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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

MEMBER OF EOTA

European Technical Assessment ETA-12/0481 of 2021/03/22

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, SK30, SK330, SKL and SKL330 inserts
Product family to which the above construction product belongs:	Inserts for use in timber constructions
Manufacturer:	RAMPA® GmbH & Co. KG Auf der Heide 8 DE-21514 Büchen Germany Tel. +49 (0)4155 8141-0 Internet www.rampa.de
Manufacturing plant:	RAMPA® GmbH & Co. KG Auf der Heide 8 DE-21514 Büchen
This European Technical Assessment contains:	29 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 130324-00-0603 “Inserts for use in timber constructions”
This version replaces:	The ETA with the same number issued on 2020-04-02

II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

Technical description of the product
RAMPA A, B, BL, BV, C, CV, SK, SK30, SK330, SKL and SKL330 inserts are inserts to be used in timber structures. RAMPA A, B, BL, BV, C and CV inserts shall be threaded over the full length, RAMPA SK, SK30, 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, 1.0715, 1.0736 and 1.1121 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·D (i.e. $\ell_g \geq 1{,}2 \cdot D$).

The lead p (distance between two adjacent thread flanks) ranges from 0,07·D to 0,35·D.

2 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.

Steel plates, fibreboard and cement bonded particleboard shall only be located on the side of the metric bolt acting as screw head. The following wood-based panels may be used::

- 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. This includes fatigue loads, if the parameter κ according to Annex A.1 in EN 1995-2:2010 does not exceed 0,15.

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 RAMPA A, B, BL, BV, C, CV, SK, SK30, 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 of RAMPA inserts	Characteristic value $f_{tens,k}$: see Annex A
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.
3.8	**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:

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

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 ≥ 3 is to be regarded for solid timber, glulam, CLT or LVL and L / D ≥ 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 moments $M_{y,k}$ of RAMPA inserts are given in Annex A.

The embedding strength for inserts in pre-drilled holes arranged at an angle between insert axis and grain direction, 0° ≤ α ≤ 90° is:

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

Where

- ρ_k characteristic timber density [kg/m³], hardwood with a maximum characteristic density of 590 kg/m³;
- 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° ≤ α ≤ 90°, may be calculated from:

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

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° ≤α≤ 90° 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:

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

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

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

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° ≤ α ≤ 90°
  $k_{ax} = 0{,}3 + \frac{0{,}7 \cdot \alpha}{45°}$ for 0° ≤ α< 45°
- $f_{ax,k}$ Characteristic withdrawal parameter
  For softwood timber, glulam, CLT and LVL: $f_{ax,k}$ = 9 N/mm²
  For hardwood timber, glulam, CLT and LVL: $f_{ax,k}$ = 13 N/mm²
  For SWP: $f_{ax,k}$ = 7 N/mm²

	For plywood or MDF:	$f_{ax,k}$ = 5 N/mm²
	For OSB:	$f_{ax,k}$ = 7 N/mm²
	For particleboard	$f_{ax,k}$ = 6 N/mm²
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/m³]	

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:

$K_{ser} = 25 \cdot D \cdot \ell_{ef}$ [N/mm] for inserts in softwood
$K_{ser} = 30 \cdot D \cdot \ell_{ef}$ [N/mm] 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 are given in Annex A.

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

$F_{tens,RK}$	Characteristic tensile capacity of the inserts [N]
n_{ef}	Effective number of inserts according to EN 1995-1-1:2008
$f_{tens,k}$	Characteristic tensile strength of a RAMPA insert [N]
f_{ub}	Characteristic tensile strength of the metric bolt inserted in the RAMPA insert [N/mm²]
A_s	Tensile stress area of the bolt [mm²]

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:

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

where
$F_{ax,Ed}$ axial design load of the insert
$F_{v,Ed}$ lateral design load of the insert

$F_{ax,Rd}$	design load-carrying capacity of an axially loaded insert
$F_{v,Rd}$	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.

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 C):

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 C):

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 C.

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, 1.0715, 1.0736 and 1.1121 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 or1.4404 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 thecontrol plan deposited at ETA-Danmark prior to CE marking.

Issued in Copenhagen on 2021-03-21 by

Thomas Bruun
Managing Director, ETA-Danmark

Annex A

Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA inserts

Drawings are given in Annex B.

$M_{y,k}$ = characteristic yield Moment
$f_{tens,k}$ = characteristic tensile strength
$d_{drill,SW}$ = Pre-drilling diameter for softwood (timber, glulam, CLT and LVL)
$d_{drill,HW/WB}$ = Pre-drilling diameter for hardwood (timber, glulam, CLT and LVL) or wood-based panels (plywood, particleboard, OSB, SWP)

Table 1: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type A

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
A	001 514 6	10	14	5	7,5	14	3,5	50	carbon	9,40	9,82	8,0	8,0
A	001 515 6	10	15	5	7,5	15	3,5	50	carbon	9,40	9,82	8,0	8,0
A	001 518 6	10	18	5	7,5	18	3,5	50	carbon	9,40	9,82	8,0	8,0
A	001 520 6	10	20	5	7,5	20	3,5	50	carbon	9,40	9,82	8,0	8,0
A	001 540 6	10	40	5	7,5	40	3,5	50	carbon	9,40	9,82	8,0	8,0
A	001 618 6	12	18	6	9,0	18	4,0	50	carbon	16,2	14,1	10,0	9,5
A	001 620 6	12	20	6	9,0	20	4,0	50	carbon	16,2	14,1	10,0	9,5
A	001 625 6	12	25	6	9,0	25	4,0	50	carbon	16,2	14,1	10,0	9,5
A	001 630 6	12	30	6	9,0	30	4,0	50	carbon	16,2	14,1	10,0	9,5
A	001 858 6	14	18	8	11,0	18	4,0	50	carbon	25,9	17,9	11,5	11,5
A	001 823 6	16	23	8	12,0	23	5,0	50	carbon	38,5	25,1	13,0	12,5
A	001 830 6	16	30	8	12,0	30	5,0	50	carbon	38,5	25,1	13,0	12,5
A	001 125 6	18,5	25	10	14,5	25	5,0	50	carbon	64,9	34,6	15,0	15,0
A	001 130 6	18,5	30	10	14,5	30	5,0	50	carbon	64,9	34,6	15,0	15,0
A	001 140 6	18,5	40	10	14,5	40	5,0	50	carbon	64,9	34,6	15,0	15,0
A	001 230 6	22	30	12	18,0	30	5,0	50	carbon	130	56,5	19,0	19,0
A	001 235 6	22	35	12	18,0	35	5,0	50	carbon	130	56,5	19,0	19,0
A	001 652 6	25	30	16	20,0	30	5,0	50	carbon	124	45,2	21,0	21,0
A	001 653 6	25	35	16	20,0	35	5,0	50	carbon	124	45,2	21,0	21,0
A	001 940 6	30	40	20	25,0	40	5,0	50	carbon	241	70,7	26,0	26,0

Table 2: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type B

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
B	002 514 6	10	14	5	7,5	14	3,5	50	carbon	9,40	9,82	8,0	8,0
B	002 618 6	12	18	6	9,0	18	4,0	50	carbon	16,2	14,1	10,0	9,5
B	002 620 6	12	20	6	9,0	20	4,0	50	carbon	16,2	14,1	10,0	9,5
B	002 624 6	12	24	6	9,0	24	4,0	50	carbon	16,2	14,1	10,0	9,5
B	002 838 6	13	18	8	10,0	18	3,0	50	carbon	15,5	11,3	10,5	10,5
B	002 840 6	13	20	8	10,0	20	3,0	50	carbon	15,5	11,3	10,5	10,5
B	002 845 6	13	25	8	10,0	25	3,0	50	carbon	15,5	11,3	10,5	10,5
B	002 858 6	14	18	8	11,0	18	4,0	50	carbon	25,9	17,9	11,5	11,5
B	002 860 6	14	20	8	11,0	20	4,0	50	carbon	25,9	17,9	11,5	11,5
B	002 823 6	16	23	8	12,0	23	5,0	50	carbon	38,5	25,1	13,0	12,5
B	002 830 6	16	30	8	12,0	30	5,0	50	carbon	38,5	25,1	13,0	12,5
B	002 839 6	16	40	8	12,0	40	5,0	50	carbon	38,5	25,1	13,0	12,5
B	002 125 6	18,5	25	10	14,5	25	5,0	50	carbon	64,9	34,6	15,0	15,0
B	002 130 6	18,5	30	10	14,5	30	5,0	50	carbon	64,9	34,6	15,0	15,0
B	002 230 6	22	30	12	18,0	30	5,0	50	carbon	130	56,5	19,0	19,0
B	002 955 6	22	30	14	18,0	30	5,0	50	carbon	97,8	40,2	19,0	19,0
B	002 652 6	25	30	16	20,0	30	5,0	50	carbon	124	45,2	21,0	21,0
B	002 615 63	12	15	6	9,5	15	3,0	50	stainless	20,3	17,0	10,0	10,0
B	002 230 63	22	30	12	18,0	30	5,0	50	stainless	130	56,5	19,0	19,0
B	002 652 63	25	30	16	20,0	30	5,0	50	stainless	124	45,2	21,0	21,0

