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Authorised and notified according to Article 29 of the Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011

MEMBER OF EOTA

European Technical Assessment ETA-24/0222 of 2024/04/03

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S	
Trade name of the construction product:	HSB Chipboard Screw and HSB Wood Construction Screw HSB Spanplattenschraube und HSB Holzbau-schraube
Product family to which the above construction product belongs:	Screws for use in timber constructions
Manufacturer:	HSB-Vertriebs GmbH Kirschenwasen 20 D-74670 Forchtenberg-Sindringen Tel.: +49 7948 291 0 Internet www.hsb-schrauben.de
Manufacturing plant:	HSB-Vertriebs GmbH Manufacturing plant II
This European Technical Assessment contains:	25 pages including 3 annexes which form an integral part of the document
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of:	European Assessment document (EAD) no. EAD 130118-01-0603 “Screws and threaded rods for use in timber constructions”
This version replaces:	-

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II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

1 Technical description of product

HSB Chipboard Screw and HSB Wood Construction Screw are self-tapping screws made from special carbon steel. The screws are hardened and they have a corrosion protection according to 3.10.

Further dimensions are shown in Annex A

The washers are made from carbon steel. The dimensions of the washers are given in Annex A.

Geometry and Material

The nominal diameter (outer thread diameter), d, of HSB Chipboard Screw and HSB Wood Construction Screw shall not be less than 3,0 mm and shall not be greater than 12,0 mm. The overall length of the screws, ℓ, shall not be less than 16 mm and shall not be greater than 600 mm. Other dimensions are given in Annex A.

The ratio of inner thread diameter to outer thread diameter d_i/d ranges from 0,60 to 0,71.

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

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

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

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

Steel plates and wood-based panels except solid wood panels, laminated veneer lumber and cross laminated timber shall only be located on the side of the screw head.

The following wood-based panels may be used:

- Solid timber (softwood) according to EN 14081-1
- Glued laminated timber (softwood) according to EN 14080,
- Laminated veneer lumber LVL of softwood according to EN 14374, arrangement of the screws only perpendicular to the plane of the veneers,
- Glued solid timber (softwood) according to EN 14080 or national provisions that apply at the installation site,
- Cross-laminated timber (softwood) according to European Technical Assessments or national provisions that apply at the installation site.

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

- 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,
- Cement-bonded particle boards according to EN 634-2 and EN 13986,
- Solid-wood panels according to EN 13353 and EN 13986.
- Wood-based panels shall only be arranged on the side of the screw head.

HSB Chipboard Screw and HSB Wood Construction Screw with an outer thread diameter of at least 6 mm may be used for the fixing of thermal insulation material on top of rafters or on wood-based members in vertical façades.

The screws are driven into the wood-based member made of softwood without pre-drilling or in pre-drilled holes with a diameter not exceeding the inner thread diameter d_1. The screw holes in steel members shall be pre-drilled with an adequate diameter greater than the outer thread diameter.

If screws with an outer thread diameter $d \geq 8$ mm are driven into the wood-based member without pre-drilling, the structural solid or glued laminated timber, laminated veneer lumber and similar glued members shall be from spruce, pine or fir.

In the case of fastening battens on thermal insulation material on top of rafters the screws shall be driven in the rafter through the battens and the thermal insulation material without pre-drilling in one sequence.

Countersunk head screws may be used with washers according to Annex A. After inserting the screw the washers shall touch the surface of the wood-based member completely.

By fastening screws in wood-based members the head of the screws shall be flush with the surface of the wood based member. For pan head, wafer head, hex head or hex wafer head screws the head part remains unconsidered.

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

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

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

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

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

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

The indications given on the working life cannot be interpreted as a guarantee given by the producer or Assessment Body, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

Characteristic	Assessment of characteristic
3.1 Mechanical resistance and stability*) (BWR1)	
Dimensions	See annex A
Characteristic yield moment	See section 3.4
Bending angle	No performance assessed
Characteristic withdrawal parameter	See section 3.4
Characteristic head pull-trough parameter of screws	See section 3.4
Characteristic Tensile strength Screws made of carbon steel	Characteristic value $f_{tens,k}$: d = 3,0 mm: 2,5 kN d = 3,5 mm: 4,0 kN d = 4,0 mm: 5,0 kN d = 4,5 mm: 6,0 kN d = 5,0 mm: 8,0 kN d = 6,0 mm: 9,5 kN d = 8,0 mm: 19,0 kN d = 10,0 mm: 25,0 kN d = 12,0 mm: 42,0 kN
Characteristic yield strength	See section 3.4
Insertion moment	Ratio of the characteristic torsional strength to the mean insertion moment: $f_{tor,k} / R_{tor,mean} \geq 1,5$
Torsional strength Screws made of carbon steel	Characteristic value $f_{tor,k}$: d = 3,0 mm: 1,6 Nm d = 3,5 mm: 2,2 Nm d = 4,0 mm: 3,3 Nm d = 4,5 mm: 4,5 Nm d = 5,0 mm: 6,1 Nm d = 6,0 mm: 9,0 Nm d = 8,0 mm: 24,0 Nm d = 10,0 mm: 40,0 Nm d = 12,0 mm: 68,0 Nm
Insertion moment	Ratio of the characteristic torsional strength to the mean insertion moment: $f_{tor,k} / R_{tor,mean} \geq 1,5$
Spacing, end and edge distances of the screws or threaded rods and minimum thickness of the timber material	See annex B
Slip modulus for mainly axially loaded screws and threaded rods	See section 3.4
Durability against corrosion	See section 3.5

Characteristic		Assessment of characteristic
3.2	**Safety in case of fire (BWR2)**	
	Reaction to fire	The screws are made from steel classified as Euroclass A1 in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364
3.3	**General aspects related to the performance of the product**	The screws have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service classes 1, 2 and 3

*) See additional information in section 3.4 – 3.6.

3.4 Mechanical resistance and stability

The load-carrying capacities for HSB Chipboard Screw and HSB Wood Construction Screw are applicable to the wood-based materials mentioned in paragraph 1 even though the term timber has been used in the following.

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

Point side penetration length must be

$$l_{ef} = \min\begin{cases} \frac{4 \cdot d}{\sin\alpha} \\ 20 \cdot d \end{cases}$$

where d is the outer thread diameter of the screw.

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

Lateral load-carrying capacity

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

The characteristic yield moment shall be assumed as:

d = 3,0 mm:	$M_{y,k}$ = 1,6 Nm
d = 3,5 mm:	$M_{y,k}$ = 2,3 Nm
d = 4,0 mm:	$M_{y,k}$ = 3,3 Nm
d = 4,5 mm:	$M_{y,k}$ = 4,5 Nm
d = 5,0 mm:	$M_{y,k}$ = 5,9 Nm
d = 6,0 mm:	$M_{y,k}$ = 9,5 Nm
d = 8,0 mm:	My,k = 20,0 Nm
d = 10,0 mm:	My,k = 36,0 Nm
d = 12,0 mm:	My,k = 58,0 Nm

The embedding strength for the screws in wood-based members or in wood-based panels shall be taken from EN 1995- 1-1 or from national provisions that apply at the installation site unless otherwise specified in the following

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

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

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

Where
d outer thread diameter [mm]

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

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

Bending angle

No performance assessed.

