The lead p (distance between two adjacent thread flanks) ranges from $0,07 \cdot d$ to $0,35 \cdot d$.

Intended use

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

The following wood-based materials may be located on the side of the inserts:

- Solid timber according to EN 338
- Glued laminated timber according to EN 14080
- Cross-laminated timber according to European Technical Assessment or national provisions that apply at the installation site
- Plywood according to EN 636 or European Technical Assessment or national provisions that apply at the installation site
- Particleboard according to EN 312 or European Technical Assessment or national provisions that

apply at the installation site (minimum density 640 kg/m³)

- Oriented Strand Board according to EN 300 or European Technical Assessment or national provisions that apply at the installation site (minimum density 550 kg/m³)
- Solid wood panels according to EN 13353 and cross laminated timber according to European Technical Assessment or national provisions that apply at the installation site
- Laminated Veneer Lumber according to EN 14374 or European Technical Assessment
- Engineered wood products according to European Technical Assessment, provided that the ETA for the product provides provisions for the use of inserts and these provisions are applied.

Steel plates, fibreboard and cement bonded particleboard shall only be located on the side of the metric bolt acting as screw head.

The inserts shall be driven into the wood after pre-drilling with a diameter given in Annex A.

The inserts are intended to be used in timber connections for which requirements for mechanical resistance and stability and safety in use in the sense of Basic Works Requirements 1 and 4 of EU Regulation EU (EU) 305/2011 shall be fulfilled.

The design of the connections shall be based on the characteristic load-carrying capacities of the inserts. The design capacities shall be derived from the characteristic capacities in accordance with Eurocode 5 or an appropriate national code.

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

The scope of the inserts regarding resistance to corrosion shall be defined according to national provisions that apply at the installation site considering environmental conditions. Section 2.7 of this ETA contains the corrosion protection for RAMPAA, B, BL, BV, C, CV, SK, SK330, SKL and SKL330 inserts made from carbon steel and the material number of the stainless steel.

Assumed working life

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

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

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Tensile strength	Characteristic value $f_{\text{tens},k}$:
RAMPA inserts A, B, BL and BV	D = 10 mm: $f_{\text{tens},k} = 10$ kN D = 12 mm: $f_{\text{tens},k} = 14$ kN D = 13 mm: $f_{\text{tens},k} = 15$ kN D = 14 mm: $f_{\text{tens},k} = 18$ kN D = 16 mm: $f_{\text{tens},k} = 25$ kN D = 18,5 mm: $f_{\text{tens},k} = 35$ kN D = 22 mm: $f_{\text{tens},k} = 40$ kN D = 25 mm: $f_{\text{tens},k} = 45$ kN D = 30 mm: $f_{\text{tens},k} = 70$ kN
RAMPA inserts C and CV	D = 8 mm: $f_{\text{tens},k} = 3,5$ kN D = 9,3 mm: $f_{\text{tens},k} = 5,5$ kN D = 10 mm: $f_{\text{tens},k} = 6,0$ kN D = 12 mm: $f_{\text{tens},k} = 8,0$ kN D = 14 mm: $f_{\text{tens},k} = 10$ kN D = 16 mm: $f_{\text{tens},k} = 14$ kN
RAMPA inserts SK and SK330	D = 8 mm: $f_{\text{tens},k} = 8$ kN D = 10 mm: $f_{\text{tens},k} = 10$ kN D = 12 mm: $f_{\text{tens},k} = 17$ kN D = 14 mm: $f_{\text{tens},k} = 21$ kN D = 16 mm: $f_{\text{tens},k} = 37$ kN D = 18,5 mm: $f_{\text{tens},k} = 44$ kN D = 22 mm: $f_{\text{tens},k} = 68$ kN
RAMPA inserts SKL and SKL330	D = 12 mm: $f_{\text{tens},k} = 14$ kN D = 16 mm: $f_{\text{tens},k} = 29$ kN D = 18,5 mm: $f_{\text{tens},k} = 39$ kN D = 22 mm: $f_{\text{tens},k} = 62$ kN D = 25 mm: $f_{\text{tens},k} = 65$ kN
3.2 Safety in case of fire (BWR2)	
Reaction to fire	The screws are made from steel classified as performance class A1 of the characteristic reaction to fire, in accordance with the provisions of EC decision 96/603/EC, amended by EC Decision 2000/605/EC.
3.7 Sustainable use of natural resources (BWR7)	No Performance Assessed
3.8 General aspects related to the performance of the product	The inserts 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, 2 and 3
Identification	See Annex A

*) See additional information in section 3.9 – 3.11.

3.9 Mechanical resistance and stability

The load-carrying capacities for RAMPA inserts 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 RAMPA inserts should be used for designs in accordance with Eurocode 5 or an appropriate national code.

In case of axial loading, the point side penetration depth of the tip of the insert must be:

$$l_{ef} \geq \min \begin{cases} 10 \cdot D \\ \frac{3 \cdot D}{\sin \alpha} \end{cases}$$

where D is the outer thread diameter of the insert and α is the angle between insert axis and grain direction.

In case of lateral loading, the ratio $L / D \geq 3$ is to be regarded for solid timber, glulam, CLT or LVL and $L / D \geq 1.2$ for other wood-based panels (D is the outer thread diameter and L is the length of the insert) and the inserts must be flush with the surface of the member.

European Technical Assessments for structural members or wood-based panels must be considered where applicable.