Table 3: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type BL

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
BL	004 512 6	10	12	5	7,5	12	3,0	50	carbon	9,40	9,82	8,5	8,0
BL	004 515 6	10	15	5	7,5	15	3,0	50	carbon	9,40	9,82	8,5	8,0
BL	004 518 6	10	18	5	7,5	18	3,0	50	carbon	9,40	9,82	8,5	8,0
BL	004 520 6	10	20	5	7,5	20	3,0	50	carbon	9,40	9,82	8,5	8,0
BL	004 525 6	10	25	5	7,5	25	3,0	50	carbon	9,40	9,82	8,5	8,0
BL	004 530 6	10	30	5	7,5	30	3,0	50	carbon	9,40	9,82	8,5	8,0
BL	004 618 6	12	18	6	9,0	18	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 620 6	12	20	6	9,0	20	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 625 6	12	25	6	9,0	25	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 630 6	12	30	6	9,0	30	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 635 6	12	35	6	9,0	35	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 640 6	12	40	6	9,0	40	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 650 6	12	50	6	9,0	50	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 660 6	12	60	6	9,0	60	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 680 6	12	80	6	9,0	80	4,0	50	carbon	16,2	14,1	10,0	9,5
BL	004 820 6	16	20	8	12,0	20	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 825 6	16	25	8	12,0	25	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 830 6	16	30	8	12,0	30	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 835 6	16	35	8	12,0	35	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 840 6	16	40	8	12,0	40	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 850 6	16	50	8	12,0	50	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 860 6	16	60	8	12,0	60	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 870 6	16	70	8	12,0	70	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 880 6	16	80	8	12,0	80	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 800 6	16	100	8	12,0	100	5,0	50	carbon	38,5	25,1	13,0	12,5
BL	004 125 6	18,5	25	10	14,5	25	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 130 6	18,5	30	10	14,5	30	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 140 6	18,5	40	10	14,5	40	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 150 6	18,5	50	10	14,5	50	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 160 6	18,5	60	10	14,5	60	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 170 6	18,5	70	10	14,5	70	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 180 6	18,5	80	10	14,5	80	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 100 6	18,5	100	10	14,5	100	5,0	50	carbon	64,9	34,6	15,0	15,0
BL	004 230 6	22	30	12	17,0	30	5,0	50	carbon	101	45,6	19,5	18,0
BL	004 240 6	22	40	12	17,0	40	5,0	50	carbon	101	45,6	19,5	18,0
BL	004 260 6	22	60	12	17,0	60	5,0	50	carbon	101	45,6	19,5	18,0
BL	004 280 6	22	80	12	17,0	80	5,0	50	carbon	101	45,6	19,5	18,0
BL	004 210 6	22	100	12	17,0	100	5,0	50	carbon	101	45,6	19,5	18,0
BL	004 641 6	25	40	16	20,0	40	5,0	50	carbon	124	45,2	21,0	21,0
BL	004 661 6	25	60	16	20,0	60	5,0	50	carbon	124	45,2	21,0	21,0
BL	004 681 6	25	80	16	20,0	80	5,0	50	carbon	124	45,2	21,0	21,0
BL	004 601 6	25	100	16	20,0	100	5,0	50	carbon	124	45,2	21,0	21,0

Table 4: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type BV

Type	Article number	D mm	L mm	d mm	d_1 mm	l_g mm	p mm	α °	steel	$M_{y,k}$ Nm	$f_{tens,k}$ kN	$d_{drill,SW}$ mm	$d_{drill,HW/WB}$ mm
BV	003 514 6	10	14	5	7,5	14	3,5	50	carbon	9,40	9,82	8,0	8,0
BV	003 802 6	13	18	8	10,0	18	3,0	50	carbon	15,5	11,3	10,5	10,5
BV	003 858 6	14	18	8	11,0	18	4,0	50	carbon	25,9	17,9	11,5	11,5
BV	003 125 6	18,5	25	10	14,5	25	5,0	50	carbon	64,9	34,6	15,0	15,0
BV	003 930 6	22	30	12	18,0	30	5,0	50	carbon	130	56,5	19,0	19,0
BV	003 652 6	25	30	16	20,0	30	5,0	50	carbon	124	45,2	21,0	21,0

Table 5: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type C

Type	Article number	D mm	L mm	d mm	d_1 mm	l_g mm	p mm	α °	steel	$M_{y,k}$ Nm	$f_{tens,k}$ kN	$d_{drill,SW}$ mm	$d_{drill,HW/WB}$ mm
C	005 510 6	8	10	5	6,0	10	2,5	50	carbon	2,88	3,46	6,5	6,5
C	005 512 6	8	12	5	6,0	12	2,5	50	carbon	2,88	3,46	6,5	6,5
C	005 515 6	8	15	5	6,0	15	2,5	50	carbon	2,88	3,46	6,5	6,5
C	005 632 6	9,3	12	6	7,3	12	2,5	50	carbon	5,48	5,43	7,8	7,8
C	005 637 6	9,3	17	6	7,3	17	2,5	50	carbon	5,48	5,43	7,8	7,8
C	005 640 6	9,3	20	6	7,3	20	2,5	50	carbon	5,48	5,43	7,8	7,8
C	005 614 6	10	14	6	7,5	14	3,5	50	carbon	6,52	6,36	8,0	8,0
C	005 615 6	10	15	6	7,5	15	3,5	50	carbon	6,52	6,36	8,0	8,0
C	005 617 6	10	17	6	7,5	17	3,5	50	carbon	6,52	6,36	8,0	8,0
C	005 618 6	10	18	6	7,5	18	3,5	50	carbon	6,52	6,36	8,0	8,0
C	005 620 6	10	20	6	7,5	20	3,5	50	carbon	6,52	6,36	8,0	8,0
C	005 158 6	14	18	10	11,5	18	4,0	50	carbon	16,5	10,1	12,0	12,0
C	005 160 6	14	20	10	11,5	20	4,0	50	carbon	16,5	10,1	12,0	12,0
C	005 163 6	14	23	10	11,5	23	4,0	50	carbon	16,5	10,1	12,0	12,0
C	005 923 6	14	23	10	11,5	23	4,0	50	carbon	16,5	10,1	12,0	12,0
C	005 123 6	16	23	10	12,0	23	5,0	50	carbon	23,1	13,8	13,0	12,5
C	005 136 6	16	36	10	12,0	36	5,0	50	carbon	23,1	13,8	13,0	12,5

Table 6: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type CV

Type	Article number	D mm	L mm	d mm	d_1 mm	l_g mm	p mm	α °	steel	$M_{y,k}$ Nm	$f_{tens,k}$ kN	$d_{drill,SW}$ mm	$d_{drill,HW/WB}$ mm
CV	006 512 6	8	12	5	6,0	12	2,5	50	carbon	2,88	3,46	6,5	6,5
CV	006 615 6	10	15	6	7,5	15	3,0	50	carbon	6,52	6,36	8,5	8,0
CV	006 617 6	10	17	6	7,5	17	3,5	50	carbon	6,52	6,36	8,0	8,0
CV	006 618 6	10	18	6	7,5	18	3,5	50	carbon	6,52	6,36	8,0	8,0
CV	006 620 6	10	20	6	7,5	20	3,5	50	carbon	6,52	6,36	8,0	8,0
CV	006 818 6	12	18	8	9,5	18	3,0	50	carbon	10,9	8,25	10,0	10,0

Table 7: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type SK

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
SK	010 412 6	8	12	4	6,5	10,5	2,0	50	carbon	6,67	8,25	7,0	7,0
SK	010 514 6	10	14	5	7,5	12	3,0	50	carbon	9,40	9,82	8,5	8,0
SK	010 618 6	12	18	6	9,5	15	3,0	50	carbon	20,3	17,0	10,0	10,0
SK	010 620 6	12	20	6	9,5	17	3,0	50	carbon	20,3	17,0	10,0	10,0
SK	010 623 6	12	23	6	9,5	20	3,0	50	carbon	20,3	17,0	10,0	10,0
SK	010 625 6	12	25	6	9,5	22	3,0	50	carbon	20,3	17,0	10,0	10,0
SK	010 870 6	14	30	8	11,5	27	3,5	50	carbon	31,9	21,4	12,0	12,0
SK	010 823 6	16	23	8	13,5	20	3,5	50	carbon	61,7	37,1	14,0	14,0
SK	010 830 6	16	30	8	13,5	27	3,5	50	carbon	61,7	37,1	14,0	14,0
SK	010 130 6	18,5	30	10	15,5	27	4,0	50	carbon	86,3	44,1	16,0	16,0
SK	010 140 6	18,5	40	10	15,5	37	4,0	50	carbon	86,3	44,1	16,0	16,0
SK	010 230 6	22	30	12	19,0	26,5	4,0	50	carbon	162	68,2	20,0	20,0
SK	010 240 6	22	40	12	19,0	36,5	4,0	30	carbon	162	68,2	20,0	20,0