Axial withdrawal capacity

The characteristic withdrawal parameter at an angle $\alpha = 90°$ to the grain based on a characteristic density of the wood-based member of 350 kg/m³ is
$f_{ax,k}$ = 12.0 N/mm² for screws with 3.0 mm ≤ d ≤ 5.0 mm,
$f_{ax,k}$ = 11.0 N/mm² for screws with 6.0 mm ≤ d ≤ 8.0 mm,
$f_{ax,k}$ = 10.0 N/mm² for screws with d ≥ 10.0 mm.

For LVL a maximum characteristic density of 500 kg/m³ shall be used in equation (8.40a) of EN 1995-1-1.

For screws penetrating more than one layer of cross laminated timber the different layers may be taken into account proportionally. In the lateral surfaces of the cross laminated timber the screws shall be fully inserted in one layer.

The characteristic axial withdrawal capacity for screws arranged parallel to the plane of cross laminated timber, independent of the angle between screw axis and grain direction, $0° \le \alpha \le 90°$, may be calculated from:
$F_{\alpha x,Rk} = 20 \times d^{0.8} \times l_{ef}^{0,9}$

where
d outer thread diameter of the screw [mm]
l_{ef} penetration length of the threaded part of the screw in the wood-based member [mm].

The equation is only valid for instantaneous and short action.

The axial slip modulus K_{ser} of the threaded part of a screw for the serviceability limit state should be taken

independent of angle α to the grain as:

$K_{ser} = 780 \cdot d^{0,2} \cdot \ell_{ef}^{0,4}$ [N/mm],

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

Head pull-through capacity
The characteristic value of the head pull-through parameter for HSB Chipboard Screw and HSB Wood Construction Screw for a characteristic density of 350 kg/m³ of the timber and for wood-based panels like
- 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
- Cement-bonded particle boards according to EN 634-2 and EN 13986,
- Solid-wood panels according to EN 13353 and EN 13986

with a thickness of more than 20 mm is
$f_{head,k} = 9.4$ N/mm².

For wood-based panels a maximum characteristic density of 380 kg/m³ and for LVL a maximum characteristic density of 500 kg/m³ shall be used in equation (8.40b) of EN 1995-1-1.

The head diameter shall be equal to or greater than $1.8 \cdot d_s$, where d_s is the smooth shank or the inner thread diameter. Otherwise the characteristic head pull-through capacity in equation (8.40b) of EN 1995-1-1 is for all wood based materials: $F_{ax,\alpha,RK} = 0$.

For wood based panels with a thickness 12 mm ≤ t ≤ 20 mm the characteristic value of the head pull-through parameter for the screws is:
$f_{head,k} = 8$ N/mm²

For wood based panels with a thickness of less than 12 mm the characteristic head pull-through capacity for screws shall be based on a characteristic value of the head pull-through parameter of 8 N/mm², and limited to 400 N complying with the minimum thickness of the wood based panels of 1.2·d, with d as outer thread diameter and the values in the following table.

Wood based panel	Minimum thickness [mm]
Plywood	6
Fibreboards (hardboards and medium boards)	6
Oriented Strand Boards, OSB	8
Particleboards	8
Cement-bonded particle board	8
Solid wood Panels	12

Outer diameter of washer d_k > 32 mm shall not be considered.

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

3.5 Aspects related to the performance of the product

3.5.1 Corrosion protection in service class 1 and 2.
The HSB Chipboard Screw and HSB Wood Construction Screw are produced from carbon wire. Screws made from steel are electrogalvanised and yellow or blue chromate, brass plated, browned or nickel plated. The thickness of the zinc coating is minimum 5 µm. Alternatively, the screws can be coated with a minimum 4 µm zinc-nickel coating.

3.6 General aspects related to the intended use of the product

The screws are manufactured in accordance with the provisions of the European Technical Assessment using the automated manufacturing process as identified during the inspection of the plant by the assessment body issuing the ETA and the notified body and laid down in the technical documentation.

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

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

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

Minimum thickness for structural members made from solid timber, glued laminated timber, glued solid timber,

laminated veneer lumber and cross laminated timber is t = 24 mm for screws with d < 8 mm, t = 30 mm for screws with d = 8 mm, t = 40 mm for screws with d = 10 mm and t = 80 mm for screws with d = 12 mm.

For screws in non pre-drilled holes in structural timber members, minimum spacing and distances for screws are given in EN 1995-1-1 (Eurocode 5) clause 8.3.1.2 and table 8.2 as for nails in predrilled or non-predrilled holes, respectively. Here, the outer thread diameter d must be considered.
For Douglas fir members minimum spacing and distances parallel to the grain shall be increased by 50%. Minimum distances from the unloaded edge perpendicular to the grain may be reduced to 3·d also for timber thickness t < 5·d, if the spacing parallel to the grain and the end distance is at least 25·d.

For HSB Chipboard Screw and HSB Wood Construction Screw in pre-drilled holes the minimum spacings, end and edge distances are given in
EN 1995-1-1:2004+A1: 2008, clause 8.3.1.2 and Table 8.2 as for nails in pre-drilled holes. Here, the outer thread diameter d shall be considered.

Only axially loaded screws
For HSB Chipboard Screw and HSB Wood Construction Screw the minimum spacings, end and edge distances are given in EN 1995-1-1: 2004+AC:2006+A1:2008+A2:2014, clause 8.3.1.2 and Table 8.2 as for nails in non-predrilled holes and clause 8.7.2, Table 8.6.