Lateral load-carrying capacity

The characteristic lateral load-carrying capacity of RAMPA inserts shall be calculated according to EN 1995-1-1:2010 (Eurocode 5) using the outer thread diameter D as the nominal diameter of the insert. The contribution from the rope effect may be considered where appropriate. If the insert is not flush with the member surface but counter-sunk, the embedding strength may only be assumed along the length of the insert.

The characteristic yield moment shall be calculated from:

RAMPA inserts A, B, BL and BV

Insert D =10,0 mm:	$M_{y,k} = 9 \text{ Nm}$
Insert D =12,0 mm:	$M_{y,k} = 16 \text{ Nm}$
Insert D =13,0 mm:	$M_{y,k} = 16 \text{ Nm}$
Insert D =14,0 mm:	$M_{y,k} = 26 \text{ Nm}$
Insert D =16,0 mm:	$M_{y,k} = 38 \text{ Nm}$
Insert D =18,5 mm:	$M_{y,k} = 65 \text{ Nm}$
Insert D =22,0 mm:	$M_{y,k} = 100 \text{ Nm}$
Insert D =25,0 mm:	$M_{y,k} = 120 \text{ Nm}$
Insert D =30,0 mm:	$M_{y,k} = 240 \text{ Nm}$

RAMPA inserts C and CV

Insert D =8,0 mm:	$M_{y,k} = 3 \text{ Nm}$
Insert D =9,3 mm:	$M_{y,k} = 5 \text{ Nm}$

Insert D =10,0 mm:	$M_{y,k} = 6 \text{ Nm}$
Insert D =12,0 mm:	$M_{y,k} = 11 \text{ Nm}$
Insert D =14,0 mm:	$M_{y,k} = 16 \text{ Nm}$
Insert D =16,0 mm:	$M_{y,k} = 23 \text{ Nm}$

RAMPA inserts SK and SK330

Insert D =8,0 mm:	$M_{y,k} = 6,5 \text{ Nm}$
Insert D =10,0 mm:	$M_{y,k} = 9 \text{ Nm}$
Insert D =12,0 mm:	$M_{y,k} = 20 \text{ Nm}$
Insert D =14,0 mm:	$M_{y,k} = 32 \text{ Nm}$
Insert D =16,0 mm:	$M_{y,k} = 62 \text{ Nm}$
Insert D =18,5 mm:	$M_{y,k} = 86 \text{ Nm}$
Insert D =22,0 mm:	$M_{y,k} = 160 \text{ Nm}$

RAMPA inserts SKL and SKL330

Insert D =12,0 mm:	$M_{y,k} = 16 \text{ Nm}$
Insert D =16,0 mm:	$M_{y,k} = 45 \text{ Nm}$
Insert D =18,5 mm:	$M_{y,k} = 75 \text{ Nm}$
Insert D =22,0 mm:	$M_{y,k} = 140 \text{ Nm}$
Insert D =25,0 mm:	$M_{y,k} = 185 \text{ Nm}$

The embedding strength for inserts in pre-drilled holes arranged at an angle between insert axis and grain direction, $0^\circ \leq \alpha \leq 90^\circ$ is:

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

Where

ρ_k characteristic timber density [kg/m^3], hardwood with a maximum characteristic density of 590 kg/m^3 ;

D outer thread diameter [mm];

α angle between insert axis and grain direction.

Alternatively, the embedding strength for inserts arranged parallel to the plane of cross laminated timber (layers of softwood), independent of the angle between screw axis and grain direction, $0^\circ \leq \alpha \leq 90^\circ$, may be calculated from:

$$f_{h,k} = 20 \cdot D^{-0,5} \quad [\text{N/mm}^2]$$

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 inserts 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 component shall be

perpendicular to the insert axis and parallel to the wide face of the cross laminated timber.

Axial withdrawal capacity

The characteristic axial withdrawal capacity of RAMPA inserts in solid timber, glued laminated timber, cross-laminated timber, or laminated veneer lumber members at an angle of $0^\circ \leq \alpha \leq 90^\circ$ to the grain and in SWP or plywood at an angle of 90° to the panel plane shall be calculated according to EN 1995-1-1:2008 from:

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

The characteristic axial withdrawal capacity of RAMPA inserts in OSB, particleboard or MDF at an angle of 90° to the panel plane shall be calculated according to EN 1995-1-1:2008 from:

$$F_{ax,\alpha,Rk} = n_{ef} \cdot f_{ax,k} \cdot D \cdot \ell_{ef} \quad [N]$$

Where

$F_{ax,\alpha,Rk}$	characteristic withdrawal capacity of the inserts at an angle α to the grain [N]
n_{ef}	effective number of inserts according to EN 1995-1-1:2008
k_{ax}	$k_{ax} = 1$ for $45^\circ \leq \alpha \leq 90^\circ$ $k_{ax} = 0,3 + \frac{0,7 \cdot \alpha}{45^\circ}$ for $0^\circ \leq \alpha < 45^\circ$
$f_{ax,k}$	Characteristic withdrawal parameter For softwood timber, glulam, CLT and LVL: LVL: $f_{ax,k} = 9 \text{ N/mm}^2$ For hardwood timber, glulam, CLT and LVL: LVL: $f_{ax,k} = 13 \text{ N/mm}^2$ For SWP: $f_{ax,k} = 7 \text{ N/mm}^2$ For plywood or MDF: $f_{ax,k} = 5 \text{ N/mm}^2$ For OSB: $f_{ax,k} = 7 \text{ N/mm}^2$ For particleboard $f_{ax,k} = 6 \text{ N/mm}^2$
D	outer thread diameter [mm]
ℓ_{ef}	Penetration length of the threaded part according to EN 1995-1-1:2008 [mm]
α	Angle between grain and insert axis
ρ_k	Characteristic density [kg/m^3]

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

The axial withdrawal capacity for inserts arranged parallel to the plane of laminated veneer lumber shall be reduced by 20 %.

