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Designated according to Article 29 of Regulation (EU) No 305/2011

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European Technical Assessment

ETA-12/0373 of 30.03.2022

General part

Technical Assessment Body issuing the European Technical Assessment	Österreichisches Institut für Bautechnik (OIB) Austrian Institute of Construction Engineering
Trade name of the construction product	Schmid screws RAPID®, StarDrive GPR, StarDrive and SP
Product family to which the construction product belongs	Screws for use in timber constructions
Manufacturer	Schmid Schrauben Hainfeld GmbH Landstal 10 3170 Hainfeld Austria
Manufacturing plant	Schmid Schrauben Hainfeld GmbH
This European Technical Assessment contains	65 pages including 10 Annexes, which form an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	European Assessment Document (EAD) 130118-01-0603 “Screws and threaded rods for use in timber constructions”.
This European Technical Assessment replaces	European Technical Assessment ETA-12/0373 of 23.12.2020.

Remarks

Translations of the European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Communication of this European Technical Assessment, including transmission by electronic means, shall be in full. However, partial reproduction may be made with the written consent of Österreichisches Institut für Bautechnik. Any partial reproduction has to be identified as such.

Specific parts

1 Technical description of the product

This European Technical Assessment[1] (ETA) applies to the screws for use in timber constructions "Schmid screws RAPID®, StarDrive GPR, StarDrive and SP" hereinafter referred to as Schmid screws. Schmid screws are self-tapping screws divided into a drill tip, optionally a compressor and/or cutting groove, thread, optionally a friction part, shank, and head of the screw. The screws are made from special carbon or stainless steel. The screws from special carbon steel are hardened. They are anti-friction coated and are electrogalvanized and passivated (yellow or blue), provided with a zinc-nickel coating or hot-dip galvanised. The washers are made from carbon steel. Possible outer thread diameters as well as overall lengths for the Schmid screws are given in Table **1**.

A bending angle of 45° is reached for all screws.

The screws and washers correspond to the specifications given from Annex 0 to Annex 6. The material characteristics, dimensions and tolerances of the product not indicated in these Annexes, are given in the technical file[2] of the European Technical Assessment.

Table 1: Possible outer thread diameter and overall length of screws

Type of Schmid screws	Outer thread diameter		Overall length	
	min.	max.	min.	max.
	mm	mm	mm	mm
RAPID®	4	16	20	1000
Stardrive GPR and StarDrive	4	12	20	600
SP	4	6	20	200

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

2.1 Intended use

The screws are used for connections in load bearing timber structures between wood-based members or between those members and steel members:

- Solid timber of softwood of strength class C14 or better and solid timber of hardwood of strength class D18 or better according to EN 338[3] and EN 14081-1,

[1] The ETA-12/0373 was firstly issued in 2012 as European technical approval with validity from 05.11.2012, amended and converted in 2017 to the European Technical Assessment ETA-12/0373 of 03.11.2017, amended in 2020 to the European Technical Assessment ETA-12/0373 of 23.12.2020 and amended in 2022 to the European Technical Assessment ETA-12/0373 of 30.03.2022.

[2] The technical file of the European Technical Assessment is deposited at Österreichisches Institut für Bautechnik.

[3] Reference documents are listed in Annex 10.

- Glued laminated timber and glued solid timber of softwood of strength class GL20 or better according to EN 14080 or glued laminated timber of hardwood according to European Technical Assessments (ETA) or national provisions that apply on the installation site,
- Laminated veneer lumber LVL according to EN 14374,
- Cross laminated timber according to European Technical Assessments or national provisions that apply on the installation site.
- Cement-bonded particle boards according EN 634-1 and EN 13986 or ETA or national provisions that apply on the installation site.

The screws may be used for connecting the following wood-based panels to the timber members mentioned above:

- Laminated veneer lumber LVL according to EN 14374 or ETA,
- Solid wood panels according to EN 13353 and EN 13986 or ETA,
- Plywood according to EN 636 and EN 13986 or ETA,
- Oriented strand boards, OSB, according to EN 300 and EN 13986 or ETA,
- Particleboards according to EN 312 and EN 13986 or ETA,
- Fibreboards according to EN 622-2, EN 622-3 and EN 13986 or ETA,
- Cement-bonded particle boards according EN 634-1 and EN 13986 or ETA or national provisions that apply on the installation site,
- Engineered wood products according to ETA, provided that the ETA for the product provides provisions for the use of self-tapping screws and these provisions are applied.

Compression and tension reinforcement perpendicular to the grain with fully threaded screws as well as shear reinforcement with fully threaded screws with a diameter d ≥ 8 mm is allowed.

In addition, screws with 6 mm ≤ d ≤ 12 mm may be used for fixing of thermal insulation on rafters and walls.

For engineered wood products according to a European Technical Assessment (ETA) including provisions for the use of self-tapping screws, the provisions of the ETA of the engineered wood product apply.

The product shall be subjected to static and quasi static actions only.

The product is intended to be used in service classes 1, 2 and 3 according to EN 1995-1-1. 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.

Hot-dip galvanised screws with a minimum thickness of the zinc coating of 55 µm as well as screws made of stainless steel may be used in conditions defined by service class 3. The field of application of the screws made of stainless steel shall be defined according to EN 1993-1-4 or national provisions that apply at the installation site.

2.2 General assumptions

The screws for use in timber constructions are manufactured in accordance with the provisions of the European Technical Assessment using the manufacturing process as identified in the inspection of the manufacturing plant by Österreichisches Institut für Bautechnik and laid down in the technical file.

The manufacturer shall ensure that the requirements in accordance with the Clauses 1, 2 and 3 as well as with the Annexes of the European Technical Assessment are made known to those who are concerned with design and execution of the works.

Design

The European Technical Assessment only applies to the manufacture and use of the screws for use in timber constructions. Verification of stability of the works including application of loads on the products is not subject to the European Technical Assessment.

The following conditions shall be observed:

- Design of Schmid screws is carried under the responsibility of an engineer experienced in such products.
- Design of the works shall account for the protection of Schmid screws to maintain service classes 1, 2 and 3 according to EN 1995-1-1 or national provisions that apply on the installation site.
- Schmid screws are installed correctly.

Design of the screws for use in timber constructions may be according to EN 1995-1-1, taking into account of Annex 6 to Annex 9 of the European Technical Assessment. Hereby, the outer thread diameter d is used as nominal diameter d or rather effective diameter d_{ef} and l_{ef} is the threaded part in the timber member including point.

Standards and regulations in force at the place of use shall be considered.

Packaging, transport, storage, maintenance, replacement and repair

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

Installation

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

The screws are either driven into the wood-based member of softwood without pre-drilling or in predrilled holes with a diameter not exceeding the inner thread diameter or rather into the wood-based member of hardwood in predrilled holes with a diameter minimally exceeding the inner thread diameter.

The screw holes in steel members shall be pre-drilled with an adequate diameter greater than the outer thread diameter.

The minimum penetration length of screws in the load-bearing wood-based members shall be 4 d.

Screws made of carbon steel with an outer thread diameter 5 mm ≤ d ≤ 16 mm may be driven into laminated veneer lumber LVL of beech or related products of hardwood with predrilling; screws with an outer thread diameter d = 8 mm (see Table A6.4) may be driven into laminated veneer lumber LVL of beech or related products of hardwood without predrilling.

At least four screws shall be used in a connection with screws (4 mm ≤ d ≤ 12 mm) inserted in the timber member with an angle between screw axis and grain direction of less than 15°. The penetration length of the threaded part of the partly or fully threaded screw shall be at least 20 d.

The use of only one screw in load-bearing connections is possible for screws (4 mm ≤ d ≤ 12 mm) loaded in axial direction and angles between grain direction and screw axis $\alpha \geq 15°$ provided that a minimum penetration length of the threaded part of the screw of 20 d can be ensured. Hereby, the load-bearing capacity of the screw must be reduced by 50%. This reduction is not necessary for screws used as reinforcement perpendicular to the grain of wood-based members.

To ensure a proper installation for screws with lengths of more than 800 mm a guiding hole of 5 d is recommended.

For mounting of steel plates and wood-based panels the screw head must be placed on top of these members.

The structural members which are connected with Schmid screws shall

- be in accordance with Clause 2.1;
- ensure minimum spacing and edge distances in accordance with EN 1995-1-1 and Annex 6.

2.3 Assumed working life

The provisions made in the European Technical Assessment (ETA) are based on an assumed intended working life of Schmid screws of 50 years, when installed in the works, provided that the screws are subject to appropriate installation, use and maintenance (see Clause 2.2). These provisions are based upon the current state of the art and the available knowledge and experience[4].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA nor by the Technical Assessment Body, but are regarded only as a means for choosing the appropriate products in relation to the expected economically reasonable working life of the works.

4 The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product can also be shorter than the assumed working life.

3 Performance of the product and reference to the methods used for its assessment

3.1 Essential characteristics of the product

Table 2: Essential characteristics of the product and product performance

№	Essential characteristic	Product performance
Basic requirement for construction works 1: Mechanical resistance and stability [1)]		
1	Dimensions	Annex 0 to Annex 5
2	Characteristic yield moment	Annex 6
3	Bending angle	Annex 6
4	Characteristic withdrawal parameter	Annex 6
5	Characteristic head pull-trough parameter	Annex 6
6	Characteristic tensile strength	Annex 6
7	Characteristic yield strength	Annex 6
8	Characteristic torsional strength	Annex 6
9	Insertion moment	Annex 6
10	Spacing, end and edge distances of the screws and minimum thickness of the wood based material	Annex 6
11	Slip modulus for mainly axially loaded screws	Annex 6
12	Durability against corrosion	3.1.1
Basic requirement for construction works 2: Safety in case of fire		
13	Reaction to fire	3.1.2
Basic requirement for construction works 4: Safety and accessibility in use		
14	Same as BWR 1	
[1)] These characteristics also relate to basic requirement 4 for construction works.		

3.1.1 Durability against corrosion

The product is intended to be used in service classes 1, 2 and 3 according to EN 1995-1-1.

The screws and washers made from carbon steel are electrogalvanized and yellow or blue passivated, coated with a zinc-nickel coating or hot-dip galvanised. The minimum thickness of the zinc coating of the screws is 5 µm and the minimum thickness of the zinc-nickel coating is 4 µm. The minimum thickness of the zinc coating of hot-dip galvanised screws is 55 µm.

Steel no. 1.4567 or 14578 or equivalent according to EN 10088-1 is used for screws made from stainless steel.

Durability of Schmid screws is in accordance with EN 1995-1-1 or national provisions that apply on the installation site.

3.1.2 Reaction to fire

Schmid screws are made from steel classified as Euroclass A1 in accordance with Commission Decision 96/603/EC, as amended by Commission Decision 2000/605/EC.

3.2 Assessment methods

3.2.1 General

The assessment of the essential characteristics in Clause 3.1 of the screws for use in timber constructions for the intended use, and in relation to the requirements for mechanical resistance and stability, for safety in case of fire and for safety and accessibility in use in use in the sense of the basic requirements for construction works № 1, 2 and 4 of Regulation (EU) № 305/2011 has been made in accordance with the European Assessment Document EAD 130118-01-0603, “Screws and threaded rods for use in timber constructions”.

3.2.2 Identification

The European Technical Assessment for the screws for use in timber constructions is issued on the basis of agreed data that identify the assessed product. Changes to materials, to composition, to characteristics of the product, or to the production process could result in these deposited data being incorrect. Österreichisches Institut für Bautechnik should be notified before the changes are implemented, as an amendment of the European Technical Assessment is possibly necessary.

4 Assessment and verification of constancy of performance (thereinafter AVCP) system applied, with reference to its legal base

4.1 System of assessment and verification of constancy of performance

According to Commission Decision 97/176/EC the system of assessment and verification of constancy of performance to be applied to “Schmid screws RAPID®, StarDrive GPR, StarDrive and SP” is System 3. System 3 is detailed in Commission Delegated Regulation (EU) № 568/2014 of 18 February 2014, Annex, 1.4., and provides for the following items

(a) The manufacturer shall carry out factory production control.

(b) The notified laboratory shall assess the performance on the basis of testing (based on sampling carried out by the manufacturer), calculation, tabulated values or descriptive documentation of the construction product.

4.2 AVCP for construction products for which a European Technical Assessment has been issued

Notified bodies undertaking tasks under System 3 shall consider the European Technical Assessment issued for the construction product in question as the assessment of the performance of that product. Notified bodies shall therefore not undertake the tasks referred to in point 4.1 (b).

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

5.1 Tasks for the manufacturer

5.1.1 Factory production control

In the manufacturing plant the manufacturer shall establish and continuously maintain a factory production control. All procedures and specifications adopted by the manufacturer shall be documented in a systematic manner. The factory production control shall ensure the constancy of performances of Schmid screws with regard to the essential characteristics.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the control plan. The incoming raw materials shall be subject to controls by the manufacturer before acceptance. Check of incoming materials shall include control of inspection documents presented by the manufacturer of the raw materials.

The frequencies of controls conducted during manufacturing and on the finalised product are defined by taking account of the manufacturing process of the product and are laid down in the control plan.

The results of factory production control are recorded and evaluated. The records include at least the following data:

- Designation of the product, basic materials and components
- Type of control or test
- Date of manufacture of the product and date of testing of the product or basic materials or components
- Results of controls and tests and, if appropriate, comparison with requirements
- Name and signature of person responsible for factory production control

The records shall be kept at least for ten years time after the construction product has been placed on the market. On request they shall be presented to Österreichisches Institut für Bautechnik.

5.1.2 Declaration of performance

The manufacturer is responsible for preparing the declaration of performance. When all the criteria of the assessment and verification of constancy of performance are met, the manufacturer shall issue a declaration of performance.

Issued in Vienna on 30.03.2022
by Österreichisches Institut für Bautechnik

The original document is signed by:

Rainer Mikulits

Managing Director

Table A0.1 Code system for Schmid screws

Code	Parameter	Code		Annex
I	Screw diameter	Dimension in 0.1 mm	DDD	0 to 6
II	Length	Dimension in mm	LLL	6
III	Thread length	Dimension in mm	bbb	-
IV	Head	Letters	A to T	1
V	Shank	Number	0 to 2	2
VI	Under head "Unterkopf"	Letters	A to T	1
VII	Compressor	Number	0 to 3	2
VIII	Thread	Letters	A to E	3
IX	Cutting groove	Number	0 or 1	3
X	Point	Letters	A to F	4
XI	Characteristic head pull-through parameter	Number	0	-
	90° head	Number	1	6, Table A6.8
	180° head and washer	Number	2	6, Table A6.9
XII	Other product characteristics	Letters	A to F	6, Table A6.1 to A6.4

Example: *RAPID® PT CS 5x70/37*

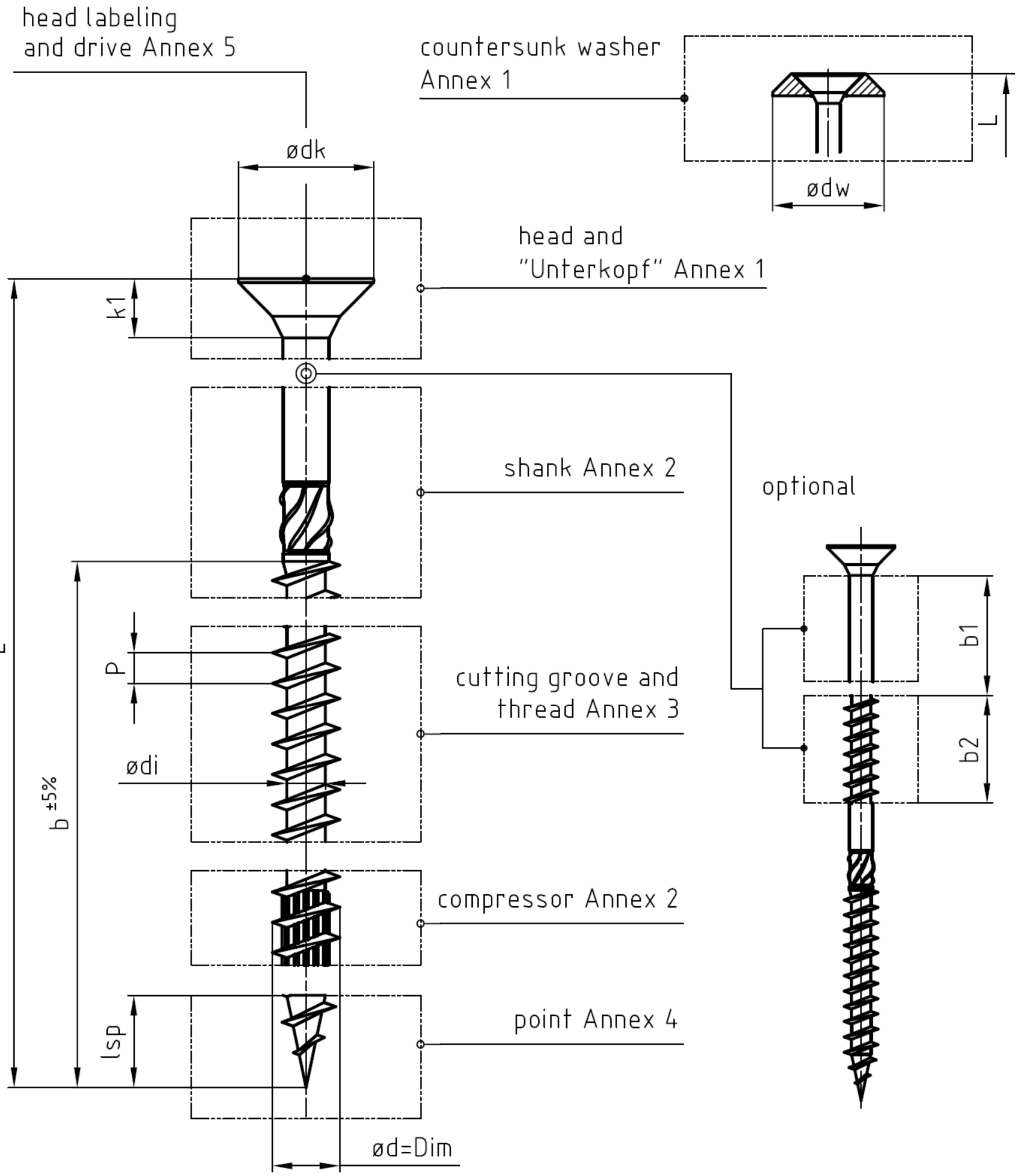
Code 050x070/037 A1B 0C1 A1C

Screw diameter	*5 mm*
Length	*70 mm*
Thread length	*37 mm*
Head	*Countersunk head d_k=10 mm, according to Annex 1, Table for head "A"*
Shank	*Shank with friction part*
Under head	*Cutter ribs according to head B*
Compressor	*without compressor*
Thread	*Double thread*
Cutting groove	*Thread with cutting groove*
Point	*Regular point*
Char. head pull-through parameter	*according to Annex 6, Table A6.8 (for 90° heads)*
Other product characteristics	*according to Annex 6, Table A6.2*