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

4.1 AVCP system

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

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

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

Issued in Copenhagen on 2024-04-03 by

Thomas Bruun
Managing Director, ETA-Danmark

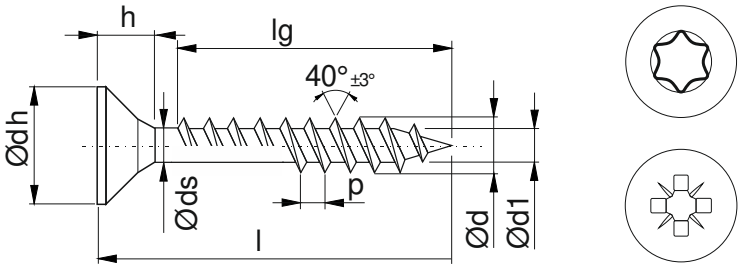
Annex A

Drawings and material specification of HSB Chipboard Screw and HSB Wood Construction Screw

HSB Spanplattenschraube

HSB Chipboard Screw

Self-drilling with full or part thread, Carbon Steel, Countersunk Head



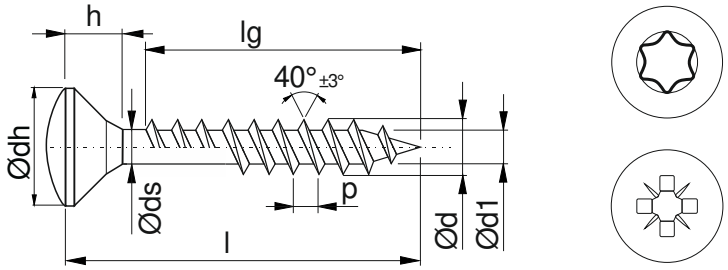
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: optional for L >=25mm and d >=3,5; obligatory for L >=220mm
Under Head Rips or Pockets: optional
Thread Cutting Line: optional
Head Mark: optional

Nominal diameter (d)			3		3,5		4		4,5		5		6	
d	Nominal Diameter	min	2,75		3,30		3,75		4,25		4,75		5,80	
		max	3,00		3,50		4,00		4,50		5,00		6,00	
d1	Inner Diameter	min	1,70		2,00		2,25		2,45		2,70		3,40	
		max	2,10		2,20		2,50		2,70		3,00		3,70	
dh	Head Diameter	min	5,60		6,60		7,50		8,50		9,50		11,50	
		max	6,00		7,00		8,00		9,00		10,00		12,10	
ds	Shaft Diameter	min	2,15		2,45		2,72		3,15		3,40		4,20	
h	Head Height	min	2,60		3,20		4,00		4,30		4,80		5,10	
		max	3,00		3,60		4,40		4,70		5,20		5,50	
p	Pitch	min	1,22		1,44		1,62		1,80		1,98		2,34	
		max	1,49		1,76		1,98		2,20		2,42		2,86	
L	Length	min	16	+1,0 -2,0	18	+1,0 -2,0	20	+1,0 -2,0	25	+1,0 -2,0	25	+1,0 -2,0	30	+1,0 -2,0
		max	50	+1,0 -2,0	50	+1,0 -2,0	70	+1,0 -2,0	80	+1,0 -2,0	120	+1,0 -2,0	300	+1,0 -2,0
L1	Thread Length	min	12	+1,0 -2,0	14	+1,0 -2,0	16	+1,0 -2,0	18	+1,0 -2,0	20	+1,0 -2,0	24	+1,0 -2,0
		max	46	+1,0 -2,0	44	+1,0 -2,0	64	+1,0 -2,0	74	+1,0 -2,0	75	+1,0 -2,0	75	+1,0 -2,0
L2	Shank Rips Length				6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0	12	+1,0 -1,0
d2	Shank Rips Diameter				3,0	+0,3 -0,2	3,6	+0,3 -0,3	3,6	+0,3 -0,3	3,8	+0,2 -0,1	5,20	+0,4 -0,4
Recess TX	Recess Size		10		10/15		15/20		20/25		20/25		25/30	
Recess PZ	Recess Size		1		2		2		2		2		3	

All dimensions and tolerances in mm.

HSB Spanplattenschraube
HSB Chipboard Screw

Self-drilling with full or part thread, Carbon Steel, Raised Countersunk Head



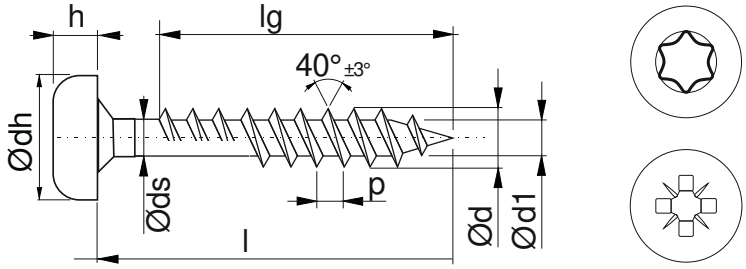
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: optional for L >=25mm and d >=3,5; obligatory for L >=220mm
Under Head Rips or Pockets: optional
Thread Cutting Line: optional
Head Mark: optional

Nominal diameter (d)			3		3,5		4		4,5		5		6	
d	Nominal Diameter	min	2,75		3,30		3,75		4,25		4,75		5,80	
		max	3,00		3,50		4,00		4,50		5,00		6,00	
d1	Inner Diameter	min	1,70		2,00		2,25		2,45		2,70		3,40	
		max	2,10		2,20		2,50		2,70		3,00		3,70	
dh	Head Diameter	min	5,60		6,60		7,50		8,50		9,50		11,50	
		max	6,00		7,00		8,00		9,00		10,00		12,10	
ds	Shaft Diameter	min	2,15		2,45		2,72		3,15		3,40		4,20	
h	Head Height	min	2,90		3,50		4,50		4,50		5,10		5,80	
		max	3,50		4,10		5,10		5,10		5,70		6,40	
p	Pitch	min	1,22		1,44		1,62		1,80		1,98		2,34	
		max	1,49		1,76		1,98		2,20		2,42		2,86	
L	Length	min	16	+1,0 -2,0	18	+1,0 -2,0	20	+1,0 -2,0	25	+1,0 -2,0	25	+1,0 -2,0	30	+1,0 -2,0
		max	50	+1,0 -2,0	50	+1,0 -2,0	70	+1,0 -2,0	80	+1,0 -2,0	120	+1,0 -2,0	300	+1,0 -2,0
L1	Thread Length	min	12	+1,0 -2,0	14	+1,0 -2,0	16	+1,0 -2,0	18	+1,0 -2,0	20	+1,0 -2,0	24	+1,0 -2,0
		max	46	+1,0 -2,0	44	+1,0 -2,0	64	+1,0 -2,0	74	+1,0 -2,0	75	+1,0 -2,0	75	+1,0 -2,0
L2	Shank Rips Length				6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0	12	+1,0 -1,0
d2	Shank Rips Diameter				3,0	+0,3 -0,2	3,6	+0,3 -0,3	3,6	+0,3 -0,3	3,8	+0,2 -0,1	5,20	+0,4 -0,4
Recess TX	Recess Size		10		10/15		15/20		20/25		20/25		25/30	
Recess PZ	Recess Size		1		2		2		2		2		3	

All dimensions and tolerances in mm.