The axial withdrawal capacity is limited by the head pull-through capacity of the metric bolt or washer and the tensile capacity of the insert.

The axial slip modulus K_{ser} of the threaded part of an

insert for the serviceability limit state should be taken independent of angle α to the grain as:

$$K_{ser} = 25 \cdot D \cdot \ell_{ef} \quad [N/mm] \quad \text{for inserts in softwood}$$

$$K_{ser} = 30 \cdot D \cdot \ell_{ef} \quad [N/mm] \quad \text{for inserts in hardwood}$$

Where

D	outer thread diameter [mm]
ℓ_{ef}	penetration length in the timber member [mm]

Tensile capacity

The characteristic tensile strength $f_{tens,k}$ of RAMPA inserts is:

RAMPA inserts A, B, BL and BV

$D = 10,0 \text{ mm}$:	$f_{tens,k} = 10 \text{ kN}$
$D = 12,0 \text{ mm}$:	$f_{tens,k} = 14 \text{ kN}$
$D = 13,0 \text{ mm}$:	$f_{tens,k} = 15 \text{ kN}$
$D = 14,0 \text{ mm}$:	$f_{tens,k} = 18 \text{ kN}$
$D = 16,0 \text{ mm}$:	$f_{tens,k} = 25 \text{ kN}$
$D = 18,5 \text{ mm}$:	$f_{tens,k} = 35 \text{ kN}$
$D = 22,0 \text{ mm}$:	$f_{tens,k} = 40 \text{ kN}$
$D = 25,0 \text{ mm}$:	$f_{tens,k} = 45 \text{ kN}$
$D = 30,0 \text{ mm}$:	$f_{tens,k} = 70 \text{ kN}$

RAMPA inserts C and CV

$D = 8,0 \text{ mm}$:	$f_{tens,k} = 3,5 \text{ kN}$
$D = 9,3 \text{ mm}$:	$f_{tens,k} = 5,5 \text{ kN}$
$D = 10,0 \text{ mm}$:	$f_{tens,k} = 6,0 \text{ kN}$
$D = 12,0 \text{ mm}$:	$f_{tens,k} = 8,0 \text{ kN}$
$D = 14,0 \text{ mm}$:	$f_{tens,k} = 10 \text{ kN}$
$D = 16,0 \text{ mm}$:	$f_{tens,k} = 14 \text{ kN}$

RAMPA inserts SK and SK330

$D = 8,0 \text{ mm}$:	$f_{tens,k} = 8,0 \text{ kN}$
$D = 10,0 \text{ mm}$:	$f_{tens,k} = 10 \text{ kN}$
$D = 12,0 \text{ mm}$:	$f_{tens,k} = 17 \text{ kN}$
$D = 14,0 \text{ mm}$:	$f_{tens,k} = 21 \text{ kN}$
$D = 16,0 \text{ mm}$:	$f_{tens,k} = 37 \text{ kN}$
$D = 18,5 \text{ mm}$:	$f_{tens,k} = 44 \text{ kN}$
$D = 22,0 \text{ mm}$:	$f_{tens,k} = 68 \text{ kN}$

RAMPA inserts SKL and SKL330

$D = 12,0 \text{ mm}$:	$f_{tens,k} = 14 \text{ kN}$
$D = 16,0 \text{ mm}$:	$f_{tens,k} = 29 \text{ kN}$
$D = 18,5 \text{ mm}$:	$f_{tens,k} = 39 \text{ kN}$
$D = 22,0 \text{ mm}$:	$f_{tens,k} = 62 \text{ kN}$
$D = 25,0 \text{ mm}$:	$f_{tens,k} = 55 \text{ kN}$

The characteristic tensile capacity of RAMPA inserts shall be calculated according to EN 1995-1-1:2008 from:

$$F_{tens,Rk} = n_{ef} \cdot \min\{f_{tens,k} ; 0,9 \cdot f_{ub} \cdot A_s\} \quad [N]$$

Where

$F_{\text{tens,RK}}$	Characteristic tensile capacity of the inserts [N]
n_{ef}	Effective number of inserts according to EN 1995-1-1:2008
$f_{\text{tens,k}}$	Characteristic tensile strength of a RAMPA insert [N]
f_{ub}	Characteristic tensile strength of the metric bolt inserted in the RAMPA insert [N/mm ²]
A_s	Tensile stress area of the bolt [mm ²]

Note: The values for the characteristic tensile strength and tensile stress area of the metric bolt depend on the metric bolt used in the specific application and therefore the characteristic tensile capacity of RAMPA inserts with metric bolts will be calculated on a case by case basis depending on the metric bolt used.