Table A0.2 Alternative code system for Schmid screws

Code long	**Code short**
RAPID fullthread countersunk head	RAPID FT CS
RAPID fullthread cylinderhead	RAPID FT CL
RAPID fullthread head type acc. to Annex 1 (e.g. small CS)	RAPID FT C
RAPID countersunk head	RAPID PT CS
RAPID washerhead	RAPID PT WH
RAPID Dual hexagonhead	RAPID PT Dual or RAPID PT HH
RAPID SuperSenkFix-head	RAPID PT SSF
RAPID head type acc. to Annex 1 (e.g. small CS)	RAPID PT C
StarDrive GPR countersunk head	StarDrive GPR CS
StarDrive GPR washerhead	StarDrive GPR WH
StarDrive GPR head type acc. to Annex 1 (e.g. small CS)	StarDrive GPR C
StarDrive head type acc. to Annex 1 (e.g. small CS)	StardDrive C
SP head type acc. to Annex 1 (e.g. small CS)	SP C

Example: *RAPID countersunk head 5x70/37*
RAPID PT CS 5x70/37



Schmid screws schmid schrauben hainfeld	Annex 0 of European Technical Assessment ETA-12/0373 of 30.03.2022
Code system and screw assembly	

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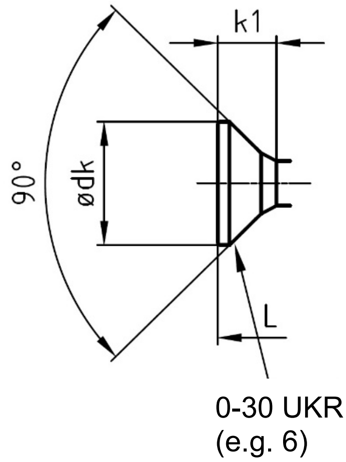
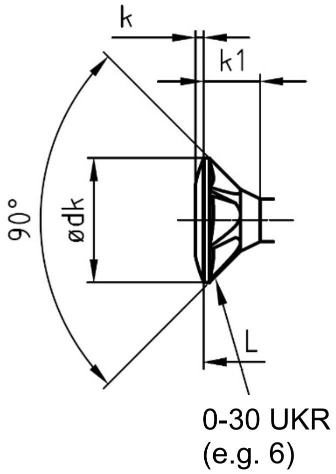
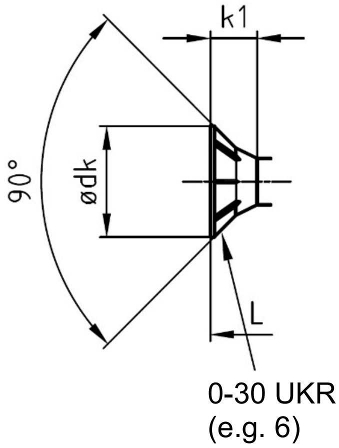
head "A"
countersunk head



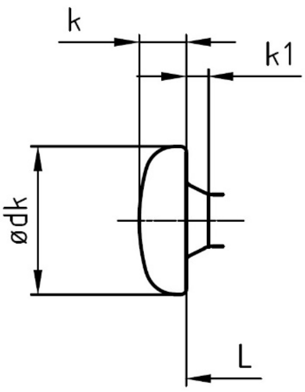
head "B"
countersunk head
with raise



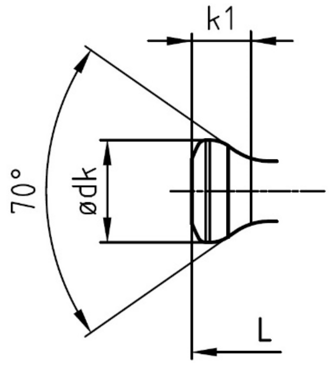
head "C"
small countersunk head



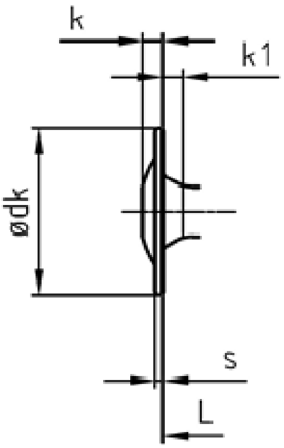
head "D"
pan head



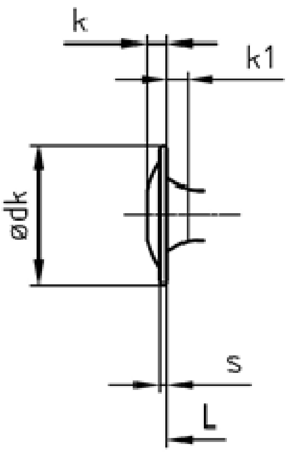
head "E"
pear head



head "F"
washer head



head "G"
small washer head



UKR…cutter ribs

Schmid screws schmid schrauben hainfeld	Annex 1 of European Technical Assessment ETA-12/0373 of 30.03.2022
Screw head geometry	

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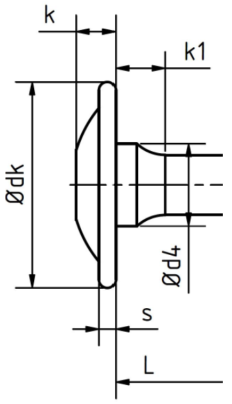
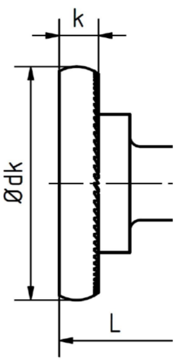
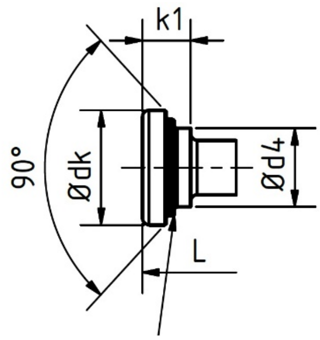
head “G1”
small washer head
with thick shaft



head “G2”
staggered head
with saw tooth

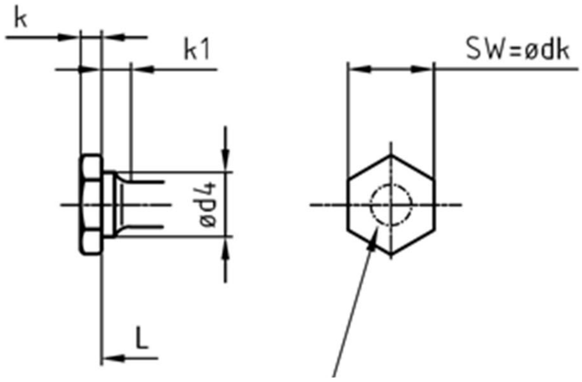


head “H”
universal head
with thick shaft



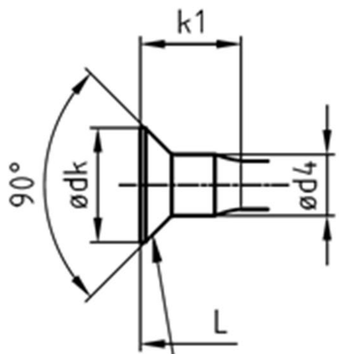
0-30 UKR
(e.g. 6)

head “J”
kombi hexagonal head
with thick shaft



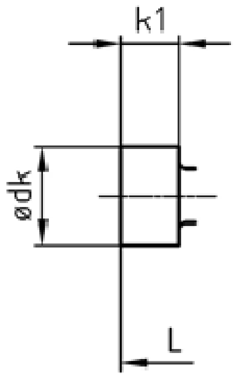
drive types
see Annex 5

head “K”
countersunk head
with thick shaft



0-30 UKR
(e.g. 6)

head “L”
cylinder head



Schmid screws schmid schrauben hainfeld	Annex 1 of European Technical Assessment ETA-12/0373 of 30.03.2022
Screw head geometry	

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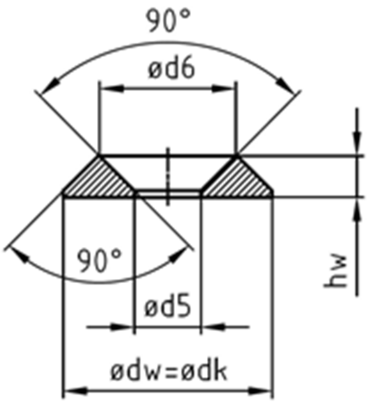
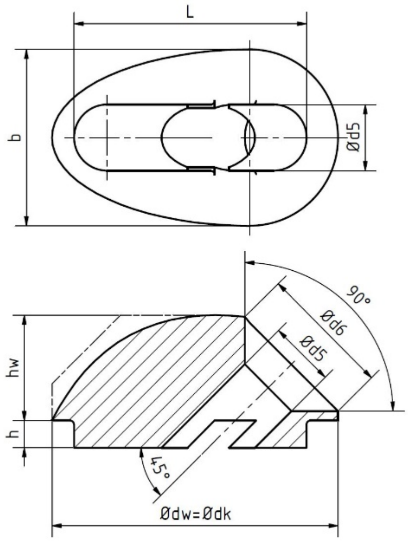
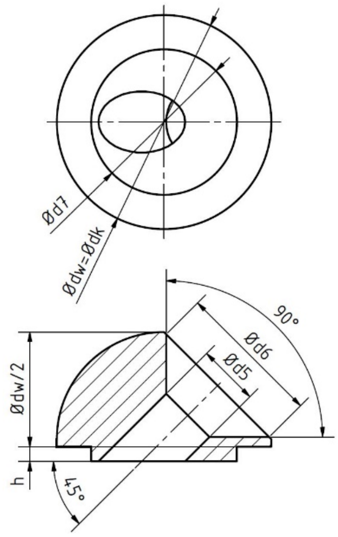
head “M”
countersunk washer



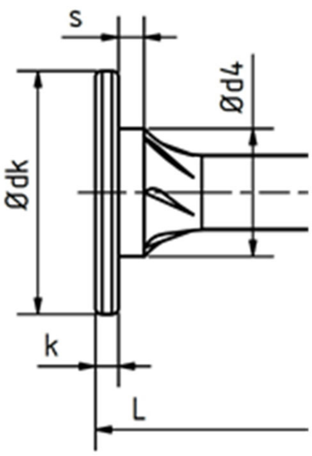
head “M 45° oval”
inclined washer



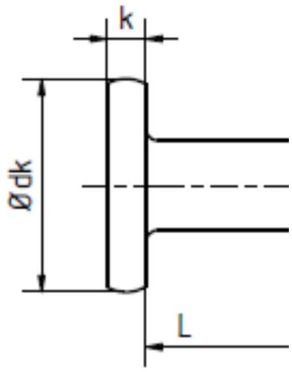
head “M 45° round”
inclined washer



head “N”
SuperSenkFix head

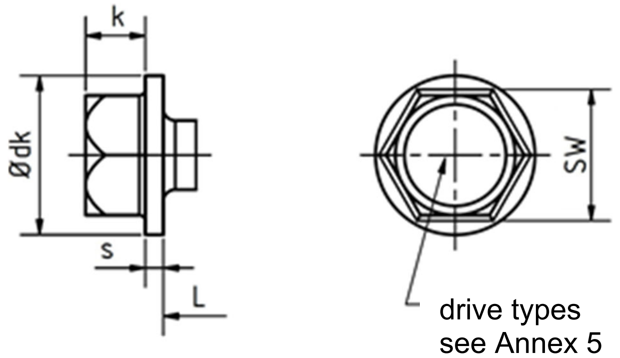


head “O”
flat head

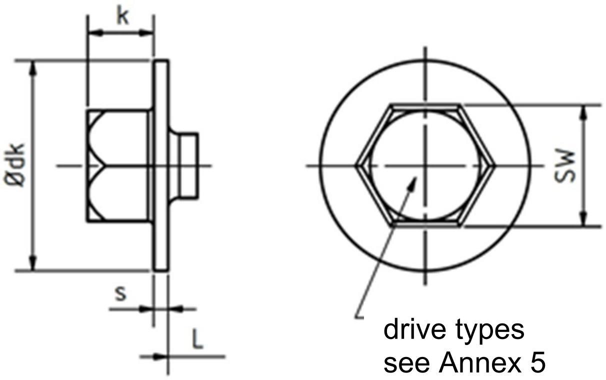


Schmid screws schmid schrauben hainfeld	Annex 1 of European Technical Assessment ETA-12/0373 of 30.03.2022
Screw head geometry	

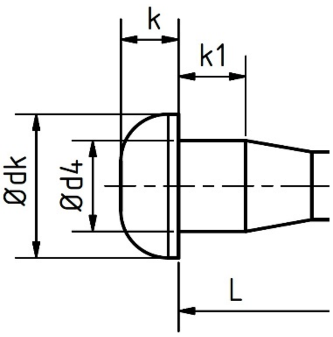
head “P”
hexagonal head
with washer
alternative with T-drive



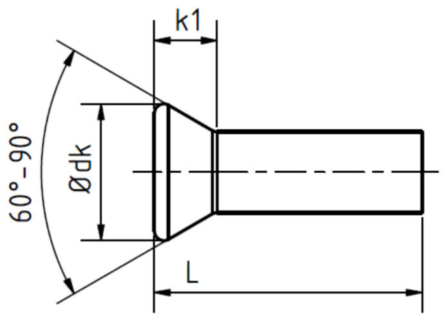
head “R”
hexagonal head
with large washer
alternative with T-drive



head “S”
round pan head
with thick shaft



head “T”
60°-90° countersunk head



Schmid screws schmid schrauben hainfeld	Annex 1 of European Technical Assessment ETA-12/0373 of 30.03.2022
Screw head geometry	

Dim	head "A" countersunk head		head "B" countersunk head with raise			head "C" small countersunk head		head "D" pan head			head "E" pear head	
	Ødk	k1	Ødk	k	k1	Ødk	k1	Ødk	k	k1	Ødk	k1
4,0	8.0 ±0.70	3.0 ±0.30	8.0 ±0.70	1.0 ±0.50	4.0 ±0.40	7.0 ±0.60	2.6 ±0.26	8.0 ±0.55	2.8 ±0.28	1.2 ±0.24		
4,5	9.0 ±0.70	3.5 ±0.35	9.0 ±0.70	1.2 ±0.50	4.5 ±0.45	8.0 ±0.70	3.0 ±0.30	9.0 ±0.60	3.0 ±0.30	1.4 ±0.28		
5,0	10.0 ±0.80	4.5 ±0.45	10.0 ±0.80	1.2 ±0.50	5.5 ±0.55	9.0 ±0.70	3.5 ±0.35	10.0 ±0.65	3.5 ±0.35	1.5 ±0.30		
6,0	12.0 ±0.90	5.5 ±0.55	12.0 ±0.90	1.4 ±0.60	6.6 ±0.66	11,0 ±0.80	4.5 ±0.45	12.0 ±0.70	4.1 ±0.41	1.7 ±0.34	10.3 ±0.51	7.0 ±1.0
7,0	14.0 ±1.00	6.0 ±0.60	14.0 ±1.00	1.6 ±0.70	7.2 ±0.72	12.0 ±0.90	5.5 ±0.55	14.0 ±0.85	4.5 ±0.45	2.1 ±0.42	11.0 ±0.55	7.2 ±1.2
8,0	15.0 ±1.20	7.0 ±0.70	15.0 ±1.20	2.0 ±0.80	8.3 ±0.83	14.0 ±1.00	6.0 ±0.60				11.5 ±0.65	7.5 ±1.2
10,0	18.5 ±1.50	9.0 ±0.90	18.5 ±1.50	2.5 ±0.90	10.5 ±1.05	15.0 ±1.20	7.0 ±0.70				12.0 ±0.75	9.5 ±1.5
12,0	21.0 ±2.00	10.0 ±1.00	21.0 ±2.00	2.8 ±1.00	12.0 ±1.20	18.5 ±1.50	9.0 ±0.90				16.0 ±0.90	13.0 ±2.0
16,0	26.0 ±2.50	11.0 ±1.10				20.0 ±2.00	7.0 ±0.70					

Dim	head "F" washer head				head "G0" small washer head				head "G1" small washer head with thick shaft				
	Ødk	k	k1	s	Ødk	k	k1	s	Ødk	k	Ød4	k1	s
4,0	11.0 ±0.60	2.2 ±0.8	1.1 ±0.6	1.1 ±0.6	9.6 ±0.50	2.2 ±0.8	1.1 ±0.6	1.1 ±0.6					
4,5	12.0 ±0.70	2.4 ±0.8	1.2 ±0.6	1.3 ±0.6	10.8 ±0.60	2.4 ±0.8	1.2 ±0.6	1.3 ±0.6					
5,0	14.0 ±0.80	2.6 ±0.9	1.2 ±0.6	1.3 ±0.6	12.5 ±0.70	2.6 ±0.9	1.2 ±0.6	1.3 ±0.6	12.5 ±0.70	2.6 ±0.9	5.0 ±0.50	4.0 ±1.0	1.3 ±0.6
6,0	17.0 ±1.00	3.0 ±1.0	1.4 ±0.8	1.5 ±0.8	14.0 ±0.80	3.0 ±1.0	1.4 ±0.8	1.5 ±0.8	14.0 ±0.80	3.0 ±1.0	6.0 ±0.60	4.7 ±1.0	1.5 ±0.8
7,0	18.0 ±1.20	3.3 ±1.0	1.8 ±0.9	1.5 ±0.8	17.0 ±1.00	3.3 ±1.0	1.8 ±0.9	1.5 ±0.8	17.0 ±1.00	3.3 ±1.0	7.0 ±0.70	5.4 ±1.0	1.5 ±0.8
8,0	22.0 ±1.50	3.5 ±1.0	1.9 ±1.0	2.0 ±0.9	20.0 ±1.50	3.5 ±1.0	1.9 ±1.0	2.0 ±0.9	20.0 ±1.50	3.5 ±1.0	8.0 ±0.80	6.3 ±1.0	2.0 ±0.9
10,0	27.0 ±2.00	4.7 ±1.2	2.6 ±1.5	2.0 ±0.9	25.0 ±2.00	4.5 ±1.2	2.6 ±1.5	2.0 ±0.9	25.0 ±2.00	4.5 ±1.2	10.0 ±1.00	8.0 ±1.5	2.0 ±0.9
12,0	30.0 ±2.00	5.8 ±1.5	3.5 ±1.7	2.5 ±0.9	27.0 ±2.00	4.7 ±1.2	3.0 ±1.6	2.5 ±0.9	27.0 ±2.00	4.7 ±1.2	12.0 ±1.20	10.0 ±2.0	2.5 ±0.9