HSB Spanplattenschraube
HSB Chipboard Screw

Self-drilling with full or part thread, Carbon Steel, Pan Head



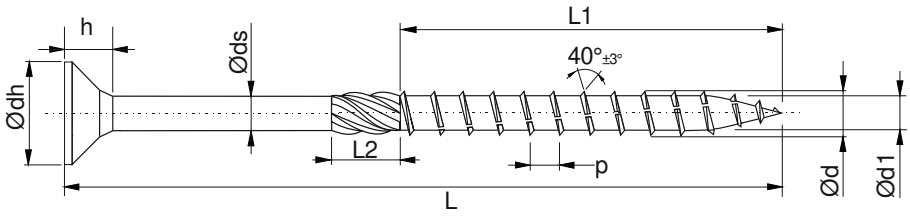
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: optional for L >=25mm and d >=3,5; obligatory for L >=220mm
Thread Cutting Line: optional
Head Mark: optional

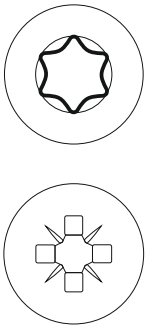
Nominal diameter (d)			3		3,5		4		4,5		5		6	
d	Nominal Diameter	min	2,75		3,30		3,75		4,25		4,75		5,80	
		max	3,00		3,50		4,00		4,50		5,00		6,00	
d1	Inner Diameter	min	1,70		2,00		2,25		2,45		2,70		3,40	
		max	2,10		2,20		2,50		2,70		3,00		3,70	
dh	Head Diameter	min	5,60		6,60		7,50		8,50		9,50		11,50	
		max	6,00		7,00		8,00		9,00		10,00		12,10	
ds	Shaft Diameter	min	2,15		2,45		2,72		3,15		3,40		4,20	
h	Head Height	min	2,10		2,20		2,60		2,95		3,35		4,05	
		max	2,40		2,50		2,90		3,25		3,65		4,35	
p	Pitch	min	1,22		1,44		1,62		1,80		1,98		2,34	
		max	1,49		1,76		1,98		2,20		2,42		2,86	
L	Length	min	16	+1,0 -2,0	18	+1,0 -2,0	20	+1,0 -2,0	25	+1,0 -2,0	25	+1,0 -2,0	30	+1,0 -2,0
		max	50	+1,0 -2,0	50	+1,0 -2,0	70	+1,0 -2,0	80	+1,0 -2,0	120	+1,0 -2,0	300	+1,0 -2,0
L1	Thread Length	min	12	+1,0 -2,0	14	+1,0 -2,0	16	+1,0 -2,0	18	+1,0 -2,0	20	+1,0 -2,0	24	+1,0 -2,0
		max	46	+1,0 -2,0	44	+1,0 -2,0	64	+1,0 -2,0	74	+1,0 -2,0	75	+1,0 -2,0	75	+1,0 -2,0
L2	Shank Rips Length				6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0	12	+1,0 -1,0
d2	Shank Rips Diameter				3,0	+0,3 -0,2	3,6	+0,3 -0,3	3,6	+0,3 -0,3	3,8	+0,2 -0,1	5,20	+0,4 -0,4
Recess TX	Recess Size		10		10/15		15/20		20/25		20/25		25/30	
Recess PZ	Recess Size		1		2		2		2		2		3	

All dimensions and tolerances in mm.

HSB Holzbauschraube | HSB Paneelschraube | HSB Mehrzweckschraube | Turbo Drill
HSB Wood Construction Screw | HSB Panel Screw | HSB Multipurpose Screw | Turbo-Drive plus

Self-drilling with full or part thread, Carbon Steel, Countersunk Head





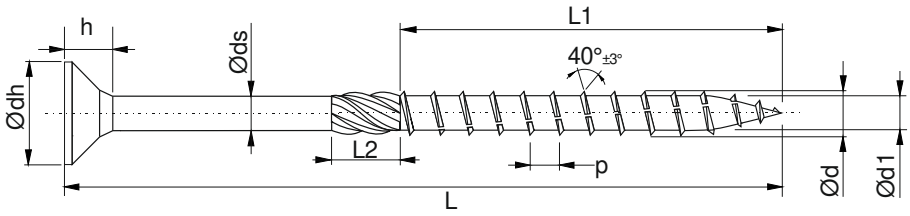
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: optional for L >=25mm
Under Head Rips or Pockets: optional
Thread Cutting Line: optional
Head Mark: optional

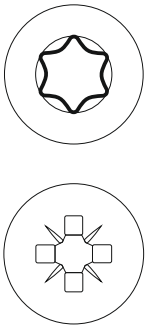
Nominal diameter (d)			3,5		4		4,5		5	
d	Nominal Diameter	min	3,20		3,70		4,20		4,70	
		max	3,50		4,00		4,50		5,00	
d1	Inner Diameter	min	1,90		2,05		2,40		2,80	
		max	2,10		2,50		2,90		3,30	
dh	Head Diameter	min	6,60		7,60		8,60		9,60	
		max	7,00		8,00		9,00		10,00	
ds	Shaft Diameter	min	2,50		2,80		3,16		3,47	
h	Head Height	min	3,20		4,00		4,30		4,90	
		max	3,60		4,40		4,70		5,30	
p	Pitch	min	2,43		2,52		2,79		2,88	
		max	2,97		3,08		3,41		3,52	
L	Length	min	20	+1,0 -2,0	20	+1,0 -2,0	20	+1,0 -2,0	25	+1,0 -2,0
		max	70	+1,0 -2,0	80	+1,0 -2,0	80	+1,0 -2,0	120	+1,0 -2,0
L1	Thread Length	min	14	+1,0 -3,0	16	+1,0 -3,0	18	+1,0 -3,0	20	+1,0 -3,0
		max	42	+1,0 -3,0	49	+1,0 -3,0	49	+1,0 -3,0	74	+1,0 -3,0
L2	Shank Rips Length		6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0	6,0	+1,0 -1,0
d2	Shank Rips Diameter		3,0	+0,3 -0,2	3,6	+0,3 -0,3	3,6	+0,3 -0,3	3,8	+0,2 -0,1
Recess TX	Recess Size		10/15		15/20		20/25		20/25	
Recess PZ	Recess Size		2		2		2		2	

All dimensions and tolerances in mm.