Combined laterally and axially loaded inserts

For connections subjected to a combination of axial and lateral load, the following expression should be satisfied:

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

where

$F_{\text{ax,Ed}}$	axial design load of the insert
$F_{\text{v,Ed}}$	lateral design load of the insert
$F_{\text{ax,Rd}}$	design load-carrying capacity of an axially loaded insert
$F_{\text{v,Rd}}$	design load-carrying capacity of a laterally loaded insert

3.10 General aspects related to the intended use of the product

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

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

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

For structural members according to European Technical Assessments the terms of the European Technical Assessments must be considered.

The inserts shall be driven into the wood after pre-drilling with a diameter given in Annex A.

Only the equipment prescribed by Hans Brüggemann GmbH & Co. shall be used for driving the inserts.

For structural timber members, minimum spacing and distances for inserts in predrilled holes are given in EN 1995-1-1:2008 (Eurocode 5) clause 8.3.1.2 and table 8.2 as for nails in predrilled holes. Here, the outer thread diameter D must be considered.

Minimum distances and spacing for inserts in the plane surface of cross laminated timber members with a minimum thickness $t = 10 \cdot d$ 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 insert-part in timber to the unloaded end grain	$a_{3,c} = 6 \cdot D$
Distance $a_{3,t}$ from centre of the insert-part in timber to the loaded end grain	$a_{3,t} = 6 \cdot D$
Distance $a_{4,c}$ from centre of the insert-part in timber to the unloaded edge	$a_{4,c} = 2,5 \cdot D$
Distance $a_{4,t}$ from centre of the insert-part in timber to the loaded edge	$a_{4,t} = 6 \cdot D$

Minimum distances and spacing for inserts in the edge surface of cross laminated timber members with a minimum thickness $t = 10 \cdot d$ and a minimum penetration depth perpendicular to the edge surface 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 insert-part in timber to the unloaded end	$a_{3,c} = 7 \cdot D$
Distance $a_{3,t}$ from centre of the insert-part in timber to the loaded end	$a_{3,t} = 12 \cdot D$
Distance $a_{4,c}$ from centre of the insert-part in timber to the unloaded edge	$a_{4,c} = 3 \cdot D$
Distance $a_{4,t}$ from centre of the insert-part in timber to the loaded edge	$a_{4,t} = 6 \cdot D$

Minimum distances and spacing for RAMPA inserts in cross laminated timber are given in Annex B.

For exclusively axially loaded inserts in softwood or hardwood members, the distance $a_{4,c}$ to the unloaded edge may be reduced to $1,5 \cdot D$.

3.11 Aspects related to the performance of the product

3.11.1 Corrosion protection in service class 1, 2 and 3.
The RAMPA inserts are produced from carbon steel wire No. 1.0301 according to EN 10277-2 or No. 1.0718 according to EN 10277-3. They are brass-plated, nickel-plated bronze finished or electro-galvanised. The mean thickness of the zinc coating is 5µm.

Steel No. 1.4571 according to EN 10088-3, No. 1.4305 or 1.4404 according to EN 10088-5 is used for screws made from stainless steel.

4 Attestation and verification of constancy of performance (AVCP)

4.1 AVCP system

According to the decision 97/638/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 2+.

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 2019-02-04 by



Thomas Bruun
Managing Director, ETA-Danmark

Annex A

Drawings of RAMPA inserts

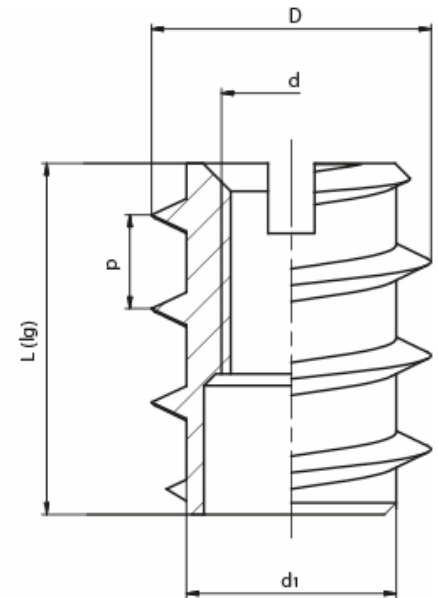
Pre-drilling for softwood: timber, glulam, CLT and LVL= core diameter (d1)

Pre-drilling for hardwood: timber, glulam, CLT and LVL = core diameter (d1) + max. 0.5 mm larger

Pre-drilling for plywood, particleboard, OSB, SWP = core diameter (d1) + max. 0.5 mm larger

Table A.1: RAMPA inserts **Type A**

Artikelnummer	D	L	lg	d	d1	p
001 514 6	10	14	14	M5	7,5	3,5
001 515 6	10	15	15	M5	7,5	3,5
001 518 6	10	18	18	M5	7,5	3,5
001 520 6	10	20	20	M5	7,5	3,5
001 540 6	10	40	40	M5	7,5	3,5
001 618 6	12	18	18	M6	9	4
001 620 6	12	20	20	M6	9	4
001 625 6	12	25	25	M6	9	4
001 630 6	12	30	30	M6	9	4
001 858 6	14	18	18	M8	11	4
001 823 6	16	23	23	M8	12	5
001 830 6	16	30	30	M8	12	5
001 125 6	18,5	25	25	M10	14,5	5
001 130 6	18,5	30	30	M10	14,5	5
001 140 6	18,5	40	40	M10	14,5	5
001 230 6	22	30	30	M12	18	5
001 235 6	22	35	35	M12	18	5
001 652 6	25	30	30	M16	20	5
001 653 6	25	35	35	M16	20	5
001 940 6	30	40	40	M20	25	5