Dim	head "G2" staggered head with saw tooth		head "H" universal head with thick shaft			head "J" kombi hexagonal head with thick shaft				head "K" countersunk head with thick shaft		
	Ødk	k	Ødk	k1	Ød4	SW=Ødk	k	k1	Ød4	Ødk	k1	Ød4
4,0	8.5 ±0.5	1.9 ±0.6								8.0 ±0.7	7.5 ±0.9	4.0 ±0.40
4,5	9.5 ±0.5	2.0 ±0.6								9.0 ±0.7	8.2 ±1.0	4.5 ±0.45
5,0	10.5 ±0.6	2.2 ±0.8				7.0 -0.35	2.0 ±1.3	4.0 ±1.0	5.0 ±0.5	10.0 ±0.8	8.8 ±1.0	5.0 ±0.50
6,0	13.0 ±0.7	2.4 ±0.8	9.5 ±0.47	5.5 ±1.0	6.0 ±0.6	9.0 -0.45	3.0 ±1.3	4.7 ±1.0	6.0 ±0.6	12.0 ±0.9	10.0 ±1.3	6.0 ±0.60
7,0			11.0 ±0.55	6.0 ±1.3	7.0 ±0.7	10.0 -0.50	4.0 ±1.3	5.4 ±1.0	7.0 ±0.7	13.0 ±1.0	11.3 ±1.5	7.0 ±0.70
8,0	18.0 ±1.2	2.6 ±0.9	12.5 ±0.62	7.0 ±1.5	8.0 ±0.8	12.0 -0.60	4.5 ±1.3	6.3 ±1.0	8.0 ±0.8	14.0 ±1.2	12.5 ±1.5	7.5 ±0.75
10,0	22.0 ±1.5	3.3 ±1.0	15.0 ±0.75	8.0 ±1.8	10.0 ±1.0	15.0 -0.75	5.0 ±1.3	8.0 ±1.5	10.0 ±1.0	18.5 ±1.5	15.0 ±2.0	10.0 ±1.00
12,0			17.0 ±0.85	9.0 ±2.0	12.0 ±1.2	17.0 -0.85	5.5 ±1.3	10.0 ±2.0	12.0 ±1.2	21.0 ±2.0	17.5 ±2.3	20.0 ±1.20
16,0						22.0 -1.10	8.0 ±1.3	12.0 ±2.4	16.0 ±1.6			

Schmid screws

schmid schrauben hainfeld

Screw head geometry

Annex 1

of European Technical Assessment
ETA-12/0373 of 30.03.2022

Dim	head "L" cylinder head		head "M" countersunk washer				head "N" Supersenkfix head			
	Ødk	k1	Ødw=Ødk	Ød5	Ød6	hw	Ødk	Ød4	k	s
4,0										
4,5										
5,0										
6,0	8.15 ±0.40	4.7 ±0.8	22.0 ±2.0	8.5 ±2.0	13.5 ±1.5	4.5 ±1.0	13.0 ±0.65	8.0 ±0.4	1.8 ±1.0	1.8 ±0.3
7,0	9.2 ±0.46	6.0 ±0.9	25.0 ±2.0	9.0 ±2.0	16.0 ±1.6	5.5 ±1.0				
8,0	10.2 ±0.51	7.5 ±1.0	28.0 ±2.0	10.0 ±2.0	17.5 ±2.0	5.5 ±1.0	19.0 ±1.5	10.0 ±0.5	2.4 ±1.0	2.4 ±0.3
10,0	13.4 ±0.67	8.0 ±1.0	35.0 ±3.0	12.0 ±2.0	22.5 ±2.2	6.5 ±1.5	24.0 ±2.5	13.0 ±0.65	3.0 ±1.0	3.0 ±0.3
12,0	14.2 ±0.71	10.0 ±1.5	42.0 ±3.0	14.0 ±2.0	25.0 ±2.5	7.5 ±1.5	26.0 ±2.5	13.0 ±0.65	3.0 ±1.0	3.0 ±0.3
16,0										

Dim	head "M 45° round" inclined washer head					head "M 45° oval" inclined washer head							head "O" flat head	
	Ødw=Ødk	Ød5	Ød6	Ød7	h	Ødw=Ødk	b	hw	L	Ød5	Ød6	h	Ødk	k
4,0														
4,5														
5,0														
6,0	20.0 ±2.0	7.0 ±1.0	12.0 ±1.2	13.0 ±1.3	1.9 ±0.5	30.0 ±3.0	17.0 ±1.7	13.5 ±1.4	22.7 ±2.7	7.0 ±1.0	14.5 ±1.5	2.7 ±0.5		
7,0													13.0 ±0.65	2.5 ±0.5
8,0	25.0 ±2.5	9.0 ±1.0	15.0 ±1.5	16.0 ±1.6	1.9 ±0.5	39.0 ±3.9	24.0 ±2.4	16.0 ±1.6	31.7 ±3.2	9.0 ±1.0	19.0 ±1.9	3.7 ±0.5	16.0 ±0.80	3.0 ±0.6
10,0	32.0 ±3.2	11.5 ±1.5	19.0 ±1.9	20.0 ±2.0	2.4 ±0.5	52.0 ±5.2	29.0 ±2.9	21.4 ±2.2	43.7 ±4.4	11.5 ±1.5	24.0 ±2.4	4.7 ±0.5		
12,0	36.0 ±3.6	13.5 ±1.5	21.0 ±2.1	23.0 ±2.3	2.4 ±0.5	59.0 ±5.9	30.0 ±3.0	23.5 ±2.4	49.7 ±5.0	13.5 ±1.5	26.0 ±2.6	5.6 ±0.5		
16,0													25.0 ±2.00	8.0 ±1.0

NOTE: head “M 45° round” can alternatively be of cylindrical shape with dw

Dim	head "P" hexagonal head with washer				head "R" hexagonal head with large washer				head "S" round pan head with thick shaft				head "T" 60-90° countersunk head	
	Ødk	k	s	SW	Ødk	k	s	SW	Ødk	k	k1	Ød4	Ødk	k1
4,0													6.8 ±0.4	3.3 ±0.6
5,0									7.5 ±0.5	3.0 ±0.5	3.2 ±0.5	4.7 ±0.5		
5,5													7.5 ±0.5	4.0 ±0.8
7,5	13.0 ±0.65	5.0 ±1.3	1.3 ±0.2	10 ±0.2	18.0 ±0.9	5.0 ±1.3	1.3 ±0.2	10 ±0.2					10.0 ±0.5	5.0 ±1.0
8,0					19.0 ±0.95	5.3 ±1.3	1.3 ±0.2	13 ±0.2					12.0 ±0.6	4.0 ±0.8
9,5	16.0 ±0.8	7.0 ±1.3	1.5 ±0.3	13 ±0.2	21.0 ±1.05	7.0 ±1.3	1.5 ±0.3	13 ±0.2						
10,0	19.0 ±0.95	5.3 ±1.3	1.3 ±0.2	13 ±0.2									14.0 ±0.7	8.0 ±1.6
12,0													16.0 ±0.8	9.3 ±1.8

Schmid screws

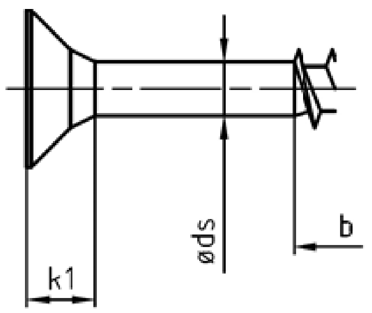
schmid schrauben hainfeld

Screw head geometry

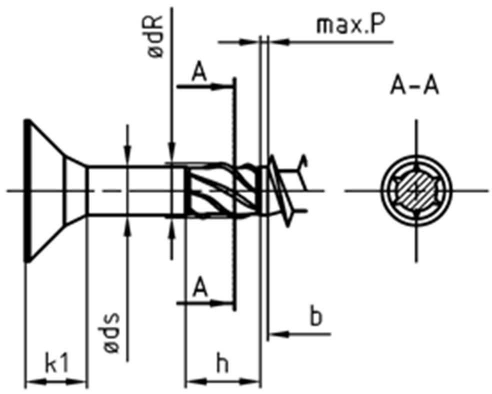
Annex 1

of European Technical Assessment ETA-12/0373 of 30.03.2022

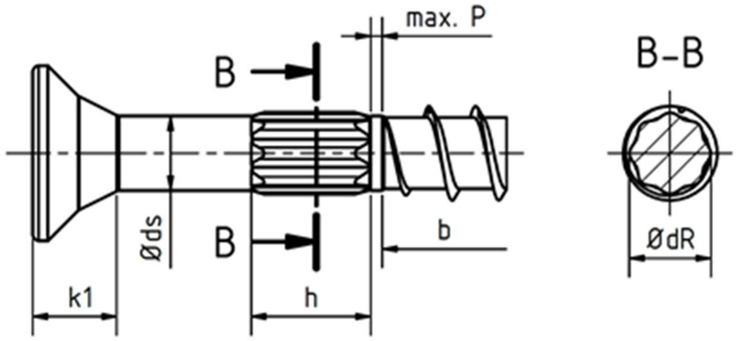
shank without
friction part “0”



shank with
friction part “1”



shank with alternative
friction part “2”



Number of flanks: 5-8

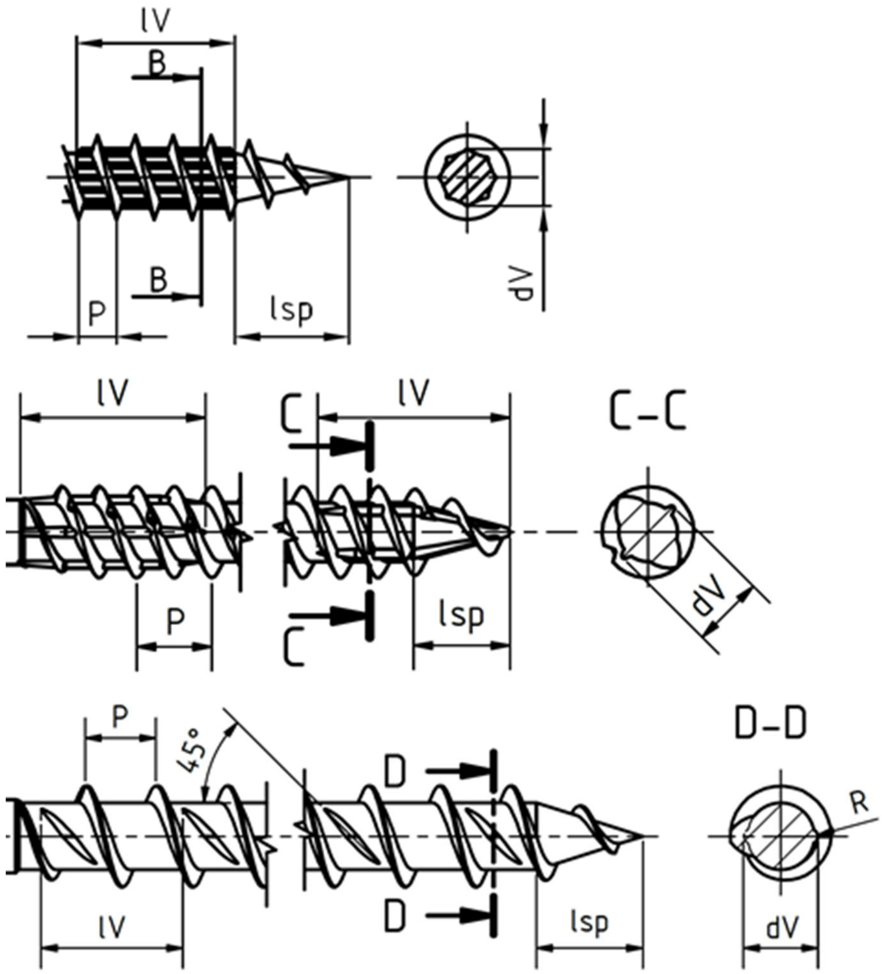
Dim	Øds	friction part "1"			friction part "2"	
		ØdR	h	alternativ h	ØdR	h
4,0	2.8 ±0.14	3.2 ±0.3	6.2 ±1.0	3.4 ±1.0	3.1 ±0.3	6.2 ±1.0
4,5	3.2 ±0.16	3.6 ±0.3	8.2 ±1.0	3.8 ±1.0	3.5 ±0.3	8.2 ±1.0
5,0	3.5 ±0.17	4.1 ±0.4	8.2 ±1.0	4.2 ±1.0	3.9 ±0.4	8.2 ±1.0
6,0	4.3 ±0.21	5.0 ±0.5	10.2 ±1.0	5.0 ±1.0	4.7 ±0.5	10.2 ±1.0
7,0	5.0 ±0.25	6.0 ±0.6	10.2 ±1.0		5.4 ±0.5	10.2 ±1.0
8,0	5.9 ±0.29	6.8 ±0.6	10.2 ±1.0		6.2 ±0.6	10.2 ±1.0
8.0*	6.4 ±0.32				7.0 ±0.7	10.2 ±1.0
10,0	7.1 ±0.35	8.3 ±0.8	10.2 ±1.0		7.7 ±0.8	10.2 ±1.0
12,0	8.2 ±0.41	9.7 ±0.9	14.2 ±1.0		9.0 ±0.9	14.2 ±1.0
16,0	11.5 ±0.58	13.3 ±1.3	14.2 ±1.0		12.3 ±1.3	14.2 ±1.0

* alternative shank diameter

„2“ screw assembly: screw head, support thread, shank with friction part
see Annex 0
for screws with 2 threads b1 = 0

Schmid screws schmid schrauben hainfeld	Annex 2 of European Technical Assessment ETA-12/0373 of 30.03.2022
Shank and compressor geometry	

OiB
Member of EOTA



with compressor “1”

with alternative compressor “2”

with alternative compressor “3”

without compressor “0”

Dim	dV
4,0	2.9 ±0.29
4,5	3.2 ±0.32
5,0	3.7 ±0.37
6,0	4.4 ±0.43
7,0	5.0 ±0.50
8,0	6.0 ±0.60
10,0	7.1 ±0.72
12,0	7.9 ±0.80
16,0	11.8 ±1.20

number of flanks: 4-8
lV = 2P to 4P

thread types according to Annex 3
lsp (lp) according to Annex 4

Schmid screws

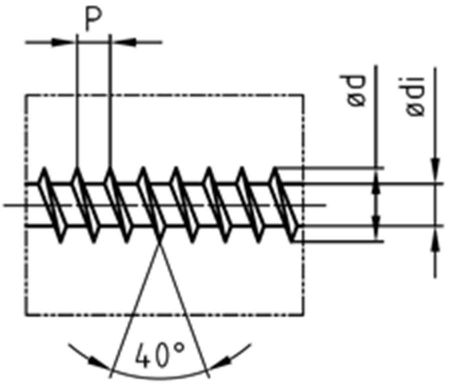
schmid schrauben hainfeld

Shank and compressor geometry

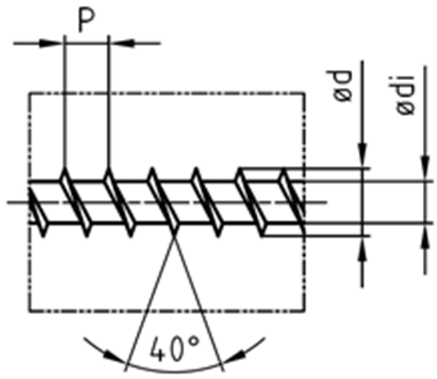
Annex 2

of European Technical Assessment
ETA-12/0373 of 30.03.2022

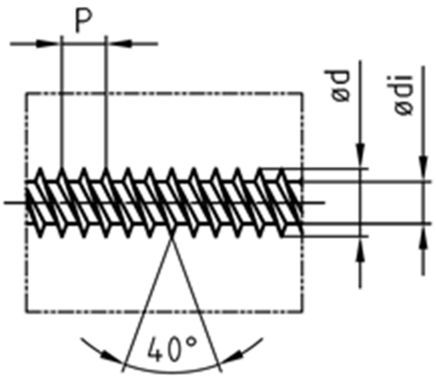
thread “A”
single thread



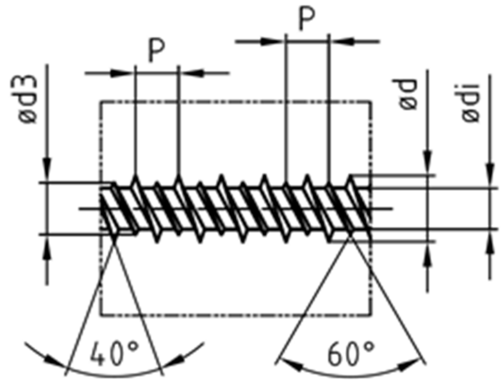
thread “B”
coarse thread



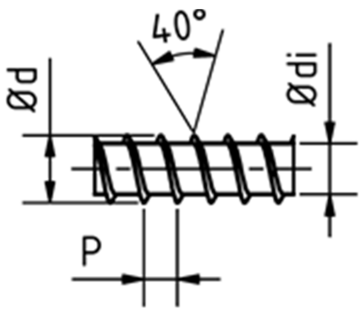
thread “C”
double thread



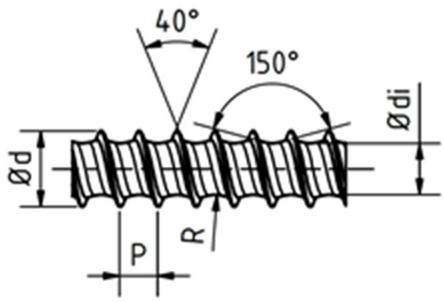
thread “D”
HiLo thread



thread “E”
hardwood and ductile thread

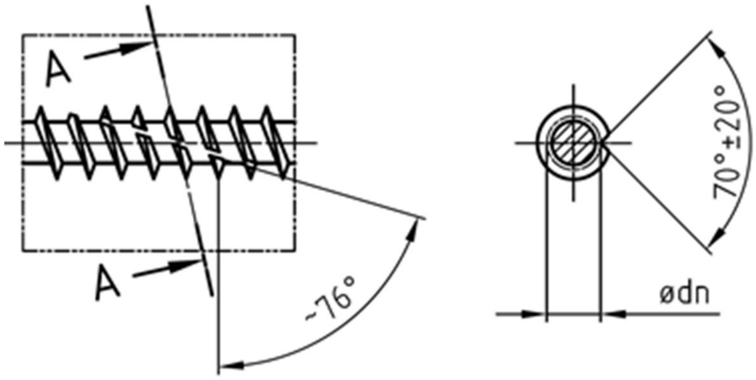


thread “E” alternative
with rounded thread ground



Schmid screws schmid schrauben hainfeld	Annex 3 of European Technical Assessment ETA-12/0373 of 30.03.2022
Thread and cutting groove geometry	

thread with cutting groove “1” (without cutting groove “0”)



Dim	Ød	thread "A" single thread		thread "B" coarse thread		thread "C" double thread	
		Ødi	P	Ødi	P	Ødi	P
4,0	4.0 ±0.20	2.55 ±0.15	1.8 ±0.18	2.50 ±0.15	2.2 ±0.22	2.50 ±0.15	3.4 ±0.34
4,5	4.5 ±0.22	2.75 ±0.15	2.0 ±0.20	2.70 ±0.15	2.4 ±0.24	2.75 ±0.15	3.8 ±0.38
5,0	5.0 ±0.25	3.15 ±0.16	2.2 ±0.22	3.25 ±0.17	2.7 ±0.27	3.05 ±0.16	4.2 ±0.42
6,0	6.0 ±0.30	3.80 ±0.19	2.6 ±0.26	3.95 ±0.20	3.6 ±0.36	3.75 ±0.19	5.0 ±0.50
7,0	7.0 ±0.35	4.35 ±0.22	3.3 ±0.33	4.40 ±0.22	4.6 ±0.46	4.30 ±0.22	6.4 ±0.64
8,0	8.0 ±0.40	5.10 ±0.26	3.8 ±0.38	5.30 ±0.26	5.6 ±0.56	5.20 ±0.26	7.8 ±0.78
10,0	10.0 ±0.60	6.30 ±0.31	4.6 ±0.46	6.20 ±0.50	6.6 ±0.66	6.10 ±0.31	9.7 ±0.97
12,0	12.0 ±0.70	7.00 ±0.35	6.0 ±0.60	6.90 ±0.60	6.6 ±0.66	6.80 ±0.34	13.4 ±1.34
16,0	15.5 ±0.80	10.70 ±0.53	8.0 ±0.80	10.70 ±0.53	9.0 ±0.90		