Table 8: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type SK30

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
SK30	039 620 6	12	20	6	9,0	17	4,0	30	carbon	16,2	14,1	9,5	9,5

Table 9: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type SK330

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
SK330	040 618 6	12	18	6	9,0	15	6,0	30	carbon	16,2	14,1	9,5	9,5
SK330	040 620 6	12	20	6	9,0	17	6,0	30	carbon	16,2	14,1	9,5	9,5
SK330	040 623 6	12	23	6	9,5	20	6,0	30	carbon	20,3	17,0	10,0	10,0
SK330	040 625 6	12	25	6	9,5	22	6,0	30	carbon	20,3	17,0	10,0	10,0
SK330	040 870 6	14	30	8	11,5	27	7,5	30	carbon	31,9	21,4	12,0	12,0
SK330	040 830 6	16	30	8	12,5	27	7,5	30	carbon	45,6	29,0	13,0	13,0

Table 10: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type SKL

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
SKL	011 625 6	12	25	6	9,0	22	4,0	30	carbon	16,2	14,1	9,5	9,5
SKL	011 630 6	12	30	6	9,0	27	4,0	30	carbon	16,2	14,1	9,5	9,5
SKL	011 635 6	12	35	6	9,0	32	4,0	30	carbon	16,2	14,1	9,5	9,5
SKL	011 640 6	12	40	6	9,0	37	4,0	30	carbon	16,2	14,1	9,5	9,5
SKL	011 650 6	12	50	6	9,0	47	4,0	30	carbon	16,2	14,1	9,5	9,5
SKL	011 660 6	12	60	6	9,0	57	4,0	30	carbon	16,2	14,1	9,5	9,5
SKL	011 680 6	12	80	6	9,0	77	4,0	30	carbon	16,2	14,1	9,5	9,5
SKL	011 830 6	16	30	8	12,5	27	5,0	30	carbon	45,6	29,0	13,0	13,0
SKL	011 840 6	16	40	8	12,5	37	5,0	30	carbon	45,6	29,0	13,0	13,0
SKL	011 850 6	16	50	8	12,5	47	5,0	30	carbon	45,6	29,0	13,0	13,0
SKL	011 860 6	16	60	8	12,5	57	5,0	30	carbon	45,6	29,0	13,0	13,0
SKL	011 870 6	16	70	8	12,5	67	5,0	30	carbon	45,6	29,0	13,0	13,0
SKL	011 880 6	16	80	8	12,5	77	5,0	30	carbon	45,6	29,0	13,0	13,0
SKL	011 800 6	16	100	8	12,5	97	5,0	30	carbon	45,6	29,0	13,0	13,0
SKL	011 130 6	18,5	30	10	15,0	27	5,0	30	carbon	75,2	39,3	15,5	15,5
SKL	011 140 6	18,5	40	10	15,0	37	5,0	30	carbon	75,2	39,3	15,5	15,5
SKL	011 150 6	18,5	50	10	15,0	47	5,0	30	carbon	75,2	39,3	15,5	15,5
SKL	011 160 6	18,5	60	10	15,0	57	5,0	30	carbon	75,2	39,3	15,5	15,5
SKL	011 170 6	18,5	70	10	15,0	67	5,0	30	carbon	75,2	39,3	15,5	15,5
SKL	011 180 6	18,5	80	10	15,0	77	5,0	30	carbon	75,2	39,3	15,5	15,5
SKL	011 100 6	18,5	100	10	15,0	97	5,0	30	carbon	75,2	39,3	15,5	15,5
SKL	011 260 6	22	60	12	18,5	56,5	5,0	30	carbon	146	62,3	19,5	19,5
SKL	011 280 6	22	80	12	18,5	76,5	5,0	30	carbon	146	62,3	19,5	19,5
SKL	011 210 6	22	100	12	18,5	96,5	5,0	30	carbon	146	62,3	19,5	19,5
SKL	011 661 6	25	60	16	21,5	56,5	5,0	30	carbon	185	64,8	22,5	22,5
SKL	011 681 6	25	80	16	21,5	76,5	5,0	30	carbon	185	64,8	22,5	22,5
SKL	011 601 6	25	100	16	21,5	96,5	5,0	30	carbon	185	64,8	22,5	22,5
SKL	011 640 63	12	40	6	9,5	37	3,5	30	stainless	20,3	17,0	10,0	10,0
SKL	011 650 63	12	50	6	9,5	47	3,5	30	stainless	20,3	17,0	10,0	10,0
SKL	011 660 63	12	60	6	9,5	57	3,5	30	stainless	20,3	17,0	10,0	10,0
SKL	011 680 63	12	80	6	9,5	77	3,5	30	stainless	20,3	17,0	10,0	10,0
SKL	011 850 63	16	50	8	13,5	47	3,5	30	stainless	61,7	37,1	14,0	14,0
SKL	011 860 63	16	60	8	13,5	57	3,5	30	stainless	61,7	37,1	14,0	14,0
SKL	011 870 63	16	70	8	13,5	67	3,5	30	stainless	61,7	37,1	14,0	14,0
SKL	011 880 63	16	80	8	13,5	77	3,5	30	stainless	61,7	37,1	14,0	14,0
SKL	011 800 63	16	100	8	13,5	97	3,5	30	stainless	61,7	37,1	14,0	14,0
SKL	011 160 63	18,5	60	10	15,5	57	4,0	30	stainless	86,3	44,1	16,0	16,0
SKL	011 170 63	18,5	70	10	15,5	67	4,0	30	stainless	86,3	44,1	16,0	16,0
SKL	011 180 63	18,5	80	10	15,5	77	4,0	30	stainless	86,3	44,1	16,0	16,0
SKL	011 100 63	18,5	100	10	15,5	97	4,0	30	stainless	86,3	44,1	16,0	16,0
SKL	011 280 63	22	80	12	18,5	76,5	4,0	30	stainless	146	62,3	19,5	19,5
SKL	011 210 63	22	100	12	18,5	96,5	4,0	30	stainless	146	62,3	19,5	19,5
SKL	011 681 63	25	80	16	21,5	76,5	4,0	30	stainless	185	64,8	22,5	22,5
SKL	011 601 63	25	100	16	21,5	96,5	4,0	30	stainless	185	64,8	22,5	22,5

Table 11: Geometry, $M_{y,k}$, $f_{tens,k}$ and pre-drilling diameters of RAMPA insert type SKL330

Type	Article number	D	L	d	d_1	l_g	p	α	steel	$M_{y,k}$	$f_{tens,k}$	$d_{drill,SW}$	$d_{drill,HW/WB}$
		mm	mm	mm	mm	mm	mm	°		Nm	kN	mm	mm
SKL330	421 625 6	12	25	6	9,5	22	6,0	30	carbon	20,3	17,0	10,0	10,0
SKL330	421 630 6	12	30	6	9,5	27	6,0	30	carbon	20,3	17,0	10,0	10,0
SKL330	421 640 6	12	40	6	9,5	37	6,0	30	carbon	20,3	17,0	10,0	10,0
SKL330	421 650 6	12	50	6	9,5	47	6,0	30	carbon	20,3	17,0	10,0	10,0
SKL330	421 660 6	12	60	6	9,5	57	6,0	30	carbon	20,3	17,0	10,0	10,0
SKL330	421 680 6	12	80	6	9,5	77	6,0	30	carbon	20,3	17,0	10,0	10,0
SKL330	421 830 6	16	30	8	12,5	27	7,5	30	carbon	45,6	29,0	13,0	13,0
SKL330	421 840 6	16	40	8	12,5	37	7,5	30	carbon	45,6	29,0	13,0	13,0
SKL330	421 850 6	16	50	8	12,5	47	7,5	30	carbon	45,6	29,0	13,0	13,0
SKL330	421 860 6	16	60	8	12,5	57	7,5	30	carbon	45,6	29,0	13,0	13,0
SKL330	421 870 6	16	70	8	12,5	67	7,5	30	carbon	45,6	29,0	13,0	13,0
SKL330	421 880 6	16	80	8	12,5	77	7,5	30	carbon	45,6	29,0	13,0	13,0
SKL330	421 800 6	16	100	8	12,5	97	7,5	30	carbon	45,6	29,0	13,0	13,0
SKL330	421 130 6	18,5	30	10	15,0	27	7,5	30	carbon	75,2	39,3	15,5	15,5
SKL330	421 140 6	18,5	40	10	15,0	37	7,5	30	carbon	75,2	39,3	15,5	15,5
SKL330	421 150 6	18,5	50	10	15,0	47	7,5	30	carbon	75,2	39,3	15,5	15,5
SKL330	421 160 6	18,5	60	10	15,0	57	7,5	30	carbon	75,2	39,3	15,5	15,5
SKL330	421 170 6	18,5	70	10	15,0	67	7,5	30	carbon	75,2	39,3	15,5	15,5
SKL330	421 180 6	18,5	80	10	15,0	77	7,5	30	carbon	75,2	39,3	15,5	15,5
SKL330	421 100 6	18,5	100	10	15,0	97	7,5	30	carbon	75,2	39,3	15,5	15,5
SKL330	421 260 6	22	60	12	18,5	56	7,5	30	carbon	146	62,3	19,5	19,5
SKL330	421 280 6	22	80	12	18,5	76	7,5	30	carbon	146	62,3	19,5	19,5
SKL330	421 210 6	22	100	12	18,5	96	7,5	30	carbon	146	62,3	19,5	19,5
SKL330	421 661 6	25	60	16	21,5	56	7,5	30	carbon	185	64,8	22,5	22,5
SKL330	421 681 6	25	80	16	21,5	76	7,5	30	carbon	185	64,8	22,5	22,5
SKL330	421 601 6	25	100	16	21,5	96	7,5	30	carbon	185	64,8	22,5	22,5