Table A.2: RAMPA inserts **Type B**

Artikelnummer	D	L	lg	d	d1	p
002 514 6	10	14	14	M5	7,5	3,5
002 618 6	12	18	18	M6	9	4
002 620 6	12	20	20	M6	9	4
002 624 6	12	24	24	M6	9	4
002 838 6	13	18	18	M8	10	3
002 840 6	13	20	20	M8	10	3
002 845 6	13	25	25	M8	10	3
002 858 6	14	18	18	M8	11	4
002 860 6	14	20	20	M8	11	4
002 823 6	16	23	23	M8	12	5
002 830 6	16	30	30	M8	12	5
002 839 6	16	40	40	M8	12	5
002 125 6	18,5	25	25	M10	14,5	5
002 130 6	18,5	30	30	M10	14,5	5
002 230 6	22	30	30	M12	18	5
002 955 6	22	30	30	M14	18	5
002 652 6	25	30	30	M16	20	5

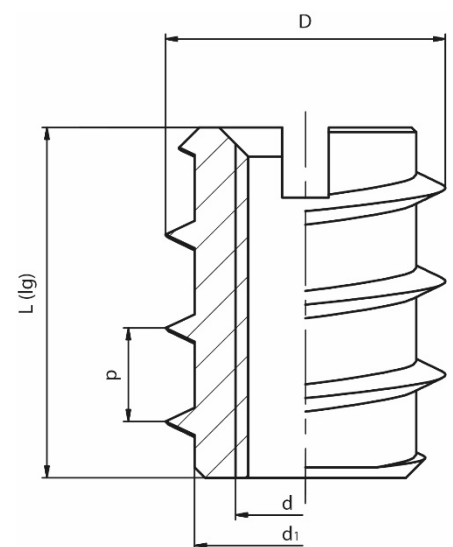


Table A.3: RAMPA inserts **Type BL**

Artikelnummer	D	L	lg	d	d1	p
004 512 6	10	12	12	M5	7,5	3
004 515 6	10	15	15	M5	7,5	3
004 518 6	10	18	18	M5	7,5	3
004 520 6	10	20	20	M5	7,5	3
004 525 6	10	25	25	M5	7,5	3
004 530 6	10	30	30	M5	7,5	3
004 618 6	12	18	18	M6	9	4
004 620 6	12	20	20	M6	9	4
004 630 6	12	30	30	M6	9	4
004 635 6	12	35	35	M6	9	4
004 640 6	12	40	40	M6	9	4
004 650 6	12	50	50	M6	9	4
004 660 6	12	60	60	M6	9	4
004 680 6	12	80	80	M6	9	4
004 820 6	16	20	20	M8	12	5
004 825 6	16	25	25	M8	12	5
004 830 6	16	30	30	M8	12	5
004 835 6	16	35	35	M8	12	5
004 840 6	16	40	40	M8	12	5
004 850 6	16	50	50	M8	12	5
004 860 6	16	60	60	M8	12	5
004 870 6	16	70	70	M8	12	5
004 880 6	16	80	80	M8	12	5
004 800 6	16	100	100	M8	12	5
004 125 6	18,5	25	25	M10	14,5	5
004 130 6	18,5	30	30	M10	14,5	5
004 140 6	18,5	40	40	M10	14,5	5
004 150 6	18,5	50	50	M10	14,5	5
004 160 6	18,5	60	60	M10	14,5	5
004 170 6	18,5	70	70	M10	14,5	5
004 180 6	18,5	80	80	M10	14,5	5
004 100 6	18,5	100	100	M10	14,5	5
004 230 6	22	30	30	M12	17	5
004 240 6	22	40	40	M12	17	5
004 260 6	22	60	60	M12	17	5
004 280 6	22	80	80	M12	17	5
004 210 6	22	100	100	M12	17	5
004 641 6	25	40	40	M16	20	5
004 661 6	25	60	60	M16	20	5
004 681 6	25	80	80	M16	20	5
004 601 6	25	100	100	M16	20	5

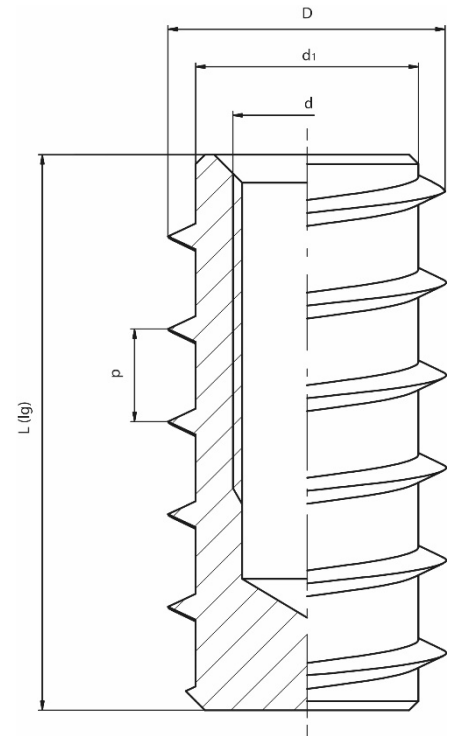


Table A.4: RAMPA inserts **Type BV**

Artikelnummer	D	L	lg	d	d1	p
003 514 6	10	14	14	M5	7,5	3,5
003 802 6	13	18	18	M8	10	3
003 858 6	14	18	18	M8	11	4
003 125 6	18,5	25	25	M10	14,5	5
003 930 6	22	30	30	M12	18	5
003 652 6	25	30	30	M16	20	5