HSB Holzbauschraube | HSB Paneelschraube | HSB Mehrzweckschraube | Turbo Drill
HSB Wood Construction Screw | HSB Panel Screw | HSB Multipurpose Screw | Turbo-Drive plus

Self-drilling with full or part thread, Carbon Steel, Countersunk Head





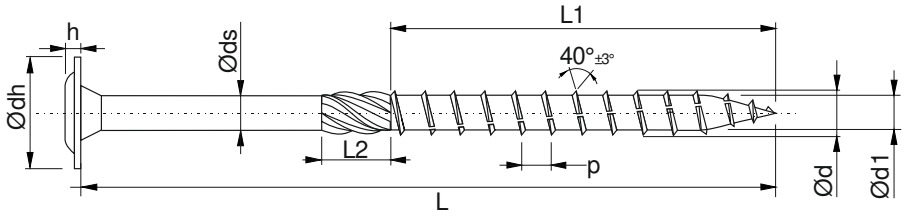
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: obligatory
Under Head Rips or Pockets: optional
Thread Cutting Line: optional
Head Mark: optional

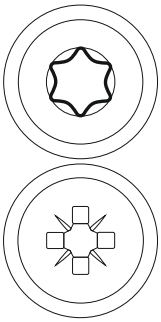
Nominal diameter (d)			6		8		10		12	
d	Nominal Diameter	min	5,80		7,60		9,60		11,60	
		max	6,20		8,25		10,25		12,30	
d1	Inner Diameter	min	3,65		5,05		6,20		7,00	
		max	4,10		5,50		6,70		7,50	
dh	Head Diameter	min	11,40		14,00		17,50		20,00	
		max	12,10		15,00		18,50		21,50	
ds	Shaft Diameter	min	4,20		5,80		7,00		7,90	
h	Head Height	min	5,30		6,75		7,70		9,20	
		max	5,90		7,25		8,70		10,20	
p	Pitch	min	4,05		4,68		5,04		5,40	
		max	4,95		5,72		6,16		6,60	
L	Length	min	40	+2,0 -2,0	40	+2,0 -2,0	80	+2,0 -2,0	80	+2,0 -2,0
		max	300	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0
L1	Thread Length	min	24	+1,5 -1,5	32	+1,5 -1,5	40	+1,5 -1,5	50	+1,5 -1,5
		max	100	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5
L2	Shank Rips Length		12,0	+1,0 -1,0	12,0	+1,0 -1,0	12,0	+1,0 -2,0	12,0	+1,0 -1,0
d2	Shank Rips Diameter		5,2	+0,4 -0,4	6,4	+0,4 -0,4	8,3	+0,4 -0,4	9,4	+0,4 -0,4
Recess TX	Recess Size		25 / 30		40		40		40/50	

All dimensions and tolerances in mm.

HSB Holzbauschraube | HSB Tellerkopfschraube | HSB Pfostenverbinderschraube
HSB Wood Construction Screw | HSB Plate Head Screw | HSB Post Connector Screw

Self-drilling with full or part thread, Carbon Steel, Wafer Head





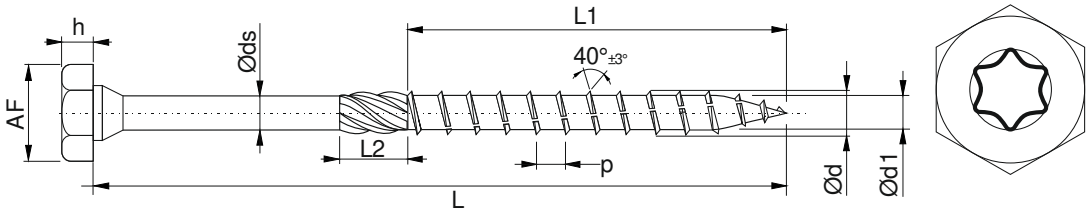
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: obligatory
Thread Cutting Line: optional
Head Mark: optional

Nominal diameter (d)			6		8		10		12	
d	Nominal Diameter	min	5,80		7,60		9,60		11,60	
		max	6,20		8,25		10,25		12,30	
d1	Inner Diameter	min	3,65		5,05		6,20		7,00	
		max	4,10		5,50		6,70		7,50	
dh	Head Diameter	min	14,50		20,50		23,50		27,50	
		max	16,50		23,50		26,50		30,50	
ds	Shaft Diameter	min	4,20		5,80		7,00		7,90	
h	Head Height	min	2,50		2,80		3,50		3,60	
		max	3,50		3,80		4,50		4,80	
p	Pitch	min	4,05		4,68		5,04		5,40	
		max	4,95		5,72		6,16		6,60	
L	Length	min	40	+2,0 -2,0	40	+2,0 -2,0	80	+2,0 -2,0	80	+2,0 -2,0
		max	300	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0
L1	Thread Length	min	24	+1,5 -1,5	32	+1,5 -1,5	40	+1,5 -1,5	50	+1,5 -1,5
		max	100	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5
L2	Shank Rips Length		12,0	+1,0 -1,0	12,0	+1,0 -1,0	12,0	+1,0 -2,0	12,0	+1,0 -1,0
d2	Shank Rips Diameter		5,2	+0,4 -0,4	6,4	+0,4 -0,4	8,3	+0,4 -0,4	9,4	+0,4 -0,4
Recess TX	Recess Size		25 / 30		40		40		40/50	

All dimensions and tolerances in mm.

HSB Holzbauschraube
HSB Wood Construction Screw

Self-drilling with full or part thread, Carbon Steel, Hex Head



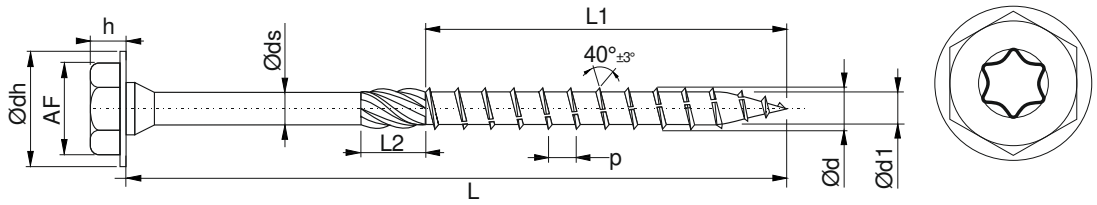
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: obligatory
Thread Cutting Line: optional
Head Mark: optional

Nominal diameter (d)			6		8		10		12	
d	Nominal Diameter	min	5,80		7,60		9,60		11,60	
		max	6,20		8,25		10,25		12,30	
d1	Inner Diameter	min	3,65		5,05		6,20		7,00	
		max	4,10		5,50		6,70		7,50	
AF	Width across flat	min	AF10 -0,4		AF12 -0,4		AF15 -0,4		AF17 -0,5	
		max	AF10		AF12		AF15		AF17	
ds	Shaft Diameter	min	4,20		5,80		7,00		7,90	
h	Head Height	min	3,70		4,20		4,60		5,10	
		max	4,50		5,00		5,80		6,30	
p	Pitch	min	4,05		4,68		5,04		5,40	
		max	4,95		5,72		6,16		6,60	
L	Length	min	40	+2,0 -2,0	40	+2,0 -2,0	80	+2,0 -2,0	80	+2,0 -2,0
		max	300	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0
L1	Thread Length	min	24	+1,5 -1,5	32	+1,5 -1,5	40	+1,5 -1,5	50	+1,5 -1,5
		max	100	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5
L2	Shank Rips Length		12,0	+1,0 -1,0	12,0	+1,0 -1,0	12,0	+1,0 -2,0	12,0	+1,0 -1,0
d2	Shank Rips Diameter		5,2	+0,4 -0,4	6,4	+0,4 -0,4	8,3	+0,4 -0,4	9,4	+0,4 -0,4
Recess TX	Recess Size		25 / 30		40		40		40/50	

All dimensions and tolerances in mm.