Annex B
Drawings of RAMPA inserts

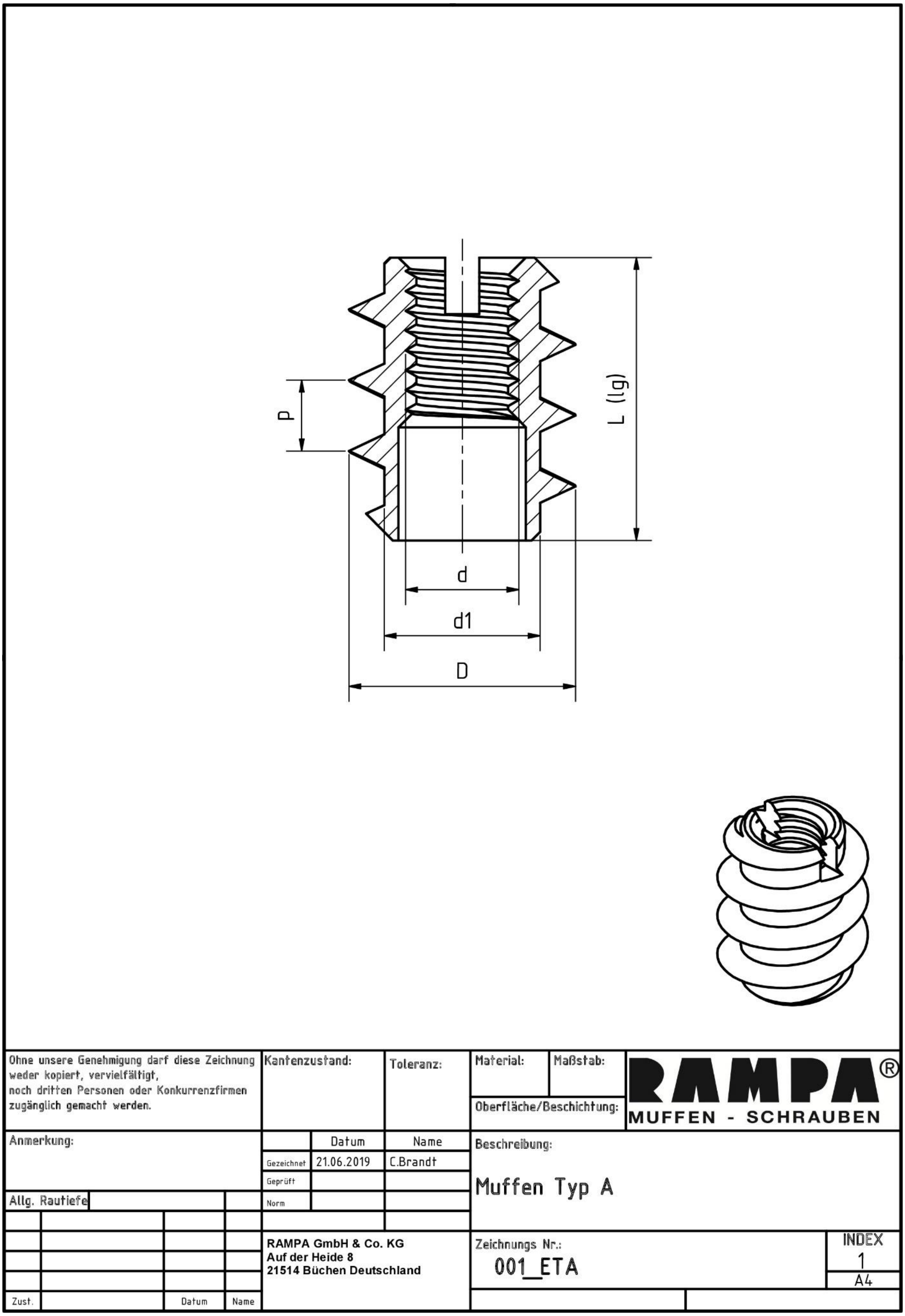
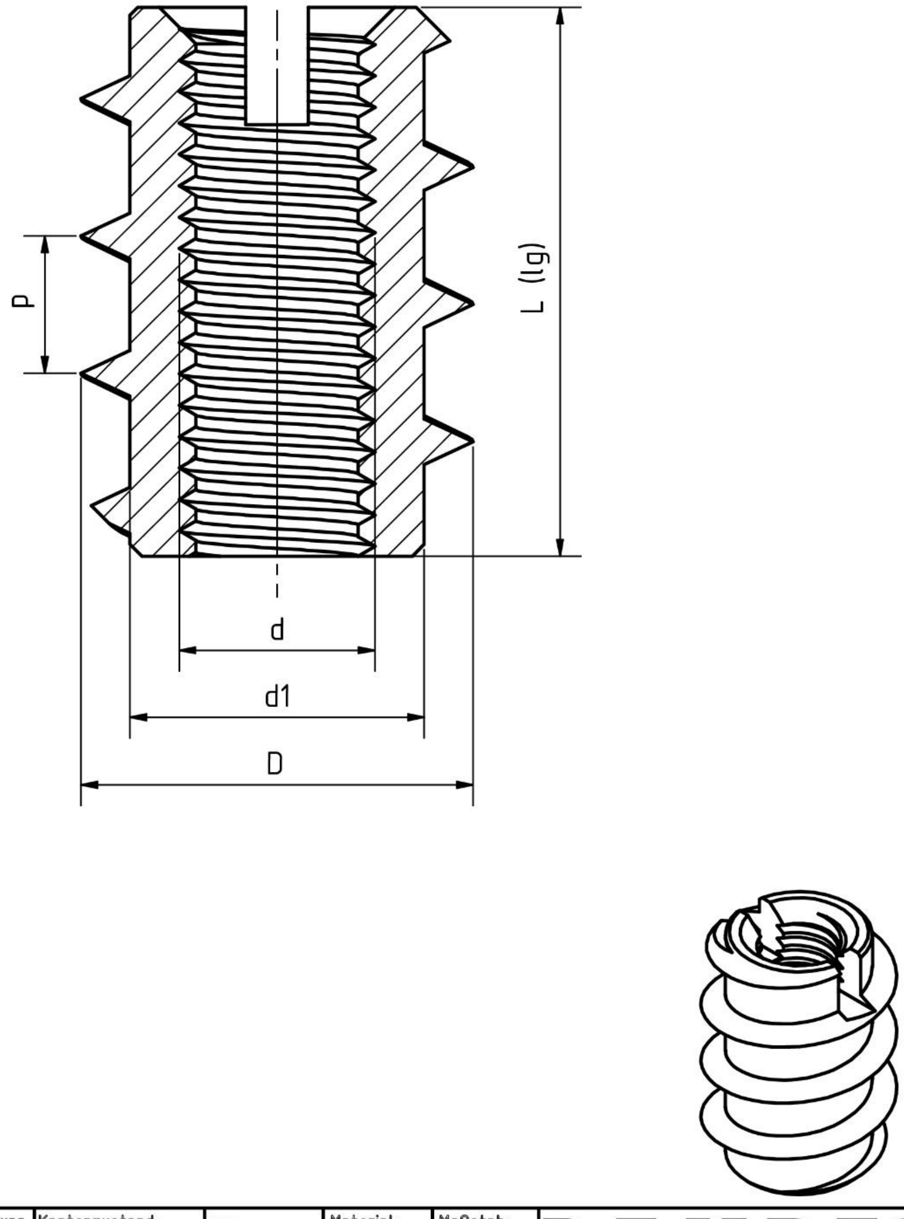