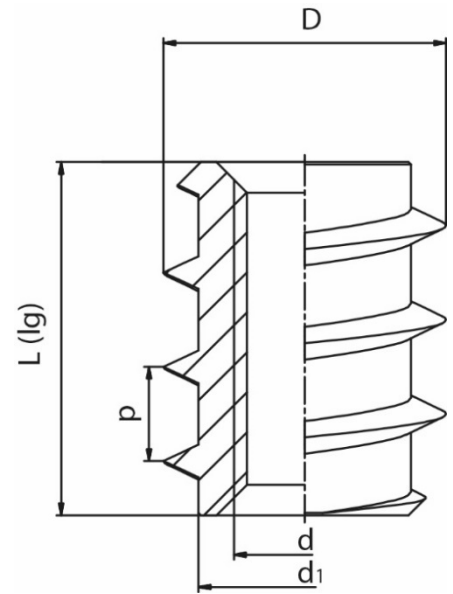


Table A.5: RAMPA inserts **Type C**

Artikelnummer	D	L	lg	d	d1	p
005 510 6	8	10	10	M5	6	2,5
005 512 6	8	12	12	M5	6	2,5
005 515 6	8	15	15	M5	6	2,5
005 632 6	9,3	12	12	M6	7,3	2,5
005 637 6	9,3	17	17	M6	7,3	2,5
005 640 6	9,3	20	20	M6	7,3	2,5
005 614 6	10	14	14	M6	7,5	3,5
005 615 6	10	15	15	M6	7,5	3,5
005 617 6	10	17	17	M6	7,5	3,5
005 618 6	10	18	18	M6	7,5	3,5
005 620 6	10	20	20	M6	7,5	3,5
005 923 6	14	23	23	M10x1	11,5	4
005 158 6	14	18	18	M10	11,5	4
005 160 6	14	20	20	M10	11,5	4
005 163 6	14	23	23	M10	11,5	4
005 123 6	16	23	23	M10	12	5
005 136 6	16	36	36	M10	12	5

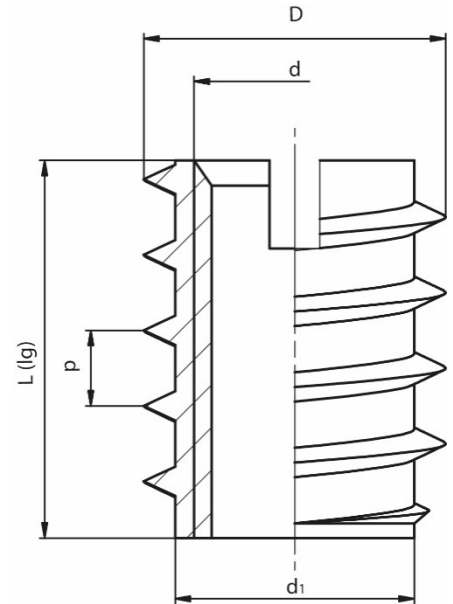
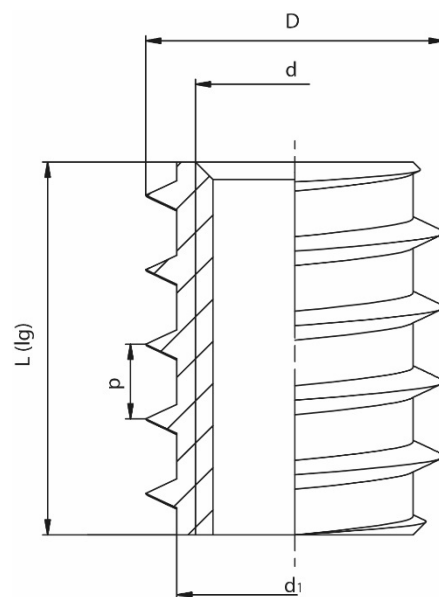


Table A.6: RAMPA inserts **Type CV**

Artikelnummer	D	L	lg	d	d1	p
006 512 6	8	12	12	M5	6	2,5
006 615 6	10	15	15	M6	7,5	3
006 617 6	10	17	17	M6	7,5	3,5
006 618 6	10	18	18	M6	7,5	3,5
006 620 6	10	20	20	M6	7,5	3,5
006 818 6	12	18	18	M8	9,5	3

Table A.7: RAMPA inserts **Type SK**

Artikelnummer	D	L	lg	d	d1	p	a
010 412 6	8	12	10,5	M4	6,5	2	1,5
010 514 6	10	14	12	M5	7,5	3	2
010 618 6	12	18	15	M6	9,5	3	3
010 620 6	12	20	17	M6	9,5	3	3
010 623 6	12	23	20	M6	9,5	3	3
010 625 6	12	25	22	M6	9,5	3	3
010 870 6	14	30	27	M8	11,5	3,5	3
010 823 6	16	23	20	M8	13,5	3,5	3
010 830 6	16	30	27	M8	13,5	3,5	3
010 130 6	18,5	30	27	M10	15,5	4	3
010 140 6	18,5	40	27	M10	15,5	4	3
010 230 6	22	30	26,5	M12	19	4	3,5
010 240 6	22	40	36,5	M12	19	4	3,5