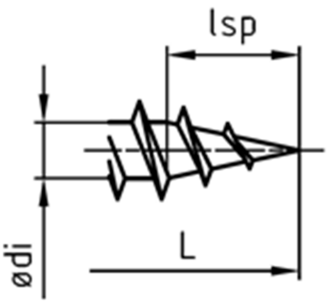
Dim	thread "D" HiLo thread			thread "E" hardwood and ductile thread		cutting groove
	Ødi	Ød3	P	Ødi	P	Ødn
4,0	2.45 ±0.15	3.3 ±0.16	3.4 ±0.34	3.00 ±0.15	2.0 ±0.20	3.7 ±0.37
4,5	2.75 ±0.15	3.7 ±0.18	3.8 ±0.38	3.40 ±0.17	2.2 ±0.22	4.1 ±0.41
5,0	3.25 ±0.16	4.1 ±0.20	4.2 ±0.42	3.80 ±0.19	2.5 ±0.25	4.5 ±0.45
6,0	4.00 ±0.20	5.0 ±0.25	5.0 ±0.50	4.50 ±0.23	3.0 ±0.30	5.4 ±0.54
7,0	4.40 ±0.22	5.4 ±0.27	5.4 ±0.54	5.30 ±0.27	3.5 ±0.35	6.3 ±0.63
8,0	5.35 ±0.28	6.8 ±0.34	6.7 ±0.67	6.10 ±0.31	4.0 ±0.40	7.2 ±0.72
10,0	6.20 ±0.31	7.9 ±0.40	7.7 ±0.77	7.20 ±0.36	5.0 ±0.50	8.6 ±0.86
10.0*	6.80 ±0.34	7.9 ±0.40	7.9 ±0.79			8.6 ±0.86
12,0	7.10 ±0.36	9.1 ±0.46	8.7 ±0.87	8.20 ±0.41	6.0 ±0.60	8.9 ±0.89
12.0*	7.80 ±0.39	9.1 ±0.46	8.7 ±0.87			9.6 ±0.96
16,0				10.70 ±0.54	8.0 ±0.80	13.0 ±1.30

* alternative shank diameter

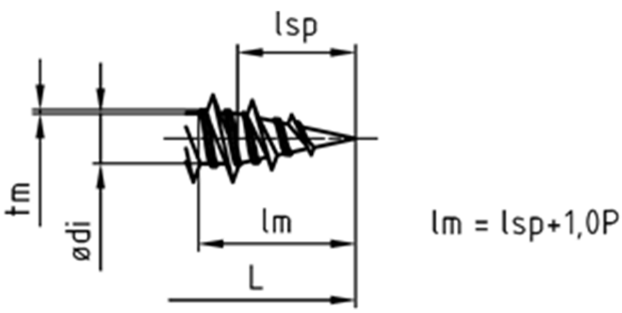
Ød…similar for all threads

Schmid screws schmid schrauben hainfeld	Annex 3 of European Technical Assessment ETA-12/0373 of 30.03.2022
Thread and cutting groove geometry	

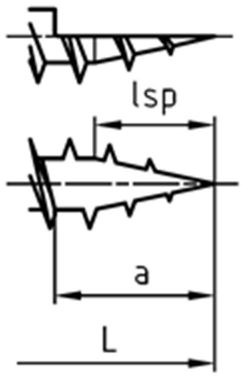
point "A"
regular point



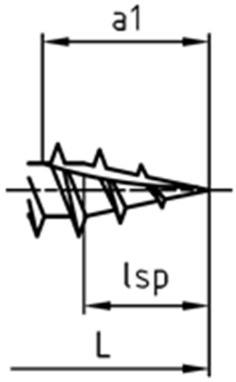
point "B"
milling thread



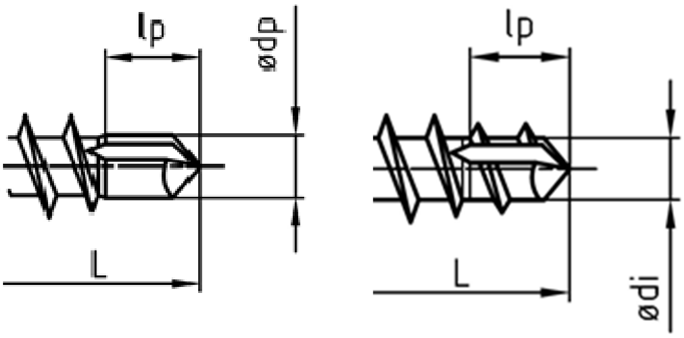
point "C"
half cut (HSP)



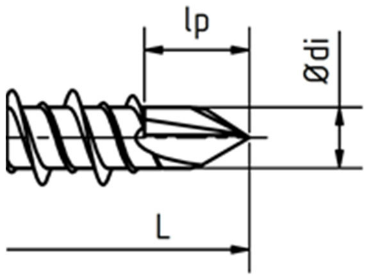
point "D"
scraping



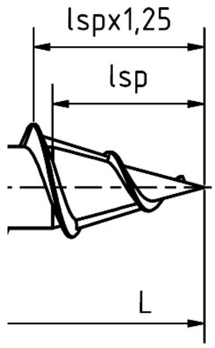
point "E"
drill point
(alternative with thread)



point "F"
drill point 1



point "G"
drill point 2



Schmid screws schmid schrauben hainfeld	Annex 4 of European Technical Assessment ETA-12/0373 of 30.03.2022
Point geometry	

Dim	lsp	a	a1	tm	lp	Ødp
4,0	4.6 ±1.5	5.4 ±2.0	8.5 ±2.0	0.20 ±0.05	3.3 ±1.0	2.8 ±0.28
4,5	5.0 ±1.6	6.0 ±2.0	9.0 ±2.0	0.30 ±0.05	3.9 ±1.0	3.1 ±0.31
5,0	6.0 ±1.7	7.0 ±2.0	10.5 ±2.0	0.35 ±0.07	4.5 ±1.5	3.4 ±0.34
6,0	7.3 ±1.9	8.5 ±2.0	12.5 ±2.5	0.30 ±0.07	6.0 ±2.0	4.1 ±0.41
7,0	7.0 ±2.0	9.5 ±2.0	14.3 ±2.5	0.40 ±0.10	6.0 ±2.5	5.0 ±0.50
8,0	8.2 ±2.1	11.0 ±2.5	16.5 ±3.0	0.60 ±0.12	6.0 ±3.0	6.0 ±0.60
10,0	10.1 ±2.3	13.0 ±3.0	19.5 ±3.0	0.60 ±0.12	6.0 ±3.0	7.2 ±0.72
12,0	11.2 ±2.6	15.0 ±3.0	22.5 ±3.0	0.60 ±0.12	6.0 ±3.0	8.3 ±0.83
16,0	15.0 ±3.5	16.0 ±3.0	23.5 ±3.0	0.60 ±0.12	6.0 ±3.0	11.5 ±1.15

lsp (lp) = similar for all points
P and ∅di according to Annex 3

Schmid screws

schmid schrauben hainfeld

Point geometry

Annex 4

of European Technical Assessment
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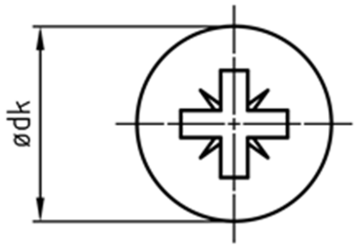
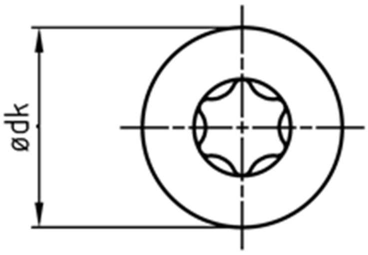
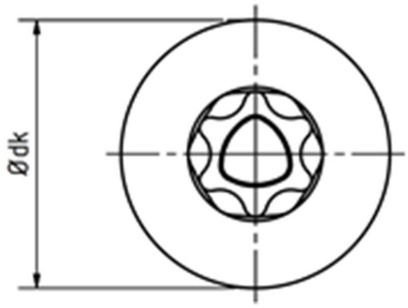
KS-Drive



T-Drive



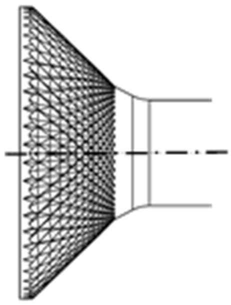
T-Drive alternative with Pin



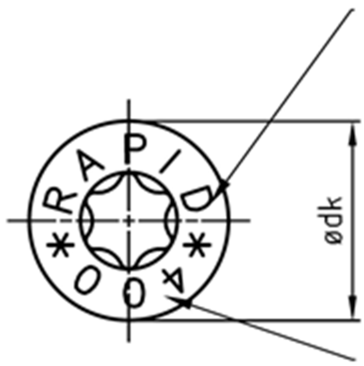
Dim	KS	T / special drive
4,0	KS 2	T10 / T15 / T20
4,5	KS 2	T15 / T20 / T25
5,0	KS 2	T20 / T25 / T30
6,0	KS 3	T20 / T25 / T30
7,0	KS 3	T25 / T30
8,0	KS 4	T30 / T40
10,0	KS 4	T40 / T50
12,0	KS 4	T40 / T50 / T55
16,0	KS 4	T50 / T55 / T60

head labelling optional

alternative UKR



e.g.: supplier code, label



e.g.: length

Schmid screws schmid schrauben hainfeld	Annex 5 of European Technical Assessment ETA-12/0373 of 30.03.2022
Drive types and head labelling	

A.6 Load bearing capacity of Schmid screws

The characteristic load bearing capacities in Tables A6.1 to A6.4 are given for timber of strength class C24 according to EN 338 ($\rho_{k,ref}$ = 350 kg/m³) unless specified otherwise in the following.

If relevant, the design block shear failure resistance of a timber member has to be proven.

Table A6.1: Characteristic load bearing capacities of Schmid screws RAPID fullthread; screw diameter 6 to 16 mm

Product characteristic [1]				Screw diameter [2]				
				6	8	10	12	16
Max. length	carbon steel	l_{max}	mm	220	1000	1000	1000	500 [5]
	stainless steel			-	300	510	-	-
Characteristic tensile strength	carbon steel	$f_{tens,k}$	kN	12.5	24.1	40.0	46.7 45.0 [4]	88.6
	stainless steel			-	13.5	18.5	-	-
Characteristic yield moment	carbon steel	$M_{y,k}$	Nm	10.0	20.3	36.7	48.5	112.9
	stainless steel			-	- [6]	- [6]	-	-
Characteristic withdrawal parameter angle screw-axis to grain: 90° ($\rho_{k,ref}$ = 350 kg/m³)		$f_{ax,k,90°}$	N/mm²	13.5	13.1	12.5	11.2	11.0
Characteristic yield strength		$f_{y,k}$	N/mm²	950 (carbon steel) - (stainless steel)				
Characteristic torsional strength	carbon steel	$f_{tor,k}$	Nm	10.5	25.8	55.0	73.0	194.7
	stainless steel			-	17.5	27.0	-	-
Ratio characteristic torsional strength to mean insertion moment	carbon steel $\rho_{k,ref}$ = 450 kg/m³ $\rho_{k,ref}$ = 480 kg/m³	$f_{tor,k}$ / $R_{tor,m}$	-	≥ 1.5 -	≥ 1.5 -	≥ 1.5 -	≥ 1.5 -	- ≥ 1.5
	stainless steel $\rho_{k,ref}$ = 480 kg/m³ $\rho_{k,ref}$ = 534 kg/m³ [3]			- -	≥ 1.5 -	≥ 1.5 ≥ 1.5 [3]	- -	- -
Slip modulus		K_{ser}	N/mm	see A.6.1.7				

[1] Product characteristic group D (6 mm) and E according to ETA-12/0373 of 03.11.2017.
[2] For intermediate screw diameters the conservative value of the next screw diameter may be used.
[3] Max. screw length is 440 mm.
[4] RAPID T-Lift with full thread.
[5] Max. length without predrilling. If predrilling with a diameter 11 mm is applied, l_{max} can be increased up to 1000 mm.
[6] Calculation is possible according to Eurocode 5, Equation (8.14) for round cross section. ($d = d_i$, f_u = 600 N/mm²).

Schmid screws schmid schrauben hainfeld	Annex 6 of European Technical Assessment ETA-12/0373 of 30.03.2022
Characteristic data of the screws	

Table A6.2: Characteristic load bearing capacities of Schmid screws RAPID PT; screw diameter 4 to 12 mm

Product characteristic [1]				Screw diameter [2]						
				4	4.5	5	6	8	10	12
Max. length	carbon steel	l_{max}	mm	70	80	120	300	600 [5]	600 [5]	600 [5]
	stainless steel			-	-	-	-	440	450	-
Characteristic tensile strength	carbon steel	$f_{tens,k}$	kN	5.0	7.0	8.8	13.1	23.3	35.0	42.0
	stainless steel			-	-	-	-	13.5	21.0	-
Characteristic yield moment	carbon steel	$M_{y,k}$	Nm	3.1	4.2	5.9	10.7	22.6	33.6	46.9
	stainless steel			-	-	-	-	- [6]	- [6]	-
Characteristic withdrawal parameter angle screw-axis to grain: 90° ($\rho_{k,ref}$ = 350 kg/m³)		$f_{ax,k,90°}$	N/mm²	14.3	13.3	13.6	13.0	10.9	11.0	8.9 [3] 11.2 [4]
Characteristic yield strength		$f_{y,k}$	N/mm²	900 (carbon steel) - (stainless steel)						
Characteristic torsional strength	carbon steel	$f_{tor,k}$	Nm	3.5	4.9	6.6	10.9	28.0	52.5	59.6
	stainless steel			-	-	-	-	17.5	27.0	-
Ratio characteristic torsional strength to mean insertion moment	carbon steel $\rho_{k,ref}$ = 450 kg/m³	$f_{tor,k}$ / $R_{tor,m}$	-	≥ 1.5						
	stainless steel $\rho_{k,ref}$ = 480 kg/m³			-	-	-	-	≥ 1.5		-

[1] Product characteristic group C according to ETA-12/0373 of 03.11.2017.

[2] For intermediate screw diameters the conservative value of the next screw diameter may be used.

[3] Single thread, HiLo thread, double thread.

[4] Single thread and compressor.

[5] l > 500 mm for screws with friction part, only.

[6] Calculation is possible according to Eurocode 5, Equation (8.14) for round cross section. ($d = d_i$, f_u = 600 N/mm²).

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schmid schrauben hainfeld	of European Technical Assessment ETA-12/0373 of 30.03.2022
Characteristic data of the screws	

Table A6.3: Characteristic load bearing capacities of Schmid screws StarDrive GPR, StarDrive and SP; screw diameter 4 to 6 mm

Product characteristic [1)]			Screw diameter [2)]			
			4	4.5	5	6
Max. length	l_{max}	mm	70	80	120	300
Characteristic tensile strength	$f_{tens,k}$	kN	5.0	5.8	8.5	12.4
Characteristic yield moment	$M_{y,k}$	Nm	3.2	4.9	6.5	10.1
Characteristic withdrawal parameter angle screw-axis to grain: 90° ($\rho_{k,ref}$ = 350 kg/m³)	$f_{ax,k,90°}$	N/mm²	14.8	13.8	12.8	12.1 [3)] 13.5 [4)]
Characteristic withdrawal parameter in cement bonded particle boards acc. to EN 13986 in lateral surface and narrow side	$f_{ax,k,lat}$	N/mm²	20.3	19.7	19.2	18.0
	$f_{ax,k,narr}$		24.3	22.4	20.5	16.6
Characteristic yield strength	$f_{y,k}$	N/mm²	900			
Characteristic torsional strength	$f_{tor,k}$	Nm	3.0	4.2	6.2	9.5
Ratio characteristic torsional strength to mean insertion moment ($\rho_{k,ref}$ = 450 kg/m³)	$f_{tor,k}$ / $R_{tor,m}$	-	≥ 1.5			

[1)] Minimum of product characteristic group A and B according to ETA-12/0373 of 03.11.2017.
[2)] For intermediate screw diameters the conservative value of the next screw diameter may be used.
[3)] Single thread.
[4)] Coarse thread.

OiB Member of EOTA

Table A6.3 continued: Characteristic load bearing capacities of Schmid screws StarDrive GPR, StarDrive and SP; screw diameter 7 to 12 mm

Product characteristic [1]				Screw diameter [2]			
				7	8	10	12
Max. length	carbon steel	l_{max}	mm	300	600 [5]	600 [5]	600 [5]
	stainless steel			-	240	-	-
Characteristic tensile strength	carbon steel	$f_{tens,k}$	kN	17.1	22.0	32.0	42.0
	stainless steel			-	13.5	-	-
Characteristic yield moment	carbon steel	$M_{y,k}$	Nm	12.6	21.0	33.0	46.9
	stainless steel			-	- [6]	-	-
Characteristic withdrawal parameter angle screw-axis to grain: 90° ($\rho_{k,ref}$ = 350 kg/m³)		$f_{ax,k,90°}$	N/mm²	11.5 [3] -	10.7 [3] 13.1 [4]	9.5 [3] 12.5 [4]	8.9 [3] 11.2 [4]
Characteristic yield strength		$f_{y,k}$	N/mm²	900 (carbon steel) - (stainless steel)			
Characteristic torsional strength	carbon steel	$f_{tor,k}$	Nm	16.1	24.8	44.8	59.6
	stainless steel			-	17.5	-	-
Ratio characteristic torsional strength to mean insertion moment	carbon steel $\rho_{k,ref}$ = 450 kg/m³	$f_{tor,k}$ / $R_{tor,m}$	-	≥ 1.5			
	stainless steel $\rho_{k,ref}$ = 480 kg/m³			-	≥ 1.5	-	-

[1] Minimum of product characteristic group A and B according to ETA-12/0373 of 03.11.2017.
[2] For intermediate screw diameters the conservative value of the next screw diameter may be used.
[3] Single thread.
[4] Coarse thread.
[5] l > 500 mm for screws with friction part, only.
[6] Calculation is possible according to Eurocode 5, Equation (8.14) for round cross section. ($d = d_i$, f_u = 600 N/mm²).