Figure 1: Drawing of RAMPA insert type A



Kantenzustand:

Toleranz:

Material:

Maßstab:

Oberfläche/Beschichtung:

RAMPA®
MUFFEN - SCHRAUBEN

Anmerkung:

Allg. Rautiefe

	Datum	Name
Gezeichnet	21.06.2019	C.Brandt
Geprüft		
Norm		

Beschreibung:

Muffen Typ B

Zust.		Datum	Name

RAMPA GmbH & Co. KG
Auf der Heide 8
21514 Büchen Deutschland

Zeichnungs Nr.:
002_ETA

INDEX
1
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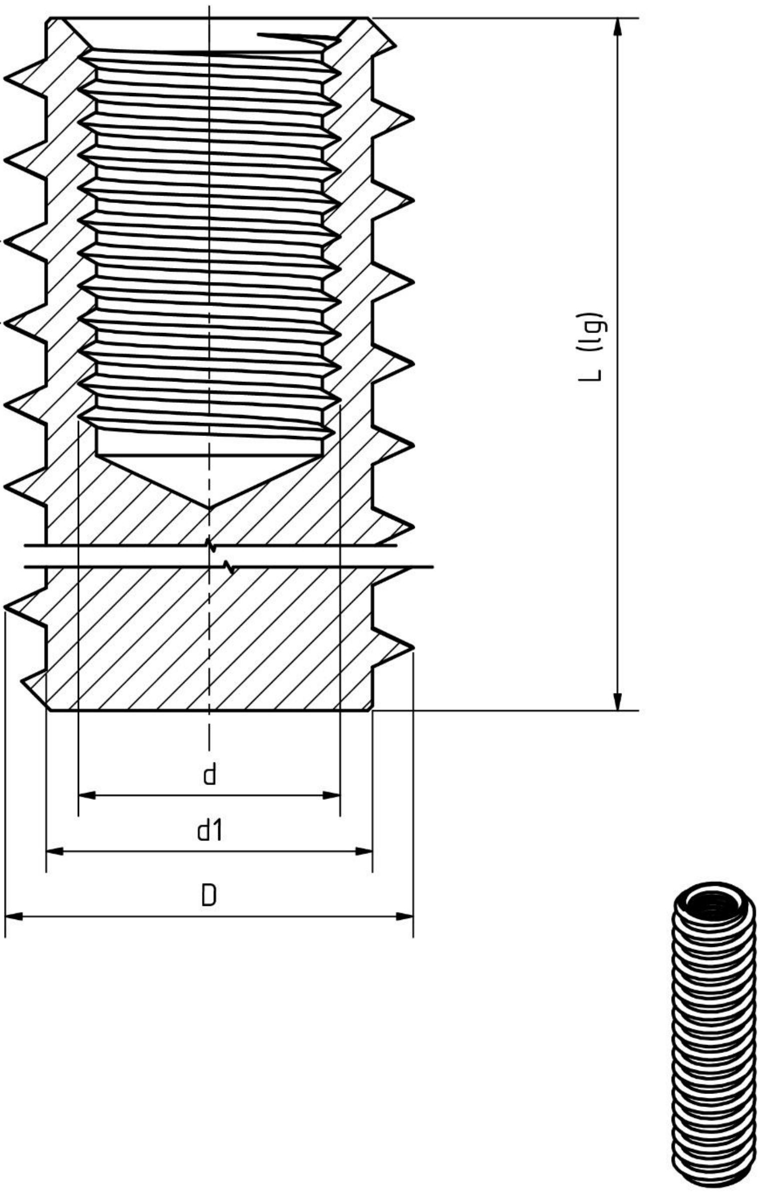
Figure 2: Drawing of RAMPA insert type B



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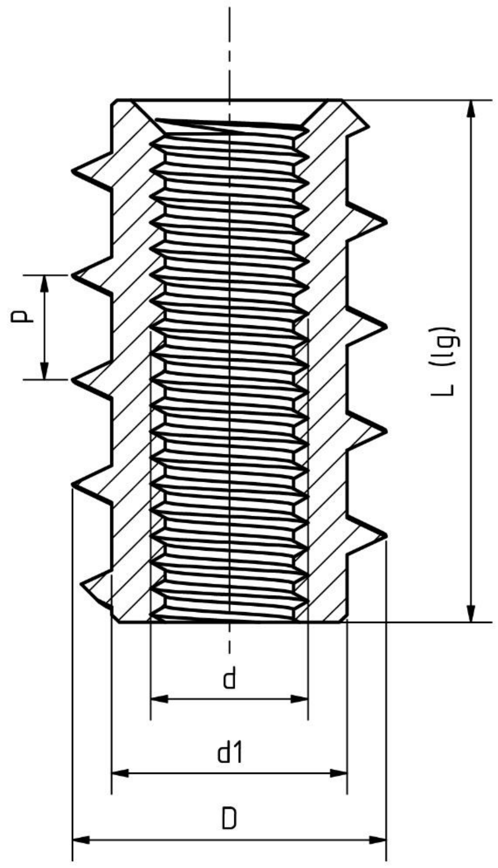
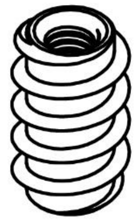
Anmerkung:		Datum	Name	Beschreibung:
	Gezeichnet	21.06.2019	C.Brandt	Muffen Typ BL
Allg. Rautiefe	Geprüft			
	Norm			
	RAMPA GmbH & Co. KG Auf der Heide 8 21514 Büchen Deutschland			Zeichnungs Nr.: 004_ETA — INDEX 1 — A4
Zust. / Datum / Name				

Figure 3: Drawing of RAMPA insert type BL





Kantenzustand:

Toleranz:

Material:

Maßstab:

Oberfläche/Beschichtung:

RAMPA®
MUFFEN - SCHRAUBEN

Anmerkung:

	Datum	Name
Gezeichnet	21.06.2019	C.Brandt
Geprüft		
Norm		

Allg. Rautiefe

Beschreibung:

Muffen Typ BV

Zust.		Datum	Name

RAMPA GmbH & Co. KG
Auf der Heide 8
21514 Büchen Deutschland

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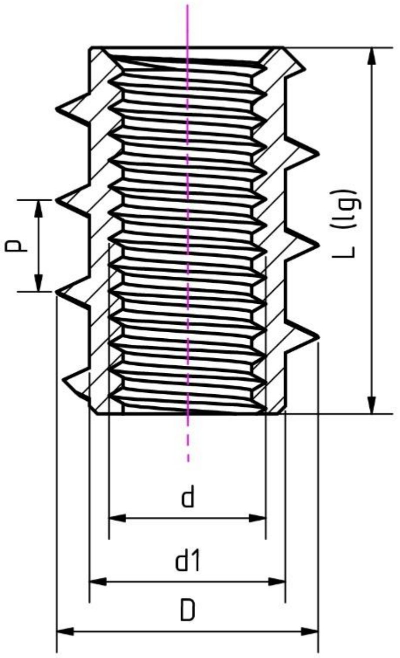
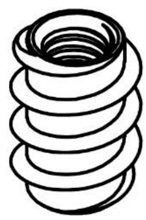
Figure 4: Drawing of RAMPA insert type BV





Ohne unsere Genehmigung darf diese Zeichnung weder kopiert, vervielfältigt, noch dritten Personen oder Konkurrenzfirmen zugänglich gemacht werden.	Kantenzustand:	Toleranz:	Material:	Maßstab:	RAMPA® MUFFEN - SCHRAUBEN
			Oberfläche/Beschichtung:		
Anmerkung:		Datum	Name	Beschreibung:	
	Gezeichnet	18.07.2019	C.Brandt	Muffen Typ C	
	Geprüft				
Allg. Rautiefe	Norm				
	RAMPA GmbH & Co. KG Auf der Heide 8 21514 Büchen Deutschland			Zeichnungs Nr.: 005_ETA	INDEX 1
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Zust. / Datum / Name					