HSB Holzbauschraube
HSB Wood Construction Screw

Self-drilling with full or part thread, Carbon Steel, Hex-Wafer Head



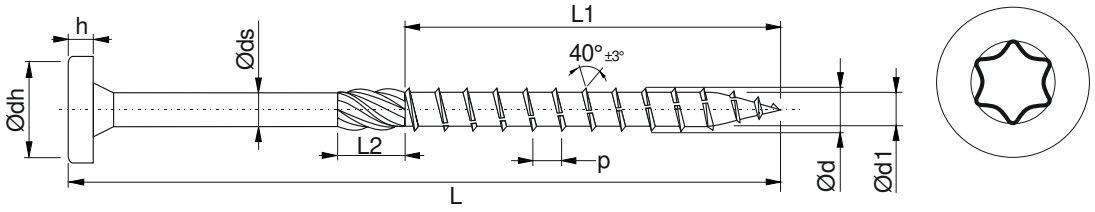
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: obligatory
Thread Cutting Line: optional
Head Mark: optional

Nominal diameter (d)			6		8		10		12	
d	Nominal Diameter	min	5,80		7,60		9,60		11,60	
		max	6,20		8,25		10,25		12,30	
d1	Inner Diameter	min	3,65		5,05		6,20		7,00	
		max	4,10		5,50		6,70		7,50	
dh	Head Diameter	min	14,50		19,40		23,00		27,50	
		max	16,50		23,00		26,60		31,50	
AF	Width across flat	min	AF10 -0,4		AF12 -0,4		AF15 -0,4		AF17 -0,5	
		max	AF10		AF12		AF15		AF17	
ds	Shaft Diameter	min	4,20		5,80		7,00		7,90	
h	Head Height	min	5,40		6,00		7,20		8,20	
		max	6,60		7,20		8,80		9,80	
p	Pitch	min	4,05		4,68		5,04		5,40	
		max	4,95		5,72		6,16		6,60	
L	Length	min	40	+2,0 -2,0	40	+2,0 -2,0	80	+2,0 -2,0	80	+2,0 -2,0
		max	300	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0
L1	Thread Length	min	24	+1,5 -1,5	32	+1,5 -1,5	40	+1,5 -1,5	50	+1,5 -1,5
		max	100	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5
L2	Shank Rips Length		12,0	+1,0 -1,0	12,0	+1,0 -1,0	12,0	+1,0 -2,0	12,0	+1,0 -1,0
d2	Shank Rips Diameter		5,2	+0,4 -0,4	6,4	+0,4 -0,4	8,3	+0,4 -0,4	9,4	+0,4 -0,4
Recess TX	Recess Size		25 / 30		40		40		40/50	

All dimensions and tolerances in mm.

HSB Holzbauschraube
HSB Wood Construction Screw

Self-drilling with full or part thread, Carbon Steel, Pan Head



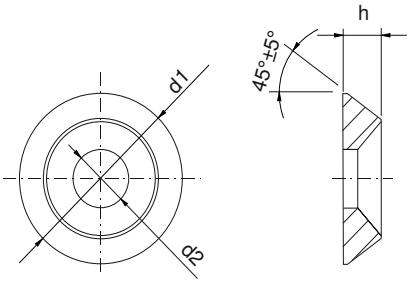
Tip: sharp, Type 17, Saw Thread and Type 17 & Saw Thread combined
Shank Rips: obligatory
Thread Cutting Line: optional
Head Mark: optional

Nominal diameter (d)			6		8		10	
d	Nominal Diameter	min	5,80		7,60		9,60	
		max	6,20		8,25		10,25	
d1	Inner Diameter	min	3,65		5,05		6,20	
		max	4,10		5,50		6,70	
dh	Head Diameter	min	13,00		16,60		20,50	
		max	13,80		17,40		21,50	
ds	Shaft Diameter	min	4,20		5,80		7,00	
h	Head Height	min	3,40		3,80		4,50	
		max	3,80		4,20		5,10	
p	Pitch	min	4,05		4,68		5,04	
		max	4,95		5,72		6,16	
L	Length	min	40	+2,0 -2,0	40	+2,0 -2,0	80	+2,0 -2,0
		max	300	+2,0 -2,0	600	+2,0 -2,0	600	+2,0 -2,0
L1	Thread Length	min	24	+1,5 -1,5	32	+1,5 -1,5	40	+1,5 -1,5
		max	100	+1,5 -1,5	150	+1,5 -1,5	150	+1,5 -1,5
L2	Shank Rips Length		12,0	+1,0 -1,0	12,0	+1,0 -1,0	12,0	+1,0 -2,0
d2	Shank Rips Diameter		5,2	+0,4 -0,4	6,4	+0,4 -0,4	8,3	+0,4 -0,4
Recess TX	Recess Size		25 / 30		40		40	

All dimensions and tolerances in mm.