Schmid screws schmid schrauben hainfeld	Annex 6 of European Technical Assessment ETA-12/0373 of 30.03.2022
Characteristic data of the screws	

Table A6.4: Characteristic load bearing capacities of Schmid screws RAPID®; screw diameter 8 mm and 12 mm

Product characteristic			Hardwood [1]	Ductile
			Screw diameter	
			8	12
Max. length	l_{max}	mm	400 [2]	510
Characteristic tensile strength	$f_{tens,k}$	kN	32.8	55.7 [3] 61.2 [4]
Characteristic yield moment	$M_{y,k}$	Nm	42.8	77.3
Characteristic withdrawal parameter angle screw-axis to grain: 90° and 0° $\rho_{k,ref,Bu}$ = 625 kg/m³ $\rho_{k,ref,FSH\text{-}Bu}$ = 740 kg/m³ $\rho_{k,ref,Fi}$ = 350 kg/m³	$f_{ax,k}$	N/mm²	$f_{ax,k,Bu,90°}$ = 38.7 $f_{ax,k,FSH\text{-}Bu,90°}$ = 50.1	$f_{ax,k,Fi,90°}$ = 11.8
			$f_{ax,k,Bu,0°}$ = 25.8 $f_{ax,k,FSH\text{-}Bu,0°}$ = 38.6	$f_{ax,k,Fi,0°}$ = 7.0
Characteristic yield strength	$f_{y,k}$	N/mm²	950	950
Characteristic torsional strength	$f_{tor,k}$	Nm	39.5	100.5
Ratio characteristic torsional strength to mean insertion moment ($\rho_{k,ref}$ = 740 kg/m³)	$f_{tor,k}$ / $R_{tor,m}$	-	≥ 1.5	≥ 1.5
Characteristic head pull-through parameter Head diameter d_k = 15 mm (90° head) $\rho_{k,ref}$ = 620 kg/m³	$f_{head,k}$	N/mm²	$f_{head,k,Bu}$ = 40.4	-
Characteristic head pull-through parameter Head diameter d_k = 22 mm (180° head) $\rho_{k,ref,Bu}$ = 620 kg/m³ $\rho_{k,ref,FSH\text{-}Bu}$ = 730 kg/m³	$f_{head,k}$	N/mm²	$f_{head,k,Bu}$ = 53.8 $f_{head,k,FSH\text{-}Bu}$ = 60.8	-

1) Product characteristic group F according to ETA-12/0373 of 03.11.2017.

2) If the screw is inserted in other products than laminated veneer lumber LVL of beech or related products of hardwood, the maximum lengths l_{max} = 600 mm and l_{max} = 1000 mm apply for RAPID Hardwood with partial thread and with full thread respectively.

3) RAPID fullthread with thread E “ductile”.

4) RAPID fullthread with thread E.

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Characteristic data of the screws	

A.6.1 Axially loaded screws

A.6.1.1 General

For verification of the load bearing capacity of axially loaded Schmid screws the failure mechanisms according to EN 1995-1-1 as well as the minimum thicknesses, spacings and distances according to A.6.1.2 must be taken into account.

Alternative to EN 1995-1-1 the effective number of inclined Schmid screws with an angle between screw axis and grain direction 30° ≤ α ≤ 60° may be taken as

$$n_{ef} = max\{n^{0.9}; 0.9 \cdot n\}$$

In the following cases the effective number of screws n_{ef} = n:

- screws used as compression reinforcement inclined or perpendicular to the grain
- inclined screws used for flexible jointing of beams or columns
- screws used for fastening of thermal insulation material on top of rafters
- screws applied for single row connections with $a_1 \geq 25$ d

For verification of the load bearing capacity according to EN 1995-1-1 and EN 1993 1-1 in the tensile as well as in the compressive area reductions in the cross sectional area of wooden members or steel members caused by screws shall be taken into account. Screws with an outer thread diameter d ≥ 10 mm shall be taken into account by the inner thread diameter in wooden members whereas in steel members the drilling diameter shall be taken into account.

In case of double-shear connections between wood-based members or between those members and steel members where wood-based or metal flaps are arranged symmetrically to the axis of the central timber member with inclined self-tapping screws, tension in transverse direction must be verified if the overlapping of the crossed screws in the middle of the axis is lower than 4 d.

A.6.1.2 Spacing, end and edge distances of the screws and minimum thicknesses

For Schmid screws with d ≤ 8 mm or provided with a half cut (HSP) or drill point which are loaded only axially, the minimum spacing, end and edge distances according to Table 6.5 apply for a minimum timber thickness of t = 12 d in non-predrilled holes. Table 6.5 is not valid for cross laminated timber.

Table A6.5: Minimum spacing, end and edge distances of only axially loaded Schmid screws (except CLT)

Designation		Variant 1	Variant 2
Boundary condition	$a_1 \cdot a_2$	$\geq 25\ d^2$	$\geq 21\ d^2$
Spacing in a plane parallel to the grain	a_1	5 d	7 d
Spacing perpendicular to a plane parallel to the grain	a_2	2.5 d	3 d
Spacing between the crossing screws for a crossed screw couple perpendicular to a plane parallel to the grain	a_{cross}	1.5 d	
End distance of the centre of gravity of the threaded part in the timber member	$a_{1,c}$	5 d	
Edge distance of the centre of gravity of the threaded part in the timber member	$a_{2,c}$	4 d	

Provided that a minimum thickness of the cross laminated timber of 10 d as well as a minimum penetration length of the screws of 4 d in the wide face or 10 d in the narrow face are met, the minimum spacings, end and edge distances given in Table A6.6 apply.

Table A6.6: Minimum spacings, end and edge distances of Schmid screws in cross laminated timber (axially and/or laterally loaded)

	a_1	$a_{3,t}$	$a_{3,c}$	a_2	$a_{4,t}$	$a_{4,c}$
Wide face (see Figure A6.1)	4 d	6 d	6 d	2.5 d	6 d	2.5 d
Narrow face (see Figure A6.1)	10 d	12 d	7 d	3 d	5 d	3 d

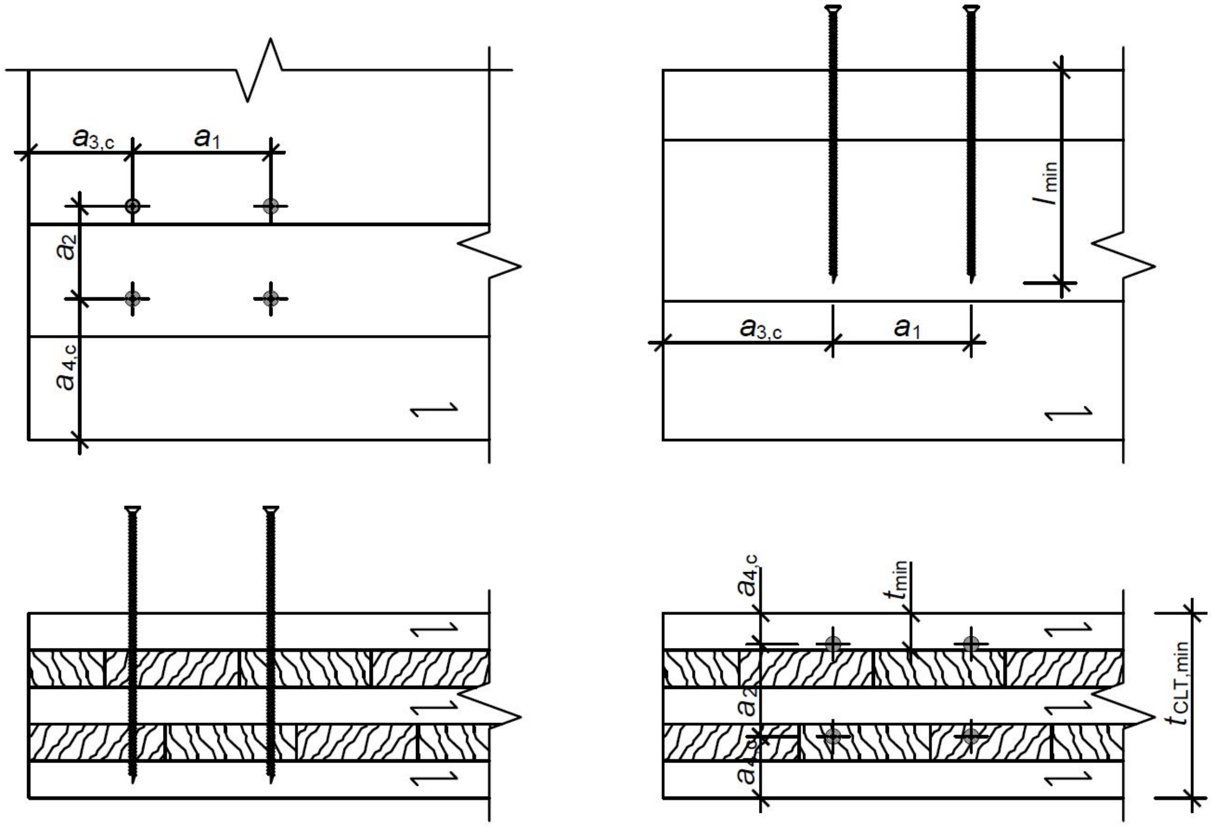
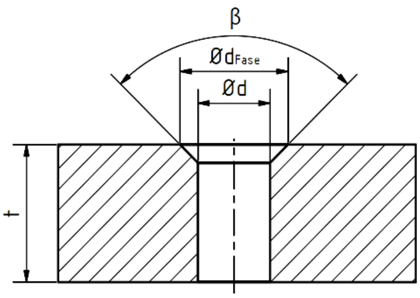


Figure A6.1: Definition of minimum spacings, end and edge distances in the wide face (left) and narrow face (right) of cross laminated timber

For connections between timber and a metal member of steel or aluminium sufficient contact of the screw head must be ensured. This is fulfilled for countersunk heads with countersunk washer as well as heads with a flat bottom side (e.g. pan head, washer head, SuperSenkFix,…) for 90° drillings. Alternatively, countersunk head screws may be used in 90° countersunk drillings where the diameter of the chamfer is 1.5 times the diameter of the drilling, see Figure A.6.2. The diameter d of the drilling must be greater than the diameter of the screw.



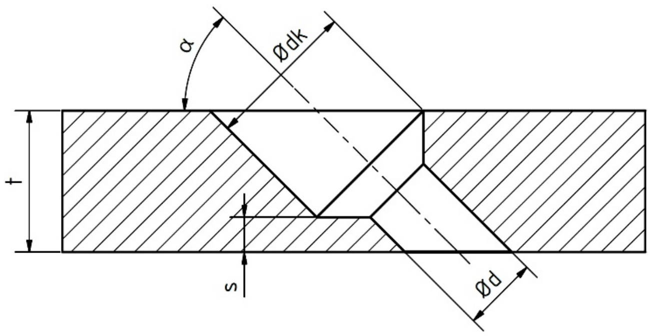
$d_{Fase} = d \cdot 1.5$ in mm

d = diameter of the drilling in mm

d_{Fase} = diameter of the chamfer in mm

Figure A6.2: Drilling of Schmid screws with countersunk head in metal members

For countersunk head screws used in countersunk drillings of metal members under an angle 30° ≤ α < 90° the drilling must be greater than the head diameter d_k and the outer thread diameter d of the screw. Hereby, the minimum thickness s of the steel member underneath the screw head according to Figure A6.3 is required.



α > 45°	s ≥ 3mm
30° ≤ α ≤ 45°	s ≥ 2 mm

Figure A6.3: Inclined drilling of Schmid screws with countersunk head in metal members

Alternatively, screws with inclined washers can be used for inclined metal-wood connections.

A.6.1.3 Characteristic withdrawal parameter

The characteristic withdrawal parameter for Schmid screws for angles 0° ≤ α ≤ 90° between screw-axis and direction of wood-fibre may be calculated as

$$f_{ax,calc,k} = f_{ax,k,90°} \cdot k_{ax} \cdot k_{sys} \cdot \left(\frac{\rho_k}{\rho_{k,ref}}\right)^{k_\rho}$$

$$k_{ax} = \begin{cases} 1.0 & \text{for } 30° \le \alpha \le 90° \\ 0.3 \cdot k_{gap} + \frac{\alpha}{30°}(1 - 0.3 \cdot k_{gap}) & \text{for } 0° \le \alpha \le 30° \end{cases}$$

$$k_{gap} = \begin{cases} 0.9 & \text{for narrow face in CLT} \\ 1.0 & \text{other} \end{cases}$$

$$k_{sys} = \begin{cases} 1.0 & \text{for solid timber} \\ \text{see Table A6.7} & \text{for layered timber} \end{cases}$$

$$k_\rho = \begin{cases} 1.10 & \text{for softwood and } 15° \le \alpha \le 90° \\ 1.25 - 0.05\, d & \text{for softwood and } 0° \le \alpha \le 15° \\ 1.40 & \text{for ring porous hardwood and } 0° \le \alpha \le 90° \\ 1.70 & \text{for diffuse porous hardwood and } 0° \le \alpha \le 90° \end{cases}$$

Examples for ring porous hardwoods: chestnut, ash, oak
Examples for diffuse porous hardwoods: poplar, birch, beech

$f_{ax,k,90°}$ characteristic withdrawal parameter according to Tables 6.1 to 6.4 in N/mm²

$\rho_{k,ref}$ reference characteristic density of timber raw material in kg/m³ in which the screw is driven (350 kg/m³ (C24) for Tables A6.1 to A6.3 or according to Table A6.4)

ρ_k characteristic density of timber in kg/m³

α angle between screw axis and grain direction

k_{sys} system factor according to Table A6.7

n number of screwed layers

Table A6.7: System factor k_{sys} depending on the number of layers n for screw insertion in GLT or CLT

n	1	2	3	4	5	≥ 6
k_{sys}	1.00	1.06	1.10	1.12	1.13	1.15

The characteristic withdrawal capacity of Schmid screws in the narrow face of cross laminated timber may be alternatively determined independent of the angle between screw axis and grain direction as

$$F_{ax,Rk} = 20 \cdot d^{0,8} \cdot l_{ef}^{0,9}$$

unless otherwise specified in the technical specification of the cross laminated timber.

A.6.1.4 Characteristic head pull-through capacity for timber

The characteristic head pull-through capacities for timber with a char. density $\rho_{k,ref}$ = 350 kg/m³ and for a timber thickness ≥ 20 mm is given in Table A.6.8 and A.6.9.

For softwood with a deviating density the characteristic head pull-through parameter shall be corrected by the factor

$$k_{dens} = \left(\frac{\rho_k}{350}\right)^{0.8}$$

Where

ρ_k Characteristic density of timber in kg/m³

For the characteristic withdrawal parameter the correction according to A.6.1.3 applies.

Table A6.8: Characteristic head pull-through capacities of Schmid screws in structural timber for 90° heads; head diameter 8 to 21 mm

Group 1			Head diameter (90° heads) [1)]							
Product characteristic			8	9	10	12	14	15	18.5	21
Characteristic head pull-through parameter ($\rho_{k,ref}$ = 350 kg/m³)	$f_{head,k}$	N/mm²	17.1	17.6	14.6	14.6	13.1	12.4	12.2	10.3

[1)] Linear interpolation is possible for head diameters in between the stated values

Table A6.9: Characteristic head pull-through capacities of Schmid screws in structural timber for washers and 180° heads; (head) diameter 13 to 42 mm

Group 2			Head diameter (180° heads) [1)]								
Product characteristic			13	14	20	22	24	25	27	33	42
Characteristic head pull-through parameter ($\rho_{k,ref}$ = 350 kg/m³)	$f_{head,k}$	N/mm²	-	16.7	17.6	20.4	-	15.2	14.5	10.0	6.5
	$f_{head,k}$ head "N"	N/mm²	19.7	-	23.5	14.6	12.3	-	-	-	-

[1)] Linear interpolation is possible for head diameters in between the stated values

A.6.1.5 Characteristic head pull-through capacity for wood based panels

The characteristic value of the head pull-through parameter for a characteristic density of 380 kg/m³ of the timber and for the following wood based panels

- Plywood according to EN 636 and EN 13986,
- Oriented strand boards, OSB, according to EN 300 and EN 13986,
- Solid wood panels according to EN 13353 and EN 13986,
- Particleboard according to EN 312 and EN 13986,
- Fibreboards according to EN 622-2, EN 622-3 and EN 13986,
- Cement-bonded particle boards according to EN 634-1 and EN 13986

is given in Table A.6.10.

Table A6.10: Characteristic value of the head pull-through parameter in dependence of the thickness of the wood-based panels t_{WBP}

t_{WBP}	≤ 12 mm	12 mm < t_{WBP} ≤ 20 mm	> 20 mm
$f_{head,k}$	8 N/mm²*	8 N/mm²	10 N/mm²
* limited to 400 N complying with the minimum thicknesses of the wood based panels of 1.2 d, with d as outer thread diameter			

For plywood with a minimum of 7 layers and a minimum thickness of 18 mm, the characteristic value of the head pull-through parameter for a characteristic density of 490 kg/m³ is (d_k ≥ 18.8 mm)

$f_{head,k}$ = 16 N/mm²

In addition the minimum thicknesses of Table A.6.11 apply.

Table A6.11 Minimum thicknesses of wood based panels

Wood based panel	Minimum thickness in mm
Plywood	6
Oriented strand board, OSB	8
Solid wood panels	12
Particleboard	8
Fibreboards	6
Cement-bonded particle boards	8

A.6.1.6 Compressive loading for fully threaded screws

The design load carrying capacity for Schmid screws with a full thread for an angle 30° ≤ α ≤ 90° between screw-axis and direction of wood-fibre for axial compressive loading is given as

$$F_{ax,Rd} = \min\left(f_{ax,calc,k} \cdot d \cdot l_{ef} \cdot \frac{k_{mod}}{\gamma_M}; \kappa_c \cdot \frac{N_{pl,k}}{\gamma_{M1}}\right)$$

with

$f_{ax,calc,k}$	char. withdrawal capacity of the threaded part of the screw according to Clause A.6.1.3 in N/mm²
d	outer thread diameter of the screw in mm
l_{ef}	penetration length of the threaded part of the screw in the timber member in mm
k_{mod}	modification factor for duration of load and moisture content according to EN 1995-1-1
γ_M	partial safety factor for connections according to EN 1995-1-1
γ_{M1}	partial safety factor according to EN 1993-1-1

$$\kappa_c = \begin{cases} 1.0 & \text{for } \overline{\lambda_k} \leq 0.2 \\ \dfrac{1.0}{k + \sqrt{k^2 - \overline{\lambda_k}^2}} & \text{for } \overline{\lambda_k} > 0.2 \end{cases}$$

$$k = 0.5\left[1 + 0.49 \cdot \left(\overline{\lambda_k} - 0.2\right) + \overline{\lambda_k}^2\right]$$

The related slenderness ratio

$$\overline{\lambda_k} = \sqrt{\frac{N_{pl,k}}{N_{ki,k}}}$$

with

$N_{pl,k}$ characteristic value of the plastic normal force load bearing capacity of the net cross-section, related to the inner thread diameter d_i (or shank diameter d_s if relevant) of the screws in N

$$N_{pl,k} = \frac{\pi \cdot d_i^2}{4} \cdot f_{y,k}$$

$f_{y,k}$	characteristic yield strength of Schmid screws in N/mm² according to Table A6.1 to A6.4
$N_{ki,k}$	characteristic ideal elastic buckling load in N

$$N_{ki,k} = \sqrt{c_h \cdot E_s \cdot I_s}$$

c_h elastic foundation of the Schmid screws in the wooden member in N/mm²

$$c_h = (0.19 + 0.012 \cdot d) \cdot \rho_k \cdot \left(\frac{90 + \alpha}{180}\right)$$

E_s modulus of elasticity of Schmid screws in N/mm², E_s = 210 000 N/mm²

I_s area moment of inertia of Schmid screws in mm⁴

ρ_k characteristic density of the wood-based member in kg/m³

$$I_s = \frac{\pi \cdot d_i^4}{64}$$

A.6.1.7 Slip modulus for mainly axially loaded screws

The axial slip modulus $K_{ser,ax}$ of the threaded part per cutting surface for the serviceability limit state shall be taken for screws independent of angle α to the grain as

$$K_{ser,ax} = k_{HA} \cdot d \cdot l_{ef}$$

with

d outer thread diameter of the screw in mm

l_{ef} penetration length of the threaded part of the screw in the timber member in mm

k_{HA} coefficient depending on the type of wood of the wood-based member according to Table A6.12

Table A6.12: Coefficient k_{HA} depending on the type of wood of the wood-based member

Type of wood	Reference density ρ_m in kg/m³	Coefficient k_{HA}
softwood	420	25
chestnut	530	48
ash	660	62
poplar	485	34
birch	635	54
beech	740	78
LVL beech*	840	53
* according to EN 14374 or European Technical Assessment		

The coefficients listed in Table A6.12 apply to Schmid screws installed with or without pre-drilling, provided that the pre-drilling diameter does not exceed 75% of the outer thread diameter.