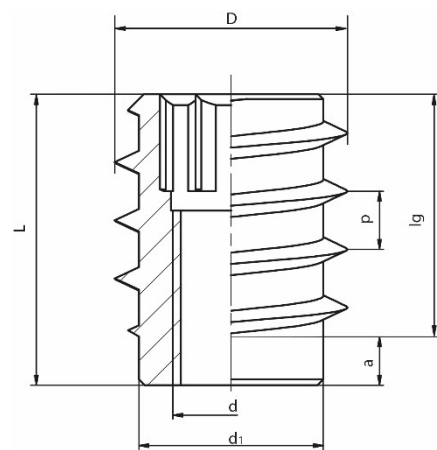
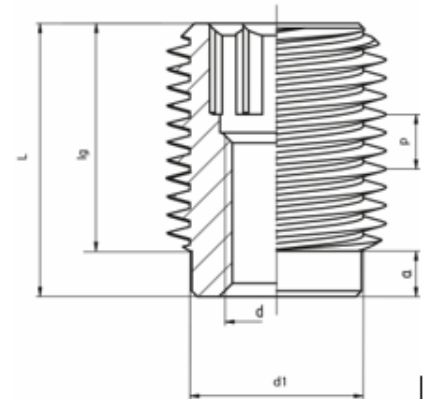


Table A.8: RAMPA inserts **Type SK330**

Artikelnummer	D	L	lg	d	d1	h	a
040 623 6	12	23	20	M6	9,5	6	3
040 625 6	12	25	22	M6	9,5	6	3
040 870 6	14	30	27	M8	11,5	7,5	3

Table A.9: RAMPA inserts **Type SKL**

Artikelnummer	D	L	lg	d	d1	p	a
011 625 6	12	25	22	M6	9	4	3
011 630 6	12	30	27	M6	9	4	3
011 635 6	12	35	32	M6	9	4	3
011 640 6	12	40	37	M6	9	4	3
011 650 6	12	50	47	M6	9	4	3
011 660 6	12	60	57	M6	9	4	3
011 680 6	12	70	67	M6	9	4	3
011 830 6	16	30	27	M8	12,5	5	3
011 840 6	16	40	37	M8	12,5	5	3
011 850 6	16	50	47	M8	12,5	5	3
011 860 6	16	60	57	M8	12,5	5	3
011 870 6	16	70	67	M8	12,5	5	3
011 880 6	16	80	77	M8	12,5	5	3
011 800 6	16	100	97	M8	12,5	5	3
011 130 6	18,5	30	27	M10	15	5	3
011 140 6	18,5	40	37	M10	15	5	3
011 150 6	18,5	50	47	M10	15	5	3
011 160 6	18,5	60	57	M10	15	5	3
011 170 6	18,5	70	67	M10	15	5	3
011 180 6	18,5	80	77	M10	15	5	3
011 100 6	18,5	100	97	M10	15	5	3
011 260 6	22	60	56,5	M12	18,5	5	3,5
011 280 6	22	80	76,5	M12	18,5	5	3,5
011 210 6	22	100	96,5	M12	18,5	5	3,5
011 661 6	25	60	56,5	M16	21,5	5	3,5
011 681 6	25	80	76,5	M16	21,5	5	3,5
011 601 6	25	100	96,5	M16	21,5	5	3,5

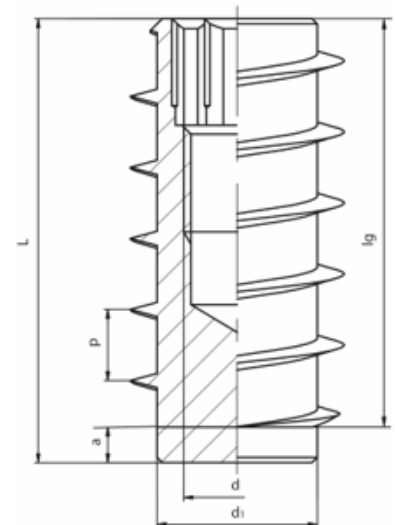
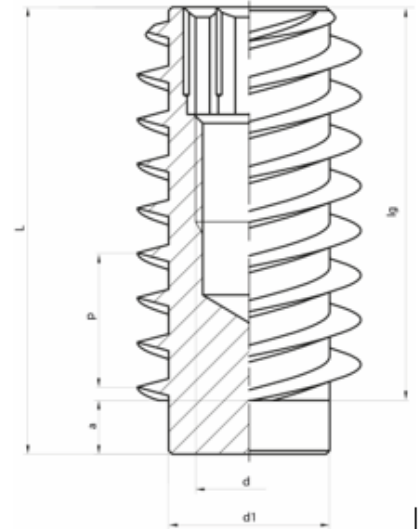