HSB Unterlegscheibe für Holzbauschrauben
HSB Washer for Wood Construction Screw

Carbon Steel

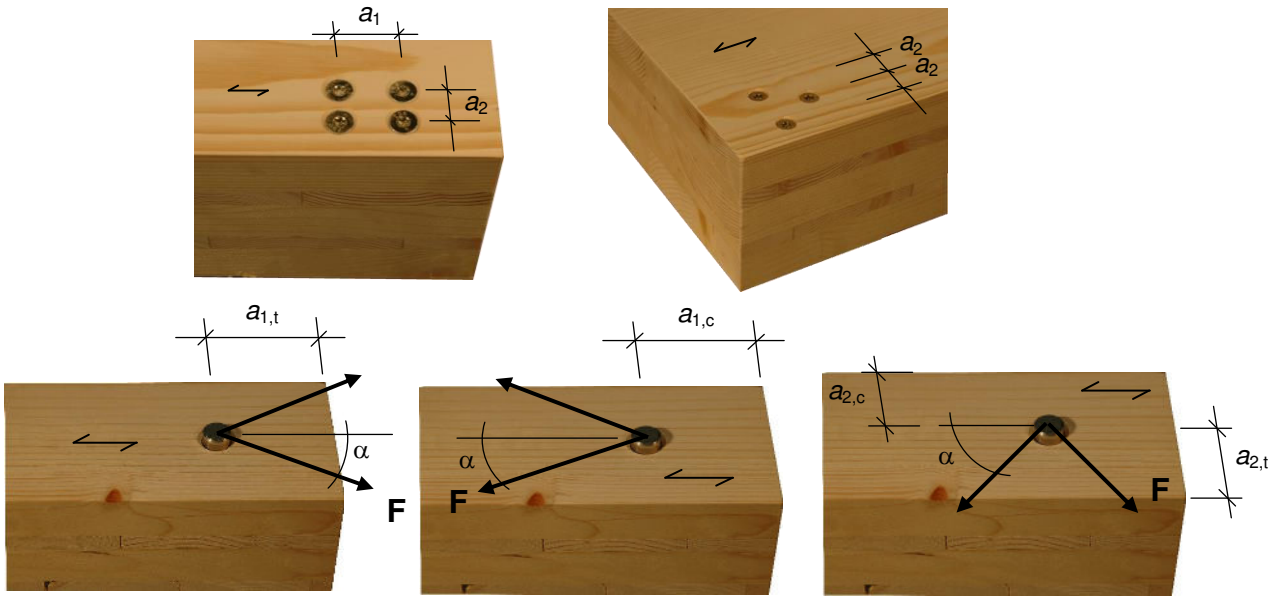


Nominal diameter (d)			6	8	10
d1	Outer Diameter	min	19,20	24,70	31,70
		max	19,80	25,30	32,30
d2	Inner Diameter	min	7,70	8,20	10,70
		max	8,30	8,80	11,30
h	Washer Height	min	4,50	4,70	5,70
		max	5,10	5,30	6,30

All dimensions and tolerances in mm.

Annex B
Minimum distances and spacing
Axially or laterally loaded screws in the plane or edge surface of cross laminated timber

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



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

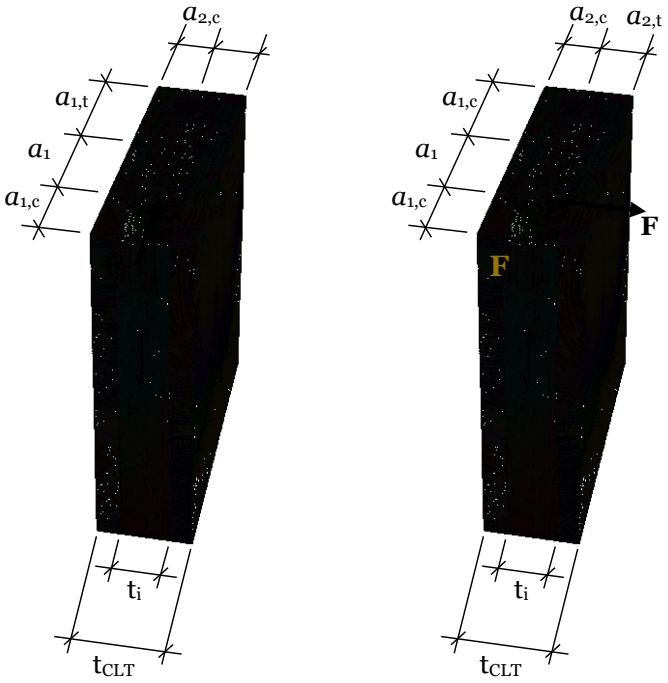


Table B1: Minimum spacing, end and edge distances of screws in the plane or edge surfaces of cross laminated timber

	a_1	$a_{3,t}$	$a_{3,c}$	a_2	$a_{4,t}$	$a_{4,c}$
Plane surface (see Figure 1)	4 · d	6 · d	6 · d	2,5 · d	6 · d	2,5 · d
Edge surface (see Figure 2)	10 · d	12 · d	7 · d	4 · d	6 · d	3 · d

Annex C
Thermal insulation material on top of rafters

HSB Chipboard Screw and HSB Wood Construction Screw with an outer thread diameter of at least 6 mm may be used for the fixing of thermal insulation material on top of rafters.

The thickness of the insulation shall not exceed 300 mm. The rafter insulation must be placed on top of solid timber or glued laminated timber rafters or cross-laminated timber members and be fixed by battens arranged parallel to the rafters or by wood-based panels on top of the insulation layer. The insulation of vertical facades is also covered by the rules given here.

Screws must be screwed in the rafter through the battens or panels and the insulation without pre-drilling in one sequence.

The angle α between the screw axis and the grain direction of the rafter should be between 30° and 90°.

The rafter consists of solid timber (softwood) according to EN 338, glued laminated timber according to EN 14081, cross-laminated timber, or laminated veneer lumber according to EN 14374 or to ETA or similar glued members according to ETA.

The battens must be from solid timber (softwood) according to EN 338:2003-04. The minimum thickness t and the minimum width b of the battens is given as follows:

Screws $d \leq 8{,}0$ mm:	$b_{min} = 50$ mm	$t_{min} = 30$ mm
Screws $d = 10$ mm:	$b_{min} = 60$ mm	$t_{min} = 40$ mm
Screws $d = 12$ mm:	$b_{min} = 100$ mm	$t_{min} = 60$ mm

The insulation must comply with an ETA. The thermal insulation material shall be applicable as insulation on top of rafters according to national provisions that apply at the installation site.