A.6.2 Laterally loaded screws (perpendicular to the screw axis)

A.6.2.1 General

For verification of the load bearing capacity of laterally loaded Schmid screws the failure mechanisms according to EN 1995-1-1 as well as the minimum thicknesses, spacings and distances according to A.6.2.2 must be taken into account.

NOTES:

1) Hereby, the outer thread diameter d is used as effective diameter of the screw in accordance with EN 1995-1-1.
2) For connections between timber and a steel member where the special head shape of the Schmid screws enables a precise fit into the drilling of the steel member the equations for thick steel may be used in case of steel thicknesses $t \geq 1.5$ mm. The height of the flange must be greater than the thickness of the steel member.
3) In the case of a connection with a group of screws loaded perpendicular to the screw axis the effective number of screws is to be taken as for nails according to EN 1995-1-1 if the connection area of the timber is not reinforced according to Clause A.8.2.3.

A.6.2.2 Spacing, end and edge distances of the screws and minimum thicknesses

For Schmid screws which are loaded only laterally, the minimum spacing, end and edge distances according to Table 6.13 apply.

Table A6.13: Minimum spacing, end and edge distances of only laterally loaded Schmid screws

Type	Spacing/distances
Predrilled wooden members Schmid screws with drill tip or HSP in non-predrilled holes of softwood members	Analogous to pre-drilled nails according to EN 1995-1-1
Non-predrilled wooden members with Schmid screws without drill tip	Analogous to non-predrilled nails according to EN 1995-1-1

NOTES:

1) For Schmid screws RAPID Hardwood inserted into non-predrilled wooden members of hardwood (strength classes D according to EN 338) or LVL made of beech according to EN 14374 or ETA, the minimum distances apply analogous to non-predrilled nails according to EN 1995-1-1 for a characteristic density of 420 kg/m³ $\leq \rho_k \leq$ 500 kg / m³.

2) For screws with outer thread diameter d ≥ 8 mm in non-predrilled holes in wood-based members with thickness t < 5 d, the minimum distances for loaded and unloaded ends shall be 15 d.

3) Minimum distances from the unloaded edge perpendicular to the grain may be reduced to 3 d also for timber thickness t < 5 d, if the spacing parallel to the grain and the end distance is at least 25 d.

4) Minimum spacings, end and edge distances of laterally loaded Schmid screws in wide face and narrow face of cross laminated timber are given in Table A6.6.

The minimum thickness for structural members shall be in accordance with Table A6.14.

Table A6.14: Minimum thickness for structural members for laterally loaded Schmid screws d ≤ 12 mm

Screw diameter		< 8	8	10	12
Minimum thickness t for structural members	mm	24	30	40	80

A.6.2.3 Characteristic embedment strength

EN 1995-1-1 applies for the embedment strength of Schmid screws in wooden members unless specified otherwise below.

The characteristic embedment strength of Schmid screws installed in wooden members of solid wood, glued laminated timber, glued solid timber, solid wood panels or laminated veneer lumber (made of softwood) may be determined as follows:

$f_{h,k} = k_\alpha \cdot k_\beta \cdot k_\varepsilon \cdot f_{h,k,ref}$ in N/mm²

with

$f_{h,k,ref}$ as reference characteristic embedment strength, for non-predrilled members

$f_{h,k,ref} = 0.082 \cdot \rho_k \cdot d^{-0.3}$ in N/mm²

and for pre-drilled members

$f_{h,k,ref} = 0.082 \cdot \rho_k \cdot (1 - 0.01 \cdot d)$ in N/mm²

and

$$k_\alpha = \frac{1}{2.5 \cdot \cos^2\alpha + \sin^2\alpha}$$

α angle between screw axis and grain direction

$$k_\beta = \begin{cases} \dfrac{1.0}{1.5 \cdot \cos^2\beta + \sin^2\beta} & \text{screws inserted in LVL made of softwood} \\ 1.0 & \text{others} \end{cases}$$

β angle between screw axis and the wide face of LVL

$$k_\varepsilon = k_{90} \cdot \cos^2\varepsilon + \sin^2\varepsilon$$

ε angle between load and grain direction

$$k_{90} = \begin{cases} 1.10 & \text{in the member of the head side} \\ 1.20 & \text{in the member of the point side} \end{cases}$$

ρ_k characteristic density of the wooden member in kg/m³

d outer thread diameter of the screw in mm

The Equations above may be applied for Schmid screws within single softwood layers in cross laminated timber, if the single layer is considered as a separate softwood member and the minimum spacing, end and edge distances are observed for the single layer. Hereby, ρ_k is the characteristic density of the cover layer.

The characteristic embedment strength of Schmid screws in the narrow face of cross laminated timber may be determined independent of the angle between screw axis and grain direction as

$$f_{h,k} = 20 \cdot d^{-0.5}$$

unless otherwise specified in the technical specification of the cross laminated timber.

A.6.2.4 Slip modulus for screws loaded perpendicular to the screw axis

The slip modulus $K_{ser,v}$ per shear joint for the serviceability limit state shall be taken for screws independent of angle α to the grain as

$K_{ser,V} = k_V \cdot d^{1.7}$ in N/mm²

with

k_V coefficient depending on the direction of load on the type of the connection and the predrilling according to Table A6.15

Table A6.15: Coefficient k_V depending on the direction of load on the type of the connection and the predrilling

Direction of load	Non-predrilled		Pre-drilled	
	Wood-wood	Metal-wood	Wood-wood	Metal-wood
Parallel to the direction of the grain $K_{ser,v,0}$	32	64	$1.6 \cdot \rho_k^{0.5}$	$3.2 \cdot \rho_k^{0.5}$
Perpendicular to the direction of the grain $K_{ser,v,90}$	16	32	$0.8 \cdot \rho_k^{0.5}$	$1.6 \cdot \rho_k^{0.5}$

Linear interpolation is possible for arbitrary angles between load direction and angle of the grain.

For the connection of two wooden members with different characteristic densities ρ_k for the determination of k_V may be determined by

$$\rho_k = \sqrt{\rho_{k,1} \cdot \rho_{k,2}}$$

with

$\rho_{k,1}$ characteristic density of wooden member 1 in kg/m³

$\rho_{k,2}$ characteristic density of wooden member 2 in kg/m³

A.6.3 Combined loading (perpendicular to and in direction of the screw axis)

Verification of Schmid screws under combined loading (perpendicular to and in direction of the screw axis) is performed by

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

with

$F_{ax,Ed}$ design value of the load in a connection in in axial direction of the screws

$F_{ax,Rd}$ design value of the load-bearing capacity of the screw connection in axial direction

$F_{V,Ed}$ design value of the load in a connection in in lateral direction of the screws

$F_{V,Rd}$ design value of the load-bearing capacity of the screw connection in lateral direction

A.7 Schmid screws in selected steel-wood and wood-wood connections

A.7.1 Steel-wood connections

Design for equally tightened screws (torque controlled) in a steel member under an angle 30° ≤ α ≤ 60° (see Figure A7.1) may follow:

$$F_{\alpha,Rd} = F_{ax,Rd} \cdot (\cos\alpha + \mu \cdot \sin\alpha)$$

with

$$F_{ax,Rd} = n_{ef} \cdot min \begin{cases} f_{ax,calc,k} \cdot d \cdot l_{ef} \cdot \dfrac{k_{mod}}{\gamma_M} \\ \dfrac{f_{tens,k}}{\gamma_{M2}} \end{cases}$$

where:

$F_{\alpha,Rd}$	load bearing capacity of inclined screws in N
n_{ef}	effective number of screws according to A.6.1.1
k_{mod}	modification factor for duration of load and moisture content according to EN 1995-1-1
γ_M	partial safety factor for connections according to EN 1995-1-1
γ_{M2}	partial safety factor according to EN 1993-1-1
α	angle between screw axis and grain direction
μ	friction coefficient between steel member and timber surface, $\mu = 0.3$

NOTES:

1) The real thread length of the screw is to be considered.
2) Occurring tensile stresses perpendicular to grain have to be verified for h_{ef} : h < 0.7. A related reinforcement with fully threaded Schmid screws is shown in Figure A7.1.
3) For arrangement of the Schmid screws perpendicular to the grain verification shall follow Clause A.6.2.
4) For combined loading (more than one loading component to be transferred by the screwed joint) the regulations according to A6.3 shall be considered.

Figure A7.1 shows an example of metal-to-timber connection with inclined Schmid Screws located in the end-grain or in side-grain.

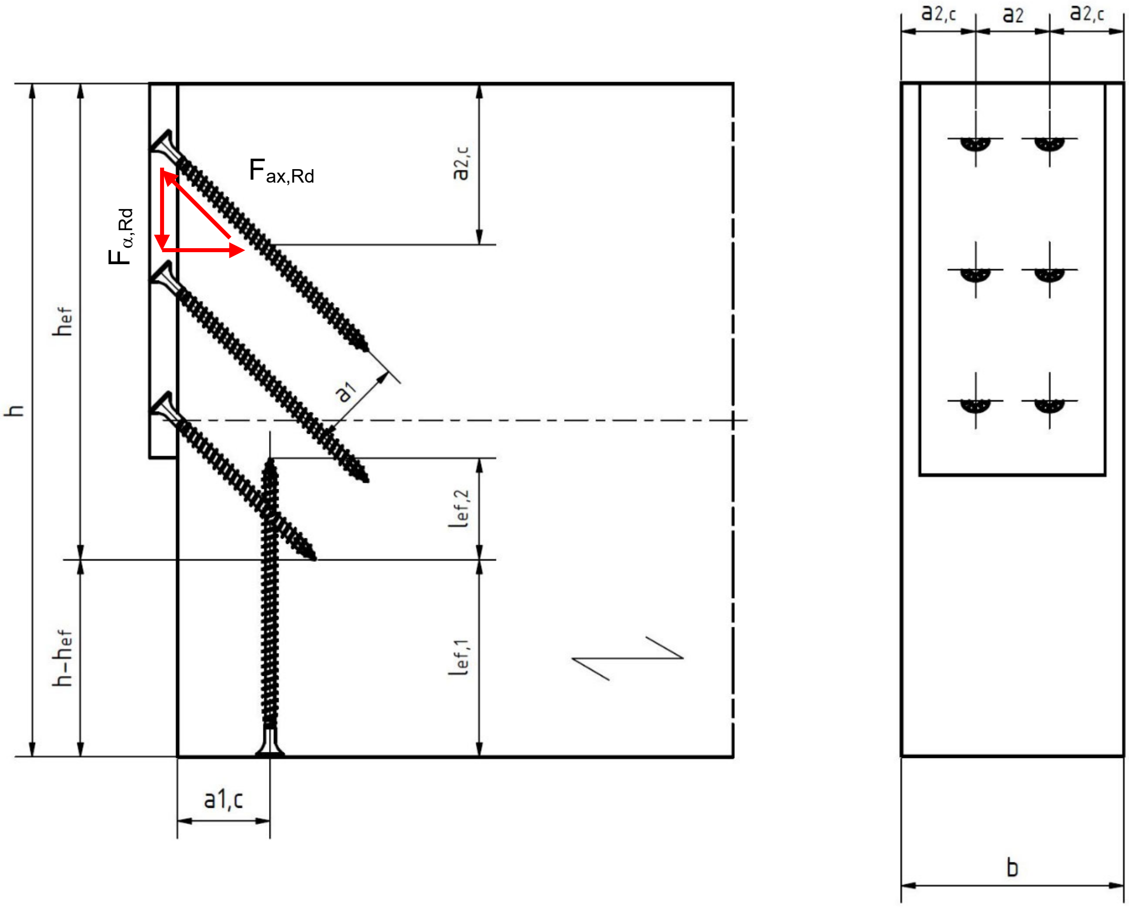


Figure A7.1: Example of metal-to-timber connection with inclined Schmid Screws located in the end-grain or in side-grain

The screws may be used in connections between timber and a steel member, e.g. wind bracing or tensile splice in solid timber, glued laminated timber and glued solid timber of softwood. The screws are driven into the timber member under an angle between the screw axis and the grain direction of α ≤ 90°.

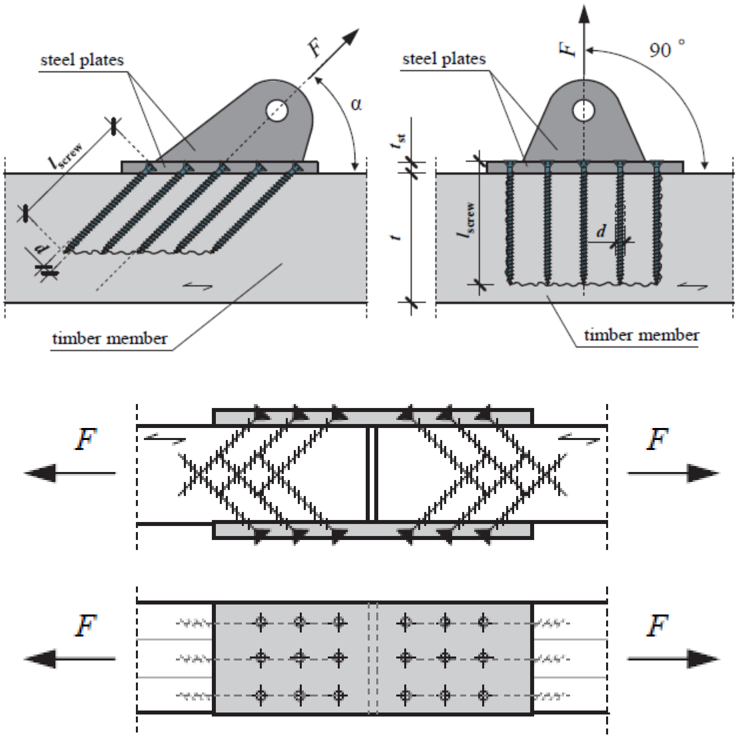


Figure A7.2: Example of metal-to-timber connection with inclined Schmid screws and Schmid screws arranged perpendicular to the grain

Schmid screws schmid schrauben hainfeld	Annex 7 of European Technical Assessment ETA-12/0373 of 30.03.2022
Bending beams under flexible jointing	

A.7.2 Bending beams and columns under flexible jointing

A.7.2.1 General

Schmid screws may be used in connections in multi-part bending beams and columns under flexible jointing. Design of these connections shall follow EN 1995-1-1 considering Annex 6 as well as the provisions in the following.

A7.2.2 Number of effective Schmid screws per joint

Deviating from Annex 6 the effective number of screws $n = n_{ef}$ for edge distances $a_1 \geq 14$ d.

A7.2.3 Slip modulus per joint and fastener in the serviceability limit state

The slip modulus K_{ser} per shear joint and fastener for the serviceability limit state shall be taken as

$$K_{ser} = K_{ser,V} \cdot \sin\alpha \cdot (\sin\alpha - \mu \cdot \cos\alpha) + K_{ser,ax} \cdot \cos\alpha \cdot (\cos\alpha + \mu \cdot \sin\alpha)$$

with

$K_{ser,V}$ slip modulus for mainly laterally loaded screws according to Clause A.6.2.4 in N/mm

$K_{ser,ax}$ slip modulus for mainly axially loaded screws according to Clause A.6.1.7 in N/mm taking into account a serial system effect of the wooden members to be connected as well as additional flexibility for partially threaded Schmid screws (head compression, free shaft expansion)

α angle between screw axis and span direction

μ friction coefficient between the timber members for screws inclined in the same direction, $\mu = 0.3$

A7.2.4 Slip modulus per joint and fastener in the ultimate limit state

The slip modulus per joint and fastener in the ultimate limit state K_u may be determined from K_{ser}, see Clause A.7.2.3, according to EN 1995-1-1.

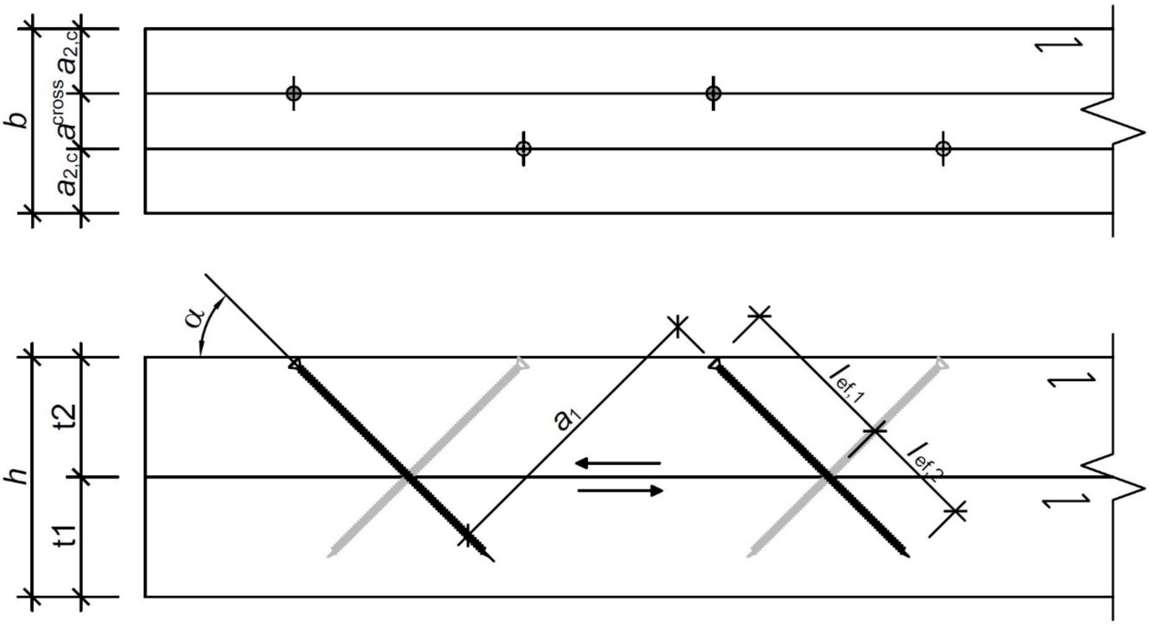


Figure A7.3: Example of flexible jointed bending beam or ribbed plate

Schmid screws	Annex 7 of European Technical Assessment ETA-12/0373 of 30.03.2022
Bending beams under flexible jointing	

A8 Schmid screws for reinforcement of timber members for timber members loaded perpendicular to the grain and shear

A.8.1 Reinforcement of timber members loaded in compression perpendicular to the grain (reinforcement of supports)

The screws are driven into the timber member perpendicular to the contact surface under an angle between the screw axis and the grain direction of 45° to 90°. The screw heads must be flush with the timber surface.

Reinforcing screws for wood-based panels are not covered by this European Technical Assessment.