Table A.10: RAMPA inserts **Type SKL330**

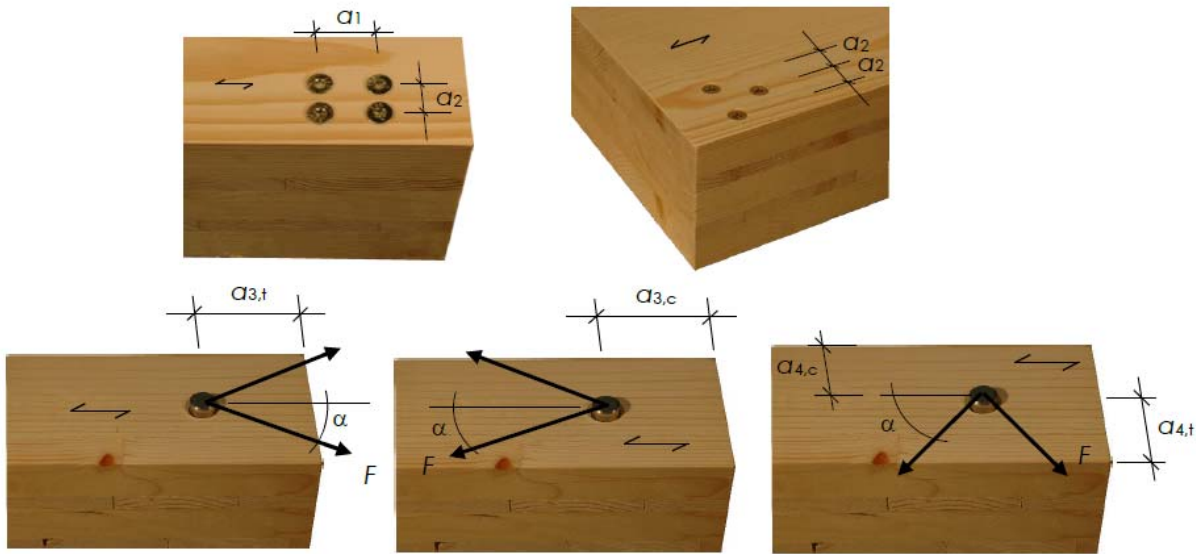
Artikelnummer	D	L	lg	d	d1	p	a
421 625 6	12	25	22	M6	9,5	6	3
421 630 6	12	30	27	M6	9,5	6	3
421 640 6	12	40	37	M6	9,5	6	3
421 650 6	12	50	47	M6	9,5	6	3
421 660 6	12	60	57	M6	9,5	6	3
421 680 6	12	70	67	M6	9,5	6	3
421 830 6	16	30	27	M8	12,5	7,5	3
421 840 6	16	40	37	M8	12,5	7,5	3
421 850 6	16	50	47	M8	12,5	7,5	3
421 860 6	16	60	57	M8	12,5	7,5	3
421 870 6	16	70	67	M8	12,5	7,5	3
421 880 6	16	80	77	M8	12,5	7,5	3
421 800 6	16	100	97	M8	12,5	7,5	3
421 130 6	18,5	30	27	M10	15	7,5	3
421 140 6	18,5	40	37	M10	15	7,5	3
421 150 6	18,5	50	47	M10	15	7,5	3
421 160 6	18,5	60	57	M10	15	7,5	3
421 170 6	18,5	70	67	M10	15	7,5	3
421 180 6	18,5	80	77	M10	15	7,5	3
421 100 6	18,5	100	97	M10	15	7,5	3
421 260 6	22	60	56	M12	18,5	7,5	4
421 280 6	22	80	76	M12	18,5	7,5	4
421 210 6	22	100	96	M12	18,5	7,5	4
421 661 6	25	60	56	M16	21,5	7,5	4
421 681 6	25	80	76	M16	21,5	7,5	4
421 601 6	25	100	96	M16	21,5	7,5	4



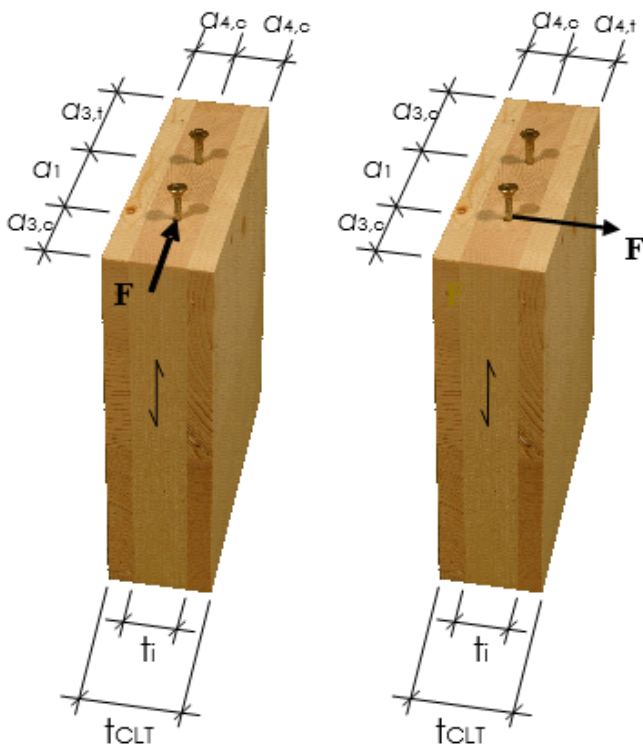
Annex B Minimum distances and spacing

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

Definition of spacing, end and edge distances in the plane surface:



Definition of spacing, end and edge distances in the edge surface:



Minimum spacing, end and edge distances of inserts in the plane or edge surfaces of cross laminated timber

	a_1	a_2	$a_{3,t}$	$a_{3,c}$	$a_{4,t}$	$a_{4,c}$
Plane surface	$4 \cdot d$	$2,5 \cdot d$	$6 \cdot d$	$6 \cdot d$	$6 \cdot d$	$2,5 \cdot d$
Edge surface	$10 \cdot d$	$4 \cdot d$	$12 \cdot d$	$7 \cdot d$	$6 \cdot d$	$3 \cdot d$