Figure 5: Drawing of RAMPA insert type C

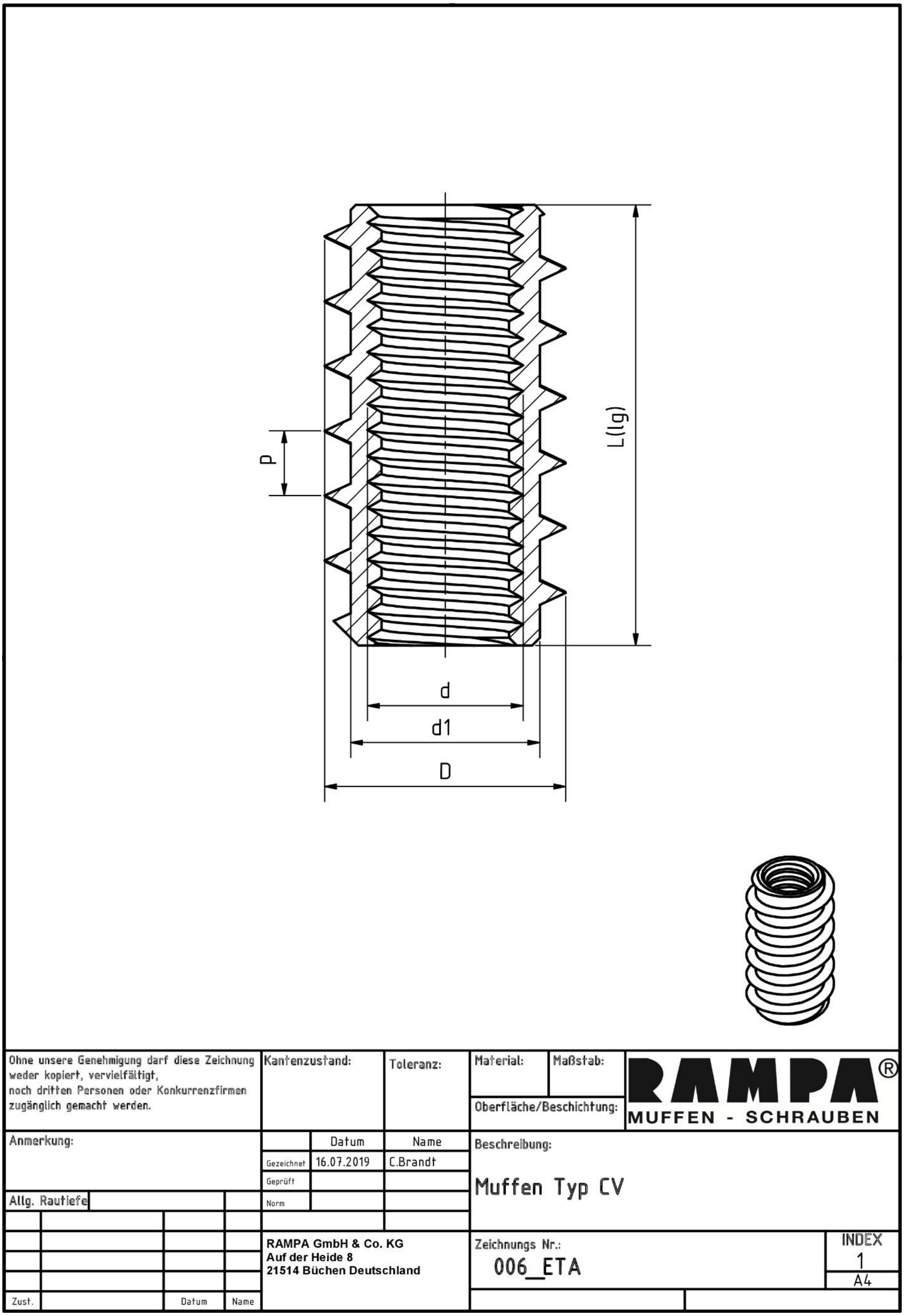
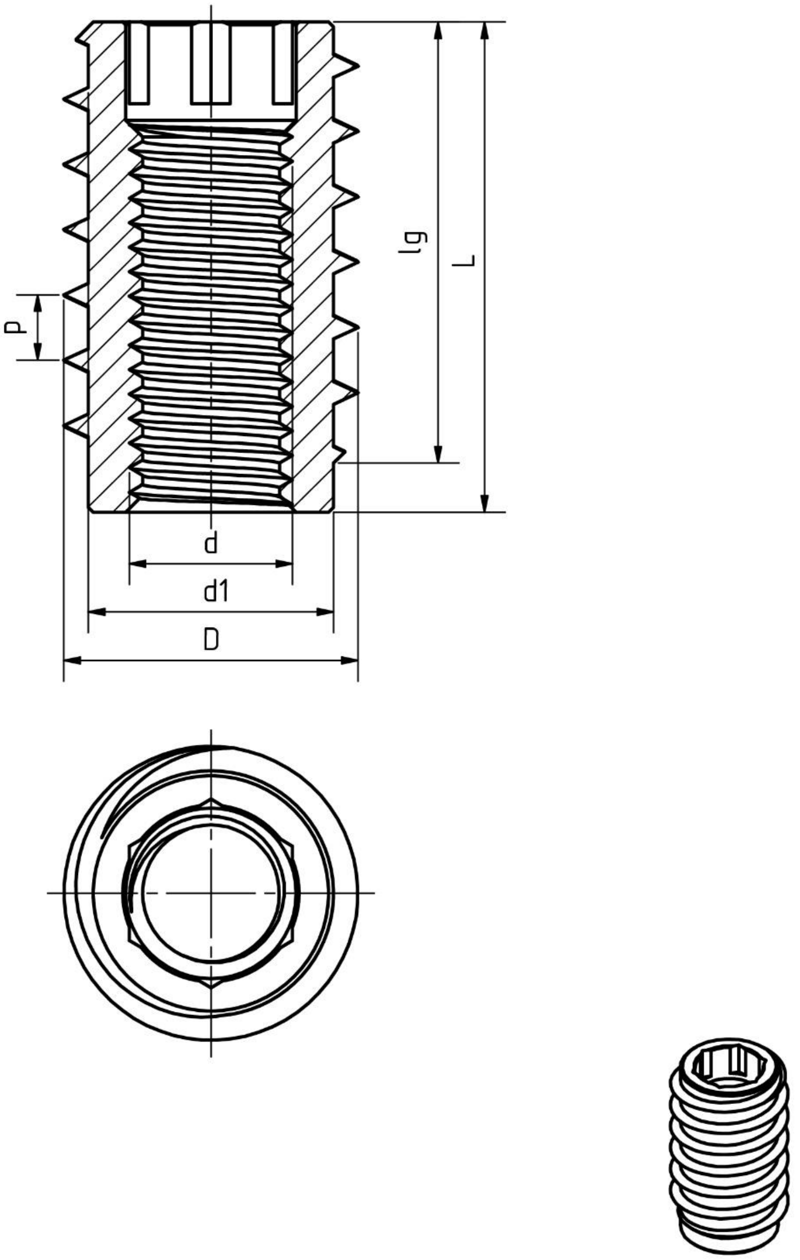


Figure 6: Drawing of RAMPA insert type CV



Ohne unsere Genehmigung darf diese Zeichnung weder kopiert, vervielfältigt, noch dritten Personen oder Konkurrenzfirmen zugänglich gemacht werden.

Kantenzustand:	Toleranz:	Material:	Maßstab:
		Oberfläche/Beschichtung:	

RAMPA®
MUFFEN - SCHRAUBEN

Anmerkung:

	Datum	Name
Gezeichnet	18.07.2019	C.Brandt
Geprüft		
Norm		

Allg. Rautiefe

Beschreibung:

Muffen Typ SK

Zust.	Datum	Name

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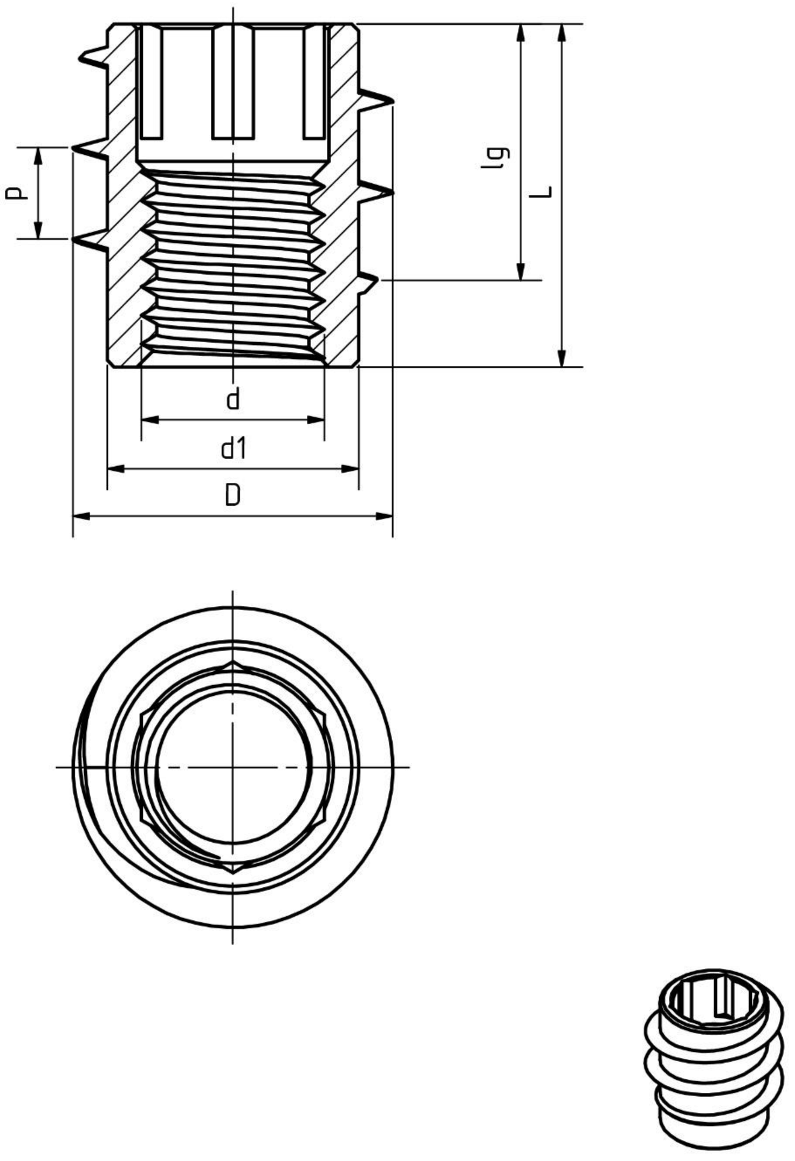
Figure 7: Drawing of RAMPA insert type SK