The design resistance of a reinforced contact area is:

$$R_{90,d} = min\begin{cases} k_{c,90} \cdot B_1 \cdot l_{ef,1} \cdot f_{c,90,d} + n \cdot \min\left(F_{ax,Rd}; \frac{N_{pl,k}}{\gamma_{M1}}\right) \\ B_2 \cdot l_{ef,2} \cdot f_{c,90,d} \end{cases} \text{ in N}$$

In addition to Clause A.6.1.6 the following parameters apply

$k_{c,90}$	parameter considering the type of loading, the risk of splitting and the degree of the compression deformation according to EN 1995-1-1, 6.1.5
B_1	bearing width in mm (minimum of steel plate and wooden member)
l	contact length in mm
B_2	Width of the wooden member in the plane of the screw tip in mm
$l_{ef,1}$	effective contact length according to EN 1995-1-1, 6.1.5, in mm
$f_{c,d,90}$	design compressive strength perpendicular to the grain in N/mm²
n	number of reinforcing screws $n = n_0 \cdot n_{90}$
n_0	number of reinforcing screws arranged in a row parallel to the grain
n_{90}	number of reinforcing screws arranged in a row perpendicular to the grain
$l_{ef,2}$	effective contact length in the plane of the screw tips in mm

$l_{ef,2} = l_{ef} + (n_0 - 1) \cdot a_1 + min(l_{ef}; a_{1,c})$ end supports

$l_{ef,2} = 2 \cdot l_{ef} + (n_0 - 1) \cdot a_1$ intermediate supports

l_{ef}	penetration length of the threaded part of the screw in the timber member in mm
$a_{1,c}$	given spacing to end distance of the centre of gravity of the threaded part in the timber member in mm
a_1	given spacing of Schmid screws in a plane parallel to the grain and screw axis
γ_{M1}	partial safety factor according to EN 1993-1-1

If the reinforcement screws are screwed into the wooden member from both sides and the following recommendations are observed, the second line in the Equation for calculation of the design resistance may be omitted.

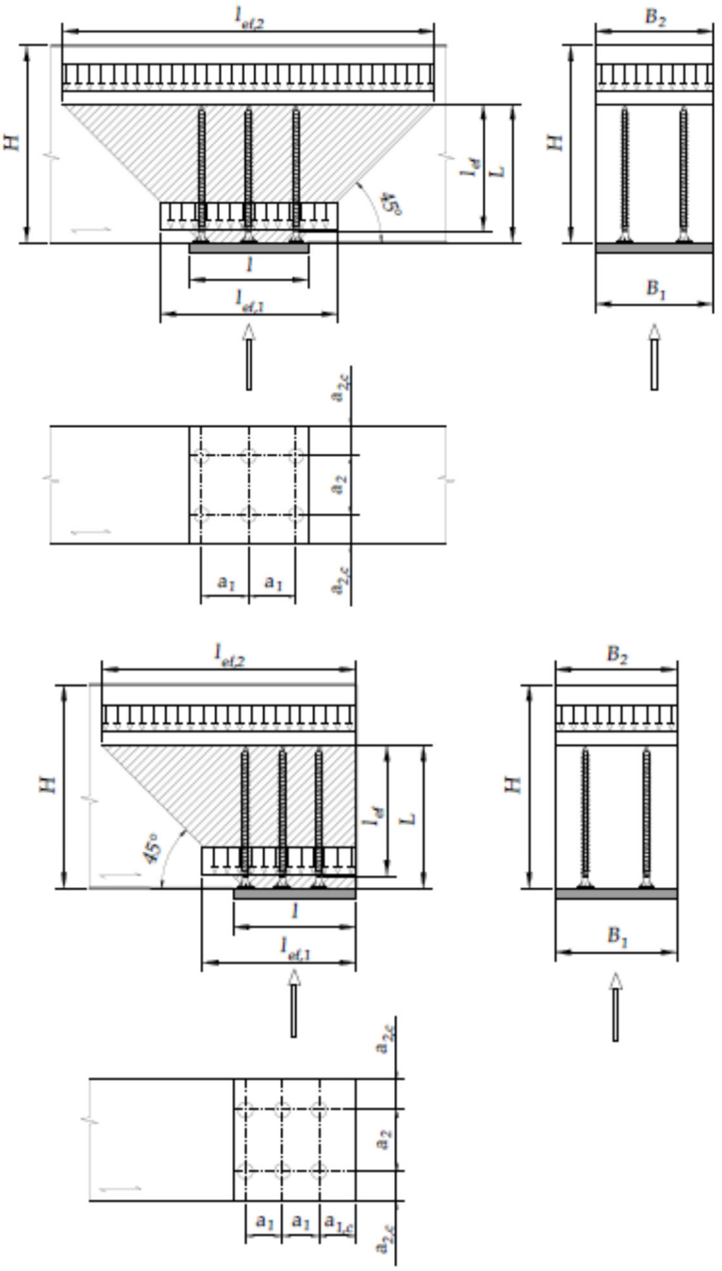


Figure A8.1: Reinforcement of timber members loaded in compression perpendicular to the grain: end support (bottom) intermediate support (top)

Schmid screws schmid schrauben hainfeld	Annex 8 of European Technical Assessment ETA-12/0373 of 30.03.2022
Reinforcement with Schmid screws	

For both sided reinforcement of timber members loaded in compression perpendicular to the grain for load transfer (see Figure A8.2) the contact surfaces on the bottom and top side of the wooden member must be arranged symmetrically. Arrangement of the reinforcing screws must be symmetrically and alternating. The minimum spacings according to A6.1.2 must be observed. The overlap l_{lap} of the reinforcement screw threads should be at least 10 d.

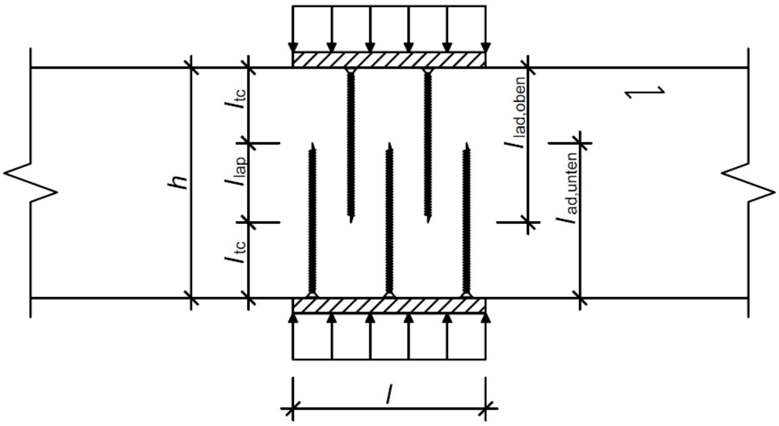


Figure A8.2: Reinforcement of timber members loaded in compression perpendicular to the grain for load transfer

A.8.2 Reinforcement of timber members loaded in tension perpendicular to the grain

Fully threaded screws may be used as tensile reinforcement perpendicular to the grain of the timber members. The screws are driven into the timber member under an angle between the screw axis and the grain direction of 90°. A minimum of two screws shall be used for tensile reinforcement perpendicular to the grain. Only one screw may be used when the minimum penetration depth of the screws below and above the potential crack is 20 · d where d is the outer thread diameter of the screw.

A.8.2.1 Tension reinforcement for transverse connections and notches

Tension reinforcement of transverse connections and notches in wooden members may be designed as follows:

$$1.3 \cdot V_d \cdot \left[3 \cdot \left(1-\frac{h_{ef}}{h}\right)^2 - 2 \cdot \left(1-\frac{h_{ef}}{h}\right)^3\right] \leq F_{ax,Rd}$$ for notches

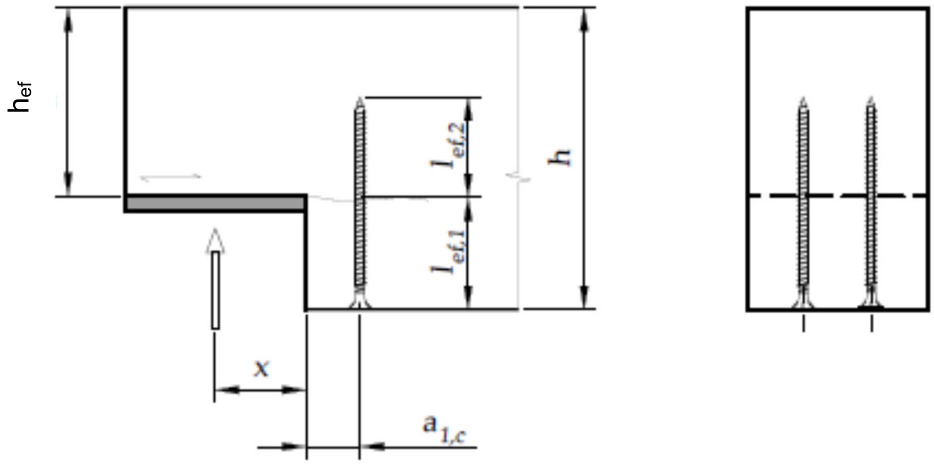
$$F_{90,Ed} \cdot \left[1 - 3 \cdot \left(\frac{a}{h}\right)^2 + 2 \cdot \left(\frac{a}{h}\right)^3\right] \leq F_{ax,Rd}$$ for transverse connections

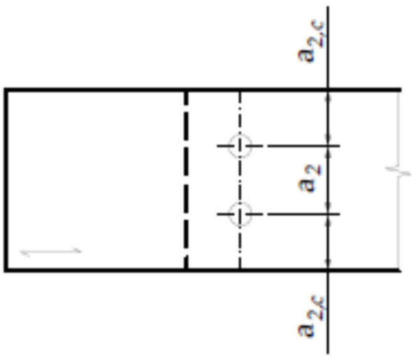
where

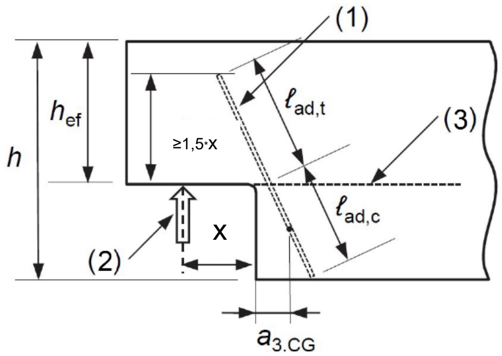
$$F_{ax,Rd} = n_{90} \cdot min \begin{cases} f_{ax,k} \cdot d \cdot l_{ef} \cdot \frac{k_{mod}}{\gamma_M} \\ \frac{f_{tens,k}}{\gamma_{M2}} \end{cases}$$ for reinforcement acc. to Figure A8.3 and A8.4

Schmid screws schmid schrauben hainfeld	Annex 8 of European Technical Assessment ETA-12/0373 of 30.03.2022
Reinforcement with Schmid screws	

V_d	design value of the lateral force in N
$F_{90,Ed}$	design value of the force acting in the connection perpendicular to the grain of the timber members in N
h_{ef}	effective height/thickness of the timber member above the notch in mm
h	height/thickness of the timber member in mm
a	distance of the furthermost fastener of the transverse connection from the loaded edge of the wooden member in mm (Figure A8.4)
l_{ef}	smaller value of the penetration depth below or above the plane of the potential crack in mm
k_{mod}	modification factor for duration of load and moisture content according to EN 1995 1-1
γ_M	partial safety factor for connections according to EN 1995-1-1, Table 2.3
γ_{M2}	partial safety factor according to EN 1993-1-1
n_{90}	number of reinforcing screws arranged in a row perpendicular to the grain (NOTE: Outside of the transverse connection or in the case of notches in general, only one screw may be taken into account in longitudinal direction of the beam)







(1) inclined fully threaded screw
(2) application of load at the support
(3) plane of the potential crack

Figure A8.3: Reinforcement of notches with screws arranged under an angle of 90° or inclined screws

Schmid screws	Annex 8 of European Technical Assessment ETA-12/0373 of 30.03.2022
Reinforcement with Schmid screws	

Member of EOTA

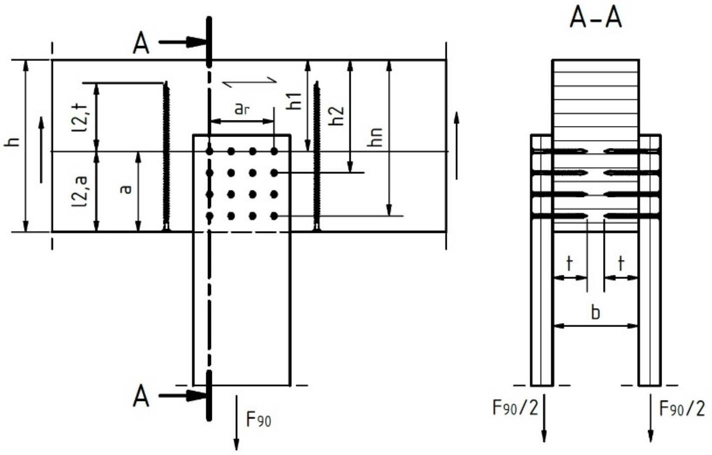


Figure A8.4: Reinforcement of transverse connections with Schmid screws

A.8.2.2 Openings

Openings in wooden members may be designed as follows:

$$F_{t,V,d} + F_{t,M,d} \leq F_{ax,Rd}$$

where

$$F_{t,V,d} = \frac{V_d \cdot h_d}{4 \cdot h} \cdot \left(3 - \frac{h_d^2}{h^2}\right)$$

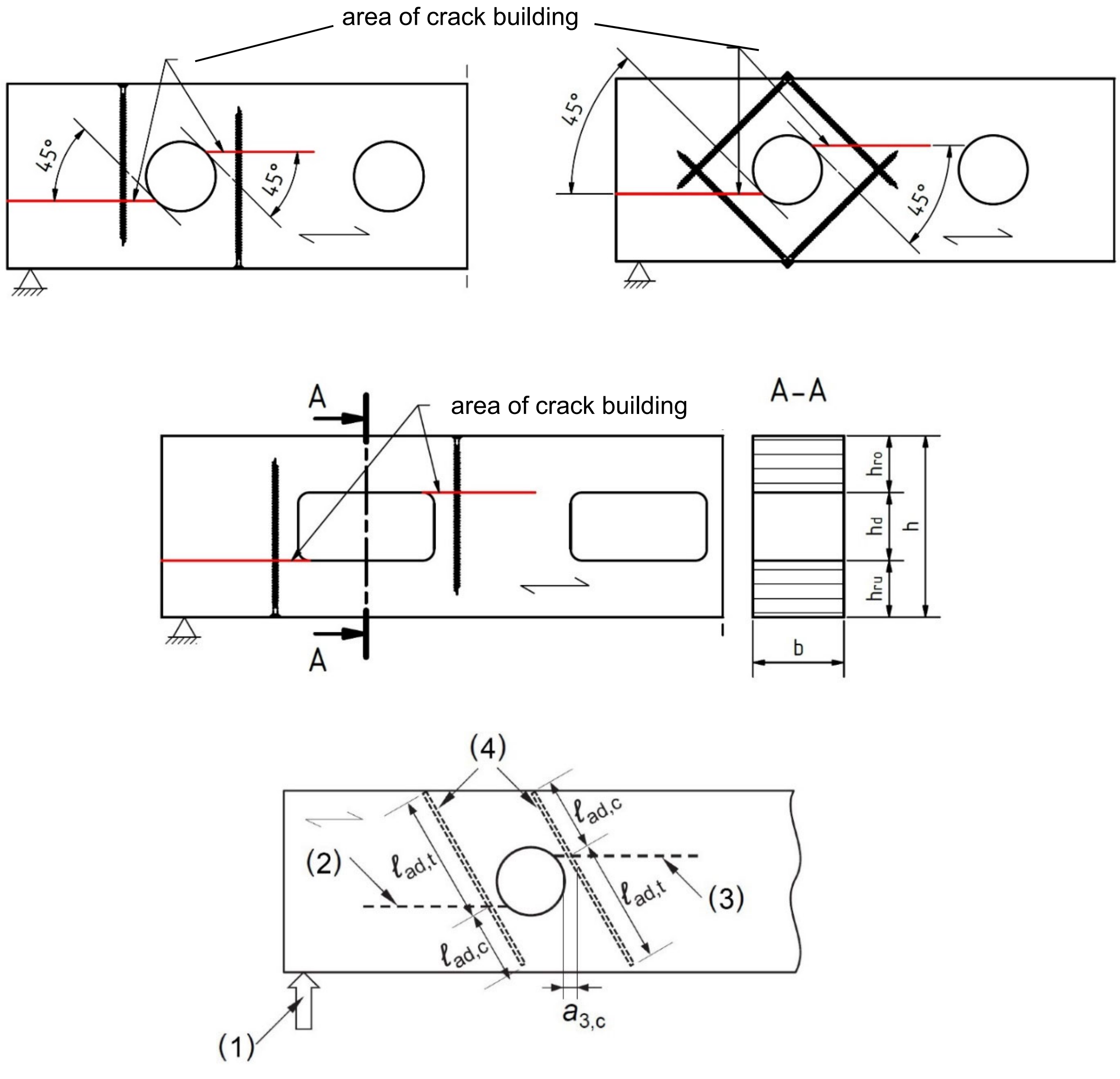
$$F_{t,M,d} = 0.008 \cdot \frac{M_d}{h_r}$$

$$F_{ax,Rd} = n_{90} \cdot min \begin{cases} f_{ax,k} \cdot d \cdot l_{ef} \cdot \frac{k_{mod}}{\gamma_M} \\ \frac{f_{tens,k}}{\gamma_{M2}} \end{cases}$$ for reinforcement acc. to Figure A8.5

with

$F_{t,V,d}$	design value of tension force perpendicular to the grain due to lateral force V_d in N
$F_{t,M,d}$	design value of tension force perpendicular to the grain due to bending moment M_d in N
h_d	height of the opening for rectangular openings or 70 % of opening diameter for circular openings in mm
h_r	min (h_{ro} ; h_{ru}) for rectangular openings or min (h_{ro} + 0.15 h_d ; h_{ru} + 0.15 h_d) for circular openings in mm
l_{ef}	smaller value of the penetration depth below or above the plane of the potential crack in mm

k_{mod}	modification factor for duration of load and moisture content according to EN 1995 1-1
γ_M	partial safety factor for connections according to EN 1995-1-1, Table 2.3
γ_{M2}	partial safety factor according to EN 1993-1-1
n_{90}	number of reinforcing screws arranged in a row perpendicular to the grain



(1) application of load at the support
(2) (3) plane of the potential crack
(4) inclined fully threaded screw

Figure A8.5: Reinforcement of openings with Schmid screws

Schmid screws schmid schrauben hainfeld	Annex 8 of European Technical Assessment ETA-12/0373 of 30.03.2022
Reinforcement with Schmid screws	

A.8.2.3 Connections with dowel-type fasteners stressed with shear loads

In connections with dowel-type fasteners stressed with shear loads (connection loaded in direction of the grain) the number of effective screws n_{ef} may be taken as n_{ef} = n for side and middle wood of each connection reinforced according to Figure A8.6 and

$$\frac{0.3 \cdot F_{v,0,Ed}}{F_{ax,Rd}} \leq 1$$

where

$F_{v,0,Ed}$ Design value of the stress per fastener parallel to the grain in N
Side wood: stress per fastener and shear plane
Middle wood: Summed up stress per fastener and both shear planes

$$F_{ax,Rd} = n_{90} \cdot min \begin{cases} f_{ax,k} \cdot d \cdot l_{ef} \cdot \dfrac{k_{mod}}{\gamma_M} \\ \dfrac{f_{tens,k}}{\gamma_{M2}} \end{cases}$$

with

l_{ef} smaller value of the penetration depth of the thread of the screw and the tip in mm

k_{mod} modification factor for duration of load and moisture content according to EN 1995 1-1

γ_M partial safety factor for connections according to EN 1995-1-1

γ_{M2} partial safety factor according to EN 1993-1-1

n_{90} number of reinforcing screws arranged in a row perpendicular to the grain per side or middle wood

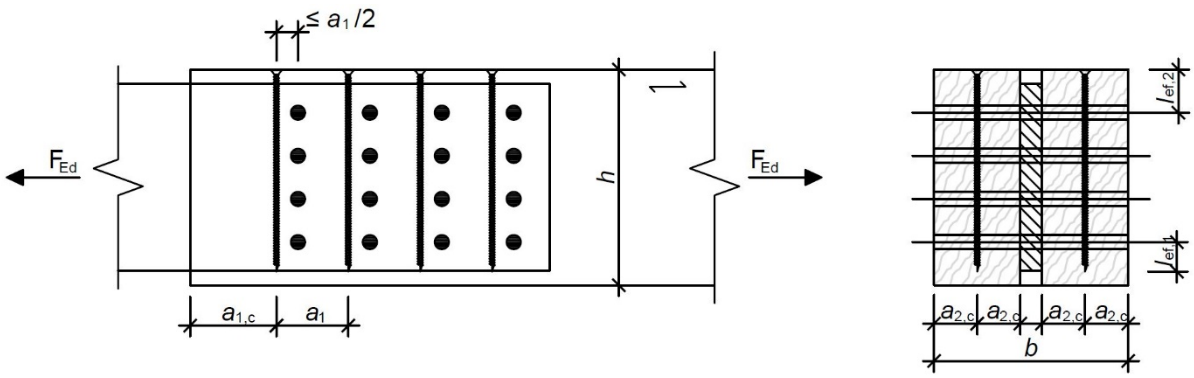


Figure A8.6: Reinforcement of connections stressed with shear loads

A.8.2.4 Shear reinforcement

Fully threaded screws may be used as shear reinforcement of solid timber, glued laminated timber and glued solid timber of softwood. The provisions are valid for straight beams with constant rectangular cross-section. The screws are driven into the timber member under an angle between the screw axis and the grain direction of 45°.

A minimum of four screws shall be used for shear reinforcement in a line parallel to the grain whereas the spacing between the screws shall not exceed the depth h of the timber member. If the screws are arranged in one line parallel to the grain, it shall be done centrically in relation to the beam width.

The effect of the reinforcement is limited to the shaded part of the timber member. Outside this area sufficient shear strength of the cross section must be verified.

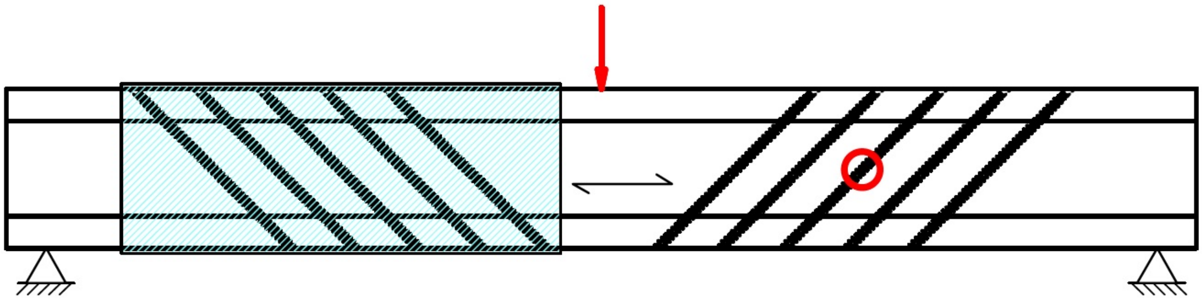


Figure A8.7: Shear reinforcement with Schmid screws

Shear reinforcement may be designed according to

$$\tau_d \leq \frac{f_{v,d} \cdot \kappa_\tau}{\eta_H}$$

where

τ_d design value of shear stress in N/mm²

$f_{v,d}$ design value of shear strength in N/mm²

$$\kappa_\tau = 1 - 0.46 \cdot \sigma_{90,d} - 0.052 \cdot \sigma_{90,d}^2$$

$\sigma_{90,d}$ design value of stress perpendicular to the grain in N/mm²

$$\sigma_{90,d} = \frac{F_{ax,d}}{\sqrt{2} \cdot b \cdot a_1}$$

b with of the timber member in mm

a_1 spacing of screws parallel to the grain in mm

$$F_{ax,d} = \frac{\sqrt{2} \cdot (1 - \eta_H) \cdot V_d \cdot a_1}{h}$$

V_d design shear force in N

h height of the timber member in mm

$$\eta_H = \frac{G \cdot b}{G \cdot b + \frac{1}{2 \cdot \sqrt{2} \cdot \left(\frac{6}{\pi \cdot d \cdot h \cdot k_{ax}} + \frac{a_1}{EA_S}\right)}}$$

G mean value of shear modulus of the timber member in N/mm²

d outer thread diameter of the screw in mm

k_{ax} connection stiffness between screw and timber member in N/mm³,
k_{ax} = 12.5 N/mm³ for RAPID® fully threaded screw with d = 8 mm

EA_s axial stiffness of one screw in N

$$EA_s = \frac{E \cdot \pi \cdot d_i^2}{4}$$

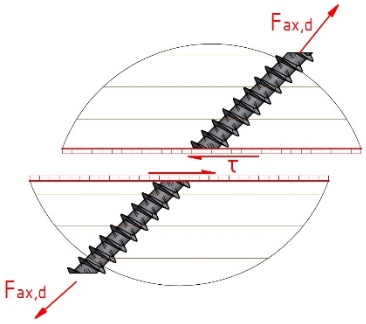
d_i inner thread diameter of the screw in mm

The axial capacity of the screw shall fulfil

$$\frac{F_{ax,d}}{F_{ax,Rd}} \leq 1$$

where

$$F_{ax,Rd} = n_{90} \cdot min \begin{cases} f_{ax,k} \cdot d \cdot l_{ef} \cdot \frac{k_{mod}}{\gamma_M} \\ \frac{f_{tens,k}}{\gamma_{M2}} \end{cases}$$



with

l_{ef} 50 % of the penetration depth of the thread in mm

k_{mod} modification factor for duration of load and moisture content according to EN 1995 1-1

γ_M partial safety factor for connections according to EN 1995-1-1

γ_{M2} partial safety factor according to EN 1993-1-1

n_{90} number of reinforcing screws arranged in a row perpendicular to the grain

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Reinforcement with Schmid screws	

A.9.1 Fastening of thermal insulation material (on top of rafters and facades)

Schmid screws with an outer thread diameter of at least 6 mm and lengths between 120 mm and 600 mm may be used for fixing of thermal insulation material on rafters or on wood-based members in vertical facades. Screws with partial thread and head "E" and "L" according to Annex 1 are excluded from fixing wood-based panels on rafters with thermal insulation material as interlayer.

The angle between grain direction and screw axis shall be 30° ≤ α ≤ 90°.

The thickness of the **thermal insulation material** is max. 400 mm. The thermal insulation material shall be applicable as insulation on top of rafters according to national provisions that apply at the installation site.

The **battens** are made from solid timber strength class C24 according to EN 338 and EN 14081-1. The minimum thickness and width of the battens is:

Table A9.1 Minimum thickness and width of the battens

Screw diameter d in mm	b_{min}	t_{min}
	mm	mm
≤ 8	50	30
10	60	40
12	80	50

Instead of battens the following **wood-based panels** may be used to cover the thermal insulation material if they are suitable for that use:

− Plywood according to EN 636 and EN 13986,

− Oriented Strand Board, OSB according to EN 300 and EN 13986,

− Particleboard according to EN 312 and EN 13986

− Fibreboards according to EN 622-2, EN 622-3 and EN 13986.

The minimum thickness of the wood-based panels shall be 22 mm.

The word batten in the following includes the meaning of the above mentioned wood-based panels.

The **substructure** is made from solid timber strength class C24 according to EN 338 and EN 14081-1, cross laminated timber according to European Technical Assessments or laminated veneer lumber according to EN 14374. The minimum width is b_{min} = 60 mm, for screws with an outer thread diameter of 12 mm the minimum width b_{min} = 80 mm.

The spacing between screws e_s shall be not more than 1.75 m.

Friction forces shall not be considered for the design of the characteristic axial capacity of the screws.

The anchorage of wind suction forces as well as the bending stresses of the battens or the boards, respectively, shall be considered for design. Screws perpendicular to the grain of the rafter (angle α = 90 °) may be arranged if necessary.

Design may follow EN 1995-1-1 if nothing different is specified below.

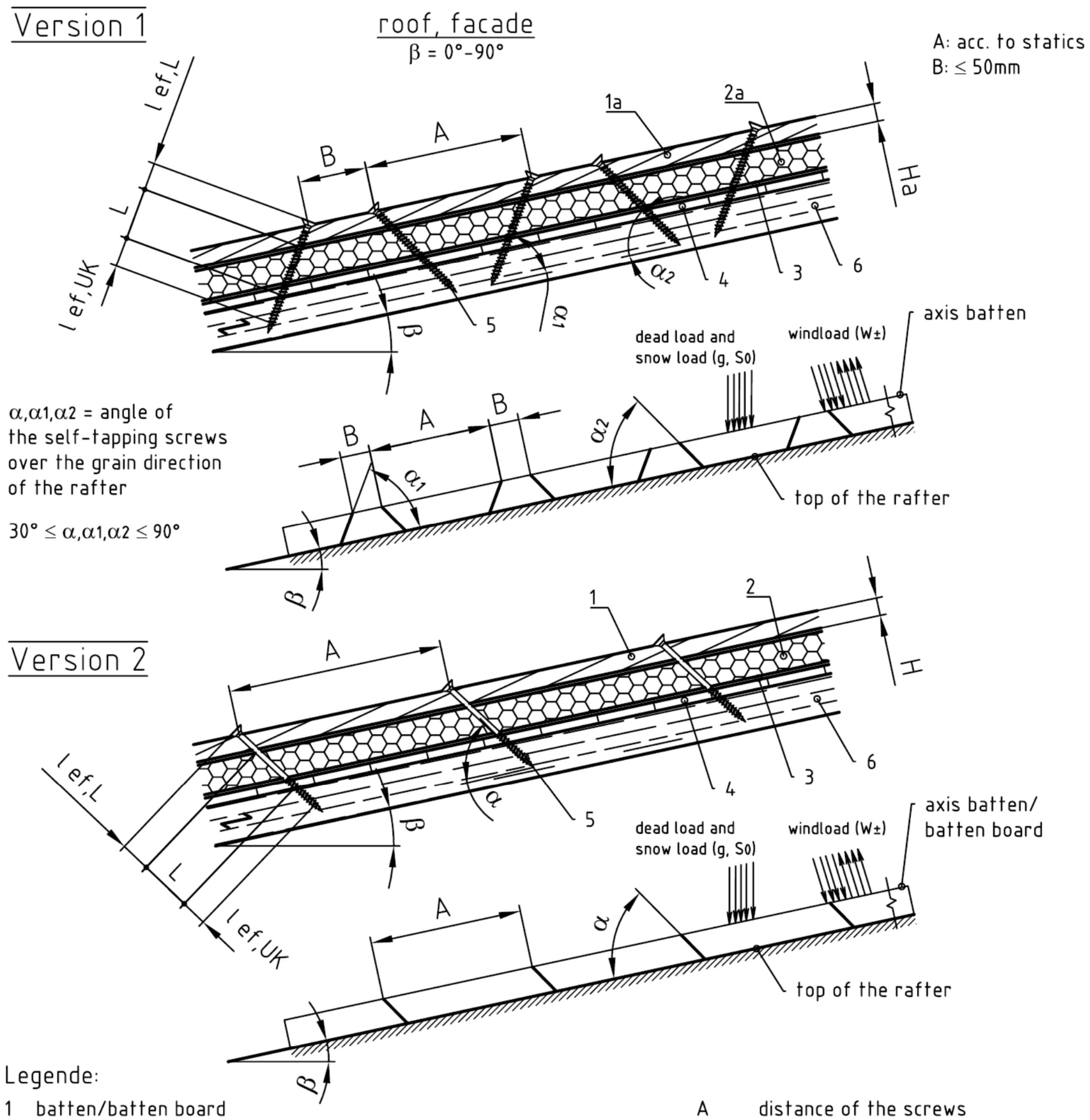
The **two** following **systems** are possible for 0° ≤ β ≤ 90°:

- System 1: Alternately inclined screws (only screws with full thread, double thread)

  A according to structural analysis, B ≤ 50 mm
- System 2: Parallel inclined screws (all screws, in case of compression resistant insulation material ≥ 0.05 N/mm²)

  A according to structural analysis

Member of EOTA



Legende:

1 batten/batten board
1a batten
2 heat isulation (till 300mm), pressure resistant (min.0,05 N/mm²)
2a heat isulation (till 400mm), pressure resistant
3 vapour barrier
4 roof boards
5 self-tapping screws
6 rafter

A distance of the screws
H thickness batten/batten board
Ha thickness batten
l ef,L penetration lenght in the batten/batten board
l ef,UK penetration lenght in the rafter

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Fastening of thermal insulation material	

A.9.2 Alternately inclined screws (only screws with full thread and Rapid® Top2Roof)

The screws are predominantly loaded in withdrawal or compression, respectively. Only systems with battens are allowed.

Design

For design of thermal insulation systems in terms of number and spacing of the screws the following characteristic values of tensile or compressive load bearing capacity may be taken into account:

$$R_{ax,k} = \min \begin{cases} f_{ax,k,\alpha} \cdot d \cdot l_{ef,L} \\ f_{ax,k,\alpha} \cdot d \cdot l_{ef,UK} \end{cases} \quad \text{in N}$$

where:

$f_{ax,k,\alpha}$	=	characteristic value of the axial withdrawal parameter of the threaded part of the screw in the batten, $f_{ax,k,\alpha}$ does not apply for wood-based panels
α	=	angle between screw axis and grain direction of batten or substructure
d	=	outer thread diameter of the screw in mm
$l_{ef,L}$	=	penetration length of the threaded part of the screw in the batten in mm; the screw head length *k* may be taken into account for tension load (not for compressive loading)
$l_{ef,UK}$	=	penetration length of the threaded part of the screw in the substructure in mm; ≥ 60 mm

For compressive loading the design compressive load bearing capacity shall not exceed the buckling capacity of the screws $\chi \cdot N_{pl,d}$ according to Table A.9.2.

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Table A9.2 Buckling capacity of the screws

Free screw length l between lath and rafter (mm)	κ_c * $N_{pl,k}$ (kN) for Schmid Schrauben				
	Outer thread diameter d				
	6	8	10	12	16
	Inner thread diameter d_i				
	3.8	5.2	6.2	6.9	10.7
≤35	4.396	11.681	19.024	25.125	71.392
60	2.497	7.576	13.516	18.834	62.440
80	1.706	5.416	10.070	14.470	54.654
100	1.232	4.008	7.621	11.154	46.825
120	0.930	3.068	5.912	8.747	39.595
140	0.726	2.418	4.699	7.000	33.360
160	0.582	1.952	3.815	5.710	28.195
180	0.477	1.608	3.156	4.739	23.991
200	0.398	1.347	2.652	3.992	20.582
220	0.337	1.144	2.259	3.407	17.808
240	0.289	0.984	1.947	2.941	15.535
260	0.251	0.855	1.695	2.563	13.657
280	0.220	0.750	1.489	2.254	12.092
300	0.194	0.663	1.318	1.997	10.776
320	-	0.591	1.175	1.781	9.660
340	-	0.529	1.054	1.599	8.707
360	-	0.477	0.950	1.443	7.887
380	-	0.432	0.862	1.309	7.176
400	-	0.393	0.785	1.193	6.557

A.9.3 Parallel inclined screws

The screws are predominantly loaded in tension whereas corresponding thermal insulation material is loaded in compression. The minimum compression stress of the thermal insulation material at 10 % deformation, measured according to EN 826, shall be $\sigma_{(10\%)} \geq 0.05$ N/mm². Hereby systems with battens or wood-based panels may be used.

Design

For design of thermal insulation systems in terms of number and spacing of the screws the following characteristic withdrawal parameter may be taken into account:

$$R_{ax,k} = \min \begin{cases} f_{ax,k,\alpha} \cdot d \cdot l_{ef,UK} \cdot k_1 \cdot k_2 \\ \max \begin{cases} f_{head,k} \cdot d_k^2 \\ f_{ax,k,\alpha} \cdot l_{ef,L} \cdot d \end{cases} \end{cases} \quad \text{in N}$$

where:

$f_{ax,k,\alpha}$	=	characteristic value of the axial withdrawal parameter of the threaded part of the screw in the batten, $f_{ax,k,\alpha}$ does not apply for wood-based panels
$f_{head,k}$	=	characteristic head pull-through parameter according to Tables A6.8 and A6.9

$$k_1 = \min \begin{cases} 1 \\ \dfrac{220}{d_{Dä.}} \end{cases}$$

$$k_2 = \min \begin{cases} 1 \\ \dfrac{\sigma_{10\%}}{0.12} \end{cases}$$

$d_{Dä.}$	=	thickness of thermal insulation material in mm
$\sigma_{10\%}$	=	compressive stress of thermal insulation material at 10 % strain in N/mm²

European Assessment Document EAD 130118-01-0603 “Screws and threaded rods for use in timber constructions”

EN 300 (07.2006), Oriented Strand Boards (OSB) – Definitions, classification and specifications

EN 312 (09.2010), Particleboards – Specifications

EN 338 (04.2016), Structural timber – Strength classes

EN 622-2 (04.2004) +AC (12.2005), Fibreboards – Specifications – Part 2: Requirements for hardboards

EN 622-3 (04.2004), Fibreboards – Specifications – Part 3: Requirements for medium boards

EN 634-1 (03.1995), Cement-bonded particleboards – Specifications – Part 1: General requirements

EN 636:2012+A1 (03.2015), Plywood – Specifications

EN 826 (03.2013), Thermal insulating products for building applications – Determination of compression behaviour

EN 1993-1-4 (10.2006) +A1 (06.2015), Eurocode 3 – Design of steel structures – Part 1-4: General rules – Supplementary rules for stainless steels

EN 1995-1-1 (11.2004), +AC (6.2006), +A1 (06.2008), +A2 (05.2014), Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings

EN 10088-1 (10.2014), Stainless steels – Part 1: List of stainless steels

EN 13353:2008+A1 (05.2011), Solid wood panels (SWP) – Requirements

EN 13986:2004+A1 (04.2015), Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking

EN 14080 (06.2013), Timber structures – Glued laminated timber and glued solid timber – Requirements

EN 14081-1:2016+A1 (08.2019), Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements

EN 14374 (11.2004), Timber structures – Structural laminated veneer lumber – Requirements

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Reference documents	