Kantenzustand:

Toleranz:

Material:

Maßstab:

Oberfläche/Beschichtung:

RAMPA®
MUFFEN - SCHRAUBEN

Anmerkung:

	Datum	Name
Gezeichnet	07.02.2020	C.Brandt
Geprüft		
Norm		

Masse:

Beschreibung:

Muffen Typ SK30

Allg. Rautiefe

Zust. | Datum | Name

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Figure 8: Drawing of RAMPA insert type SK30

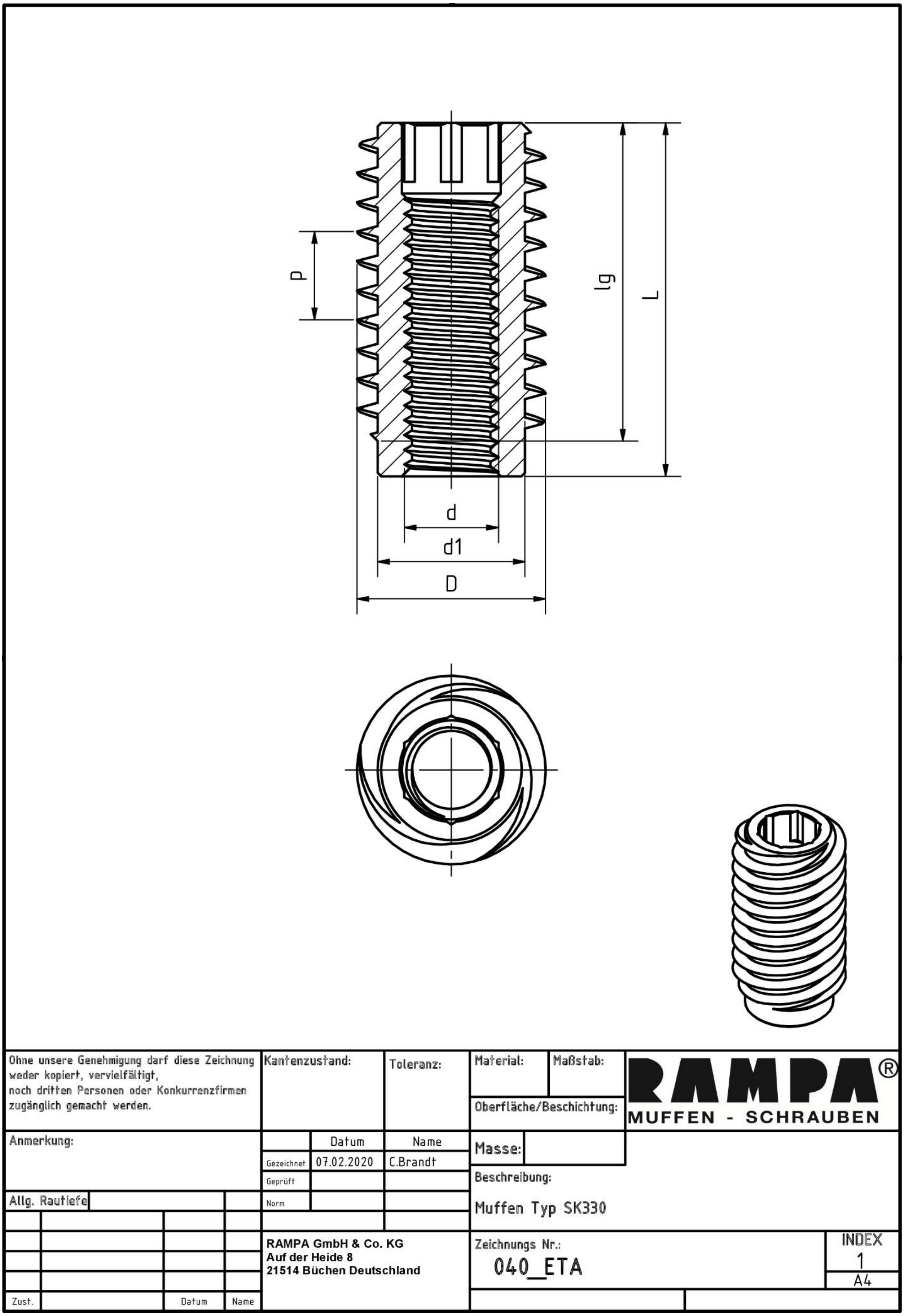
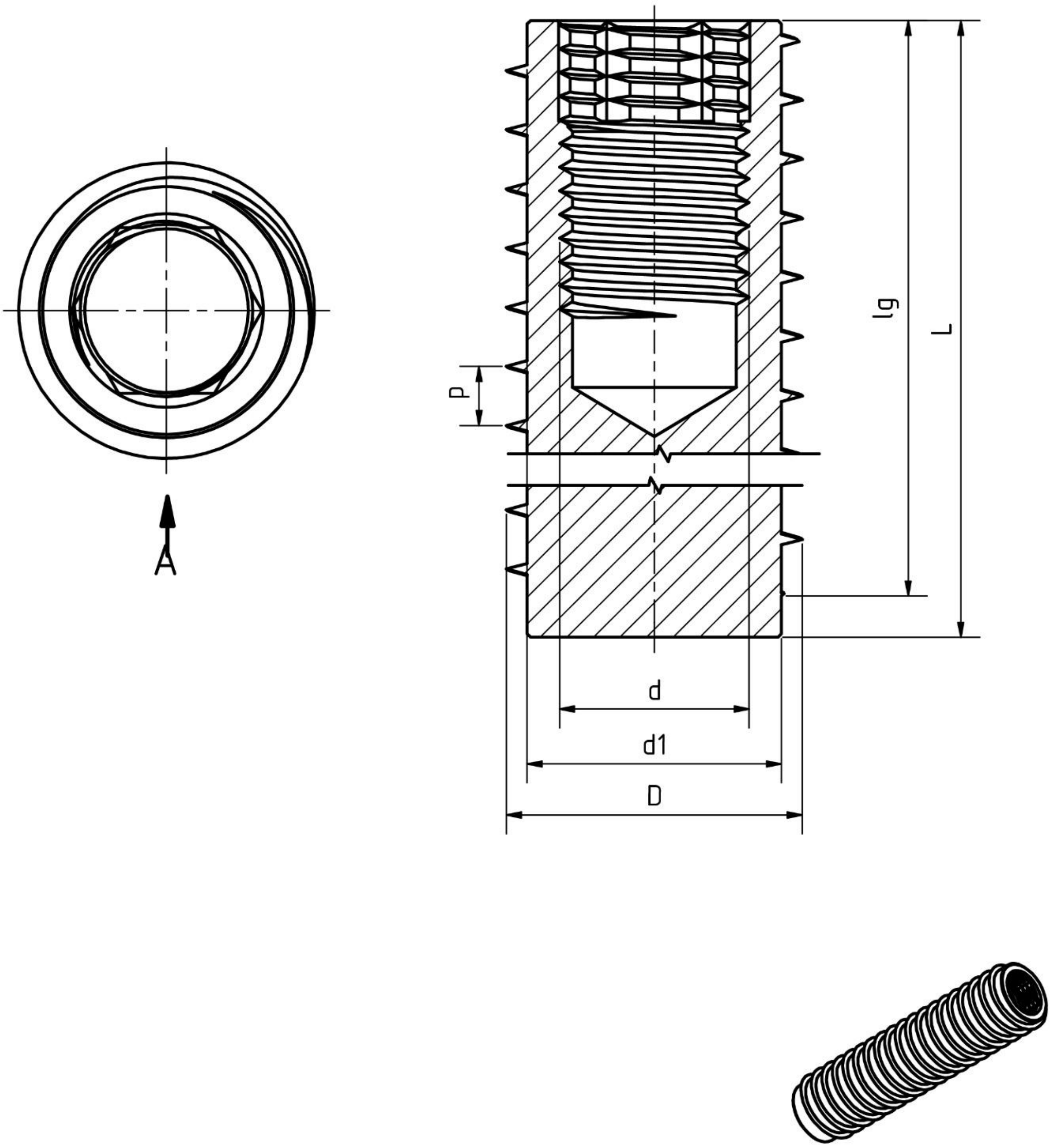


Figure 9: Drawing of RAMPA insert type SK330



Kantenzustand:

Toleranz:

Material:

Maßstab:

Oberfläche/Beschichtung

RAMPA®
MUFFEN - SCHRAUBEN

Anmerkung:

Allg. Rautiefe

	Datum	Name
Gezeichnet	18.07.2019	C.Brandt
Geprüft		
Norm		

Beschreibung:

Muffen Typ SKL

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Figure 10: Drawing of RAMPA insert type SKL

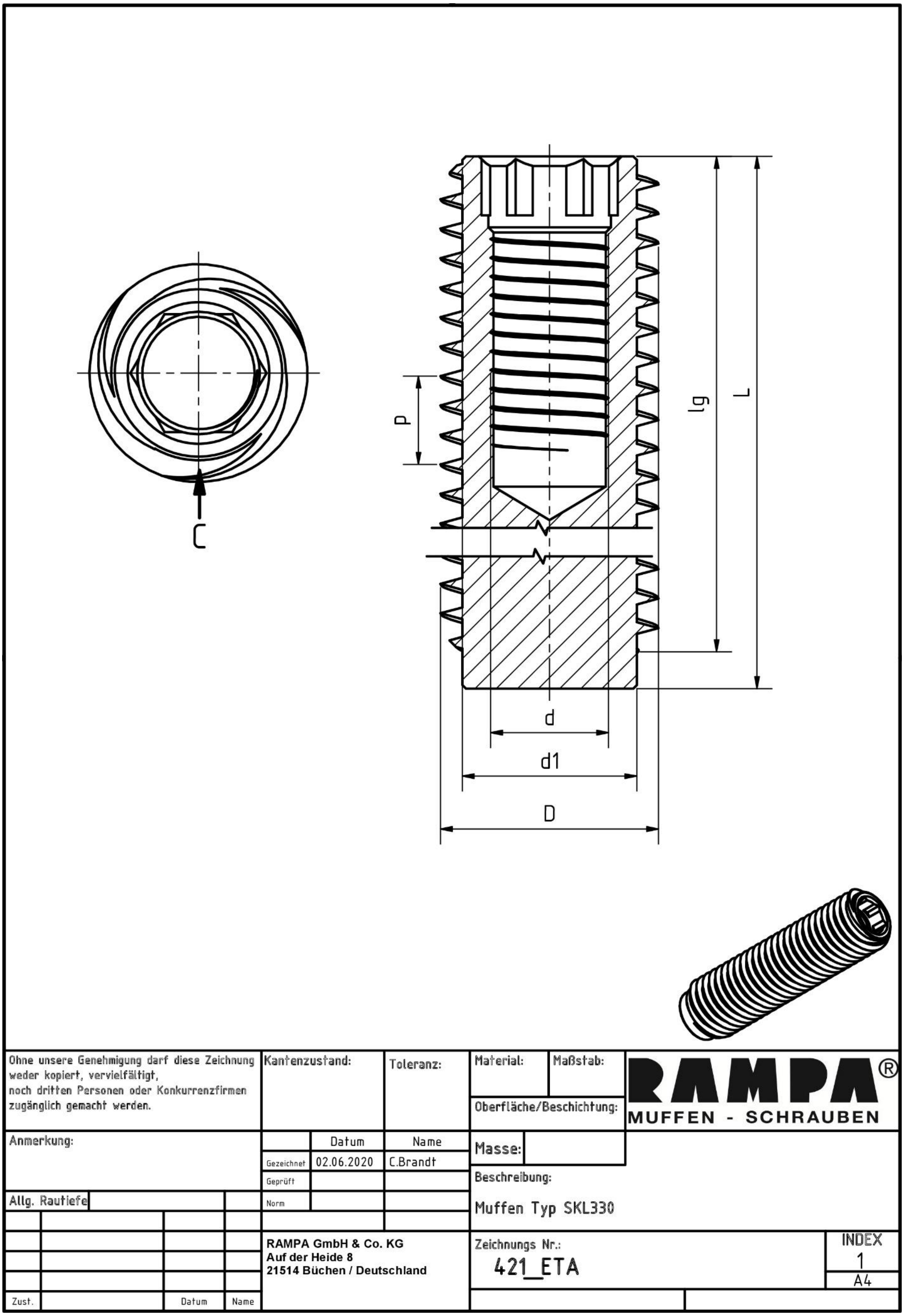
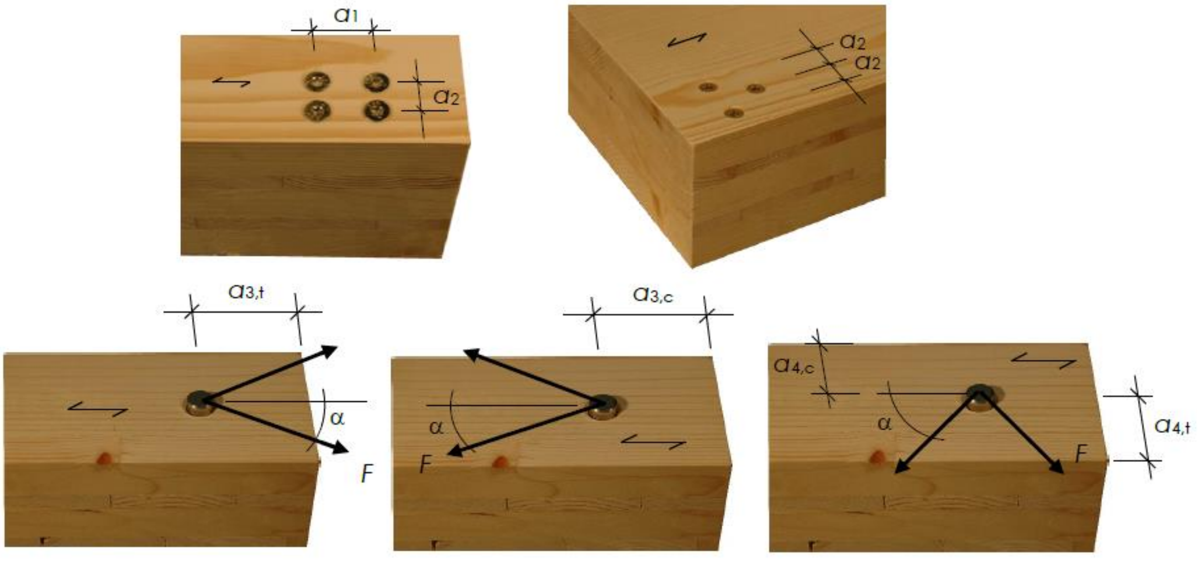


Figure 11: Drawing of RAMPA insert type SKL330

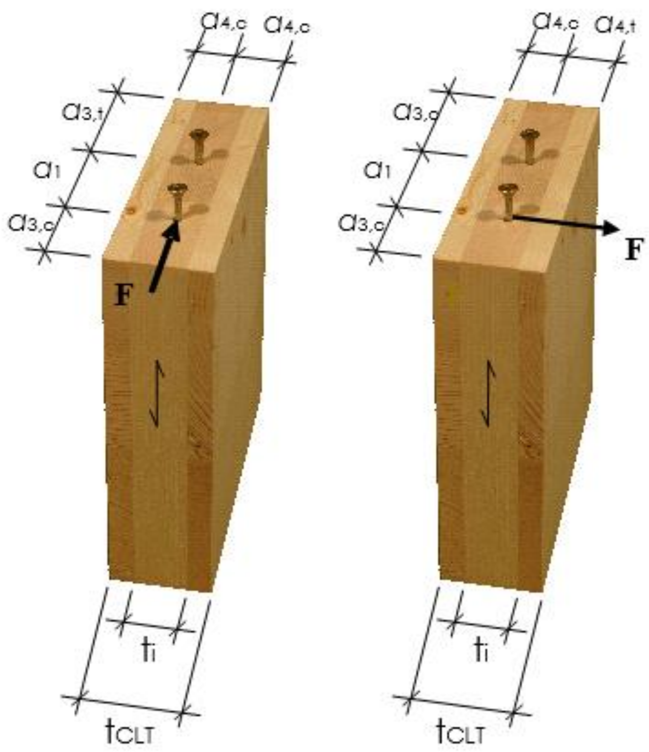
Annex C
Minimum distances and spacing

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 · D	2,5 · D	6 · D	6 · D	6 · D	2,5 · D
Edge surface	10 · D	4 · D	12 · D	7 · D	6 · D	3 · D