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

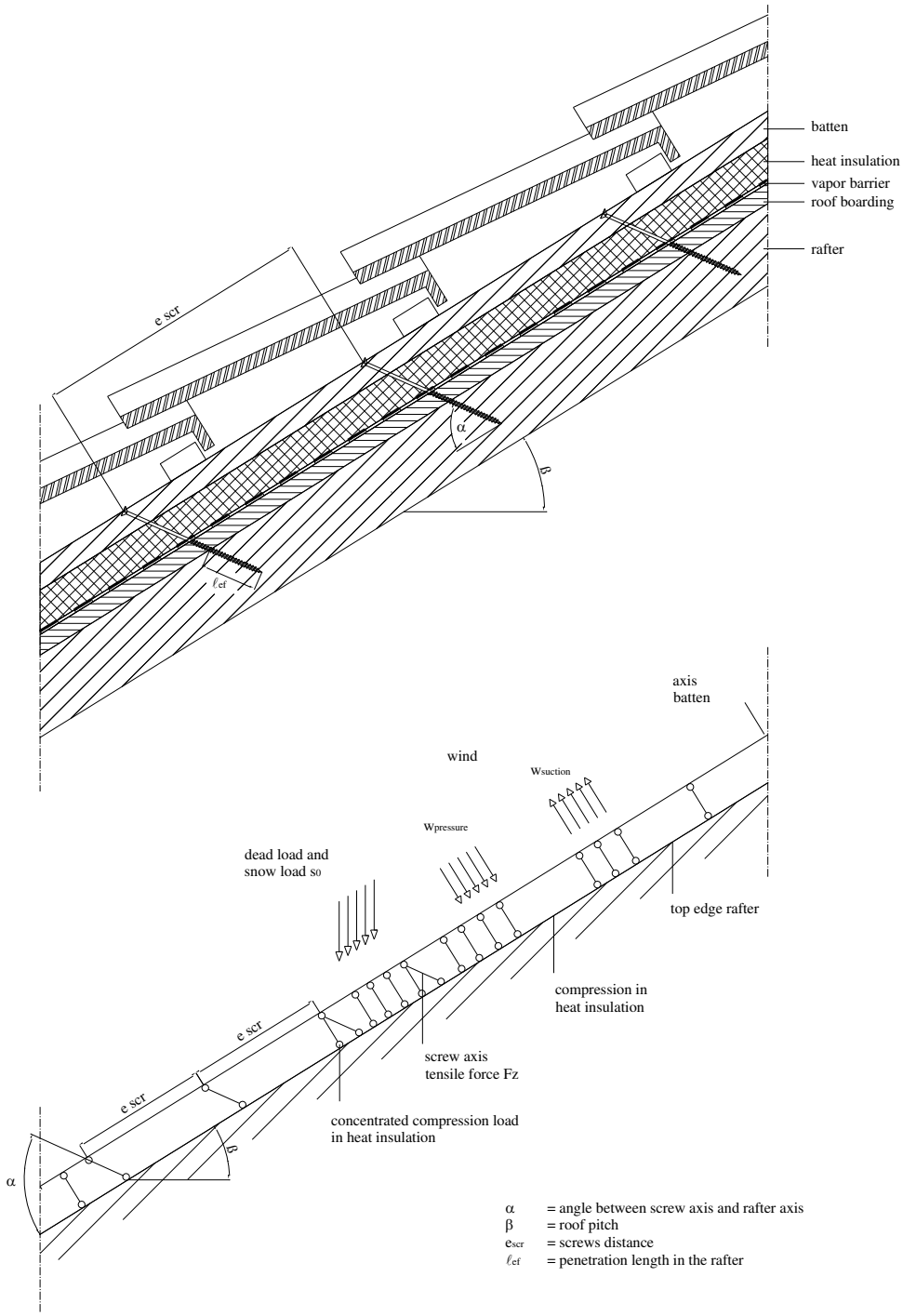
The anchorage of wind suction forces as well as the bending stresses of the battens or the boards, respectively, shall be considered in design. Additional screws perpendicular to the grain of the rafter (angle $\alpha = 90°$) may be arranged if necessary.

The maximum screw spacing is $e_S = 1{,}75$ m.

Thermal insulation material on rafters with parallel inclined screws and thermal insulation material in compression

Mechanical model

The system of rafter, thermal insulation on top of rafter and battens parallel to the rafter may be considered as a beam on elastic foundation. The batten represents the beam, and the thermal insulation on top of the rafter the elastic foundation. The minimum compression stress of the thermal insulation at 10 % deformation, measured according to EN 826[1], shall be $\sigma_{(10\,\%)} = 0{,}05$ N/mm². The batten is loaded perpendicular to the axis by point loads F_b. Further point loads F_s are from the shear load of the roof due to dead and snow load, which are transferred from the screw heads into the battens.



[1] EN 826:1996 Thermal insulating products for building applications - Determination of compression behaviour

Design of the battens
The bending stresses are calculated as:

$$M = \frac{(F_b + F_s) \cdot \ell_{char}}{4}$$

Where

ℓ_{char} = characteristic length $\ell_{char} = \sqrt[4]{\frac{4 \cdot EI}{w_{ef} \cdot K}}$
EI = bending stiffness of the batten
K = coefficient of subgrade
w_{ef} = effective width of the thermal insulation
F_b = Point loads perpendicular to the battens
F_s = Point loads perpendicular to the battens, load application in the area of the screw heads

The coefficient of subgrade K may be calculated from the modulus of elasticity E_{HI} and the thickness t_{HI} of the thermal insulation if the effective width w_{ef} of the thermal insulation under compression is known. Due to the load extension in the thermal insulation the effective width w_{ef} is greater than the width of the batten or rafter, respectively. For further calculations, the effective width w_{ef} of the thermal insulation may be determined according to:

$$w_{ef} = w + t_{HI} / 2$$

where
w = minimum width of the batten or rafter, respectively
t_{HI} = thickness of the thermal insulation

$$K = \frac{E_{HI}}{t_{HI}}$$

The following condition shall be satisfied:

$$\frac{\sigma_{m,d}}{f_{m,d}} = \frac{M_d}{W \cdot f_{m,d}} \leq 1$$

For the calculation of the section modulus W the net cross section has to be considered.
The shear stresses shall be calculated according to:

$$V = \frac{(F_b + F_s)}{2}$$

The following condition shall be satisfied:

$$\frac{\tau_d}{f_{v,d}} = \frac{1{,}5 \cdot V_d}{A \cdot f_{v,d}} \leq 1$$

For the calculation of the cross section area the net cross section has to be considered.

Design of the thermal insulation
The compressive stresses in the thermal insulation shall be calculated according to:

$$\sigma = \frac{1{,}5 \cdot F_b + F_s}{2 \cdot \ell_{char} \cdot w}$$

The design value of the compressive stress shall not be greater than 110 % of the compressive stress at 10 % deformation calculated according to EN 826.

Design of the screws
The screws are loaded predominantly axially. The axial tension force in the screw may be calculated from the shear loads of the roof R_s:

$$T_S = \frac{R_S}{\cos\alpha}$$

The load-carrying capacity of axially loaded screws is the minimum design value of the axial withdrawal capacity of the threaded part of the screw, the head pull-through capacity of the screw and the tensile capacity of the screw.

In order to limit the deformation of the screw head for thermal insulation material thicknesses over 200 mm or with compressive strength below 0,12 N/mm², respectively, the axial withdrawal capacity of the screws shall be reduced by the factors k_1 and k_2:

$$F_{ax,\alpha,Rd} = \min\left\{\frac{f_{ax,d}\cdot d\cdot \ell_{ef}\cdot k_1\cdot k_2}{1.2\cdot\cos^2\alpha+\sin^2\alpha}\cdot\left(\frac{\rho_k}{350}\right)^{0.8};\ f_{head,d}\cdot d_h^2\cdot\left(\frac{\rho_k}{350}\right)^{0.8};\ \frac{f_{tens,k}}{\gamma_{M2}}\right\}$$

Where:

$f_{ax,d}$	design value of the axial withdrawal parameter of the threaded part of the screw
d	outer thread diameter of the screw
ℓ_{ef}	Point side penetration length of the threaded part of the screw in the batten, $l_{ef} \geq 40$ mm
α	Angle between grain and screw axis ($\alpha \geq 30°$)
ρ_k	characteristic density of the wood-based member [kg/m³]
$f_{head,d}$	design value of the head pull-through capacity of the screw
d_h	head diameter
$f_{tens,k}$	characteristic tensile capacity of the screw
γ_{M2}	partial factor according to EN 1993-1-1 or to the particular national annex
k_1	min {1; 200/t_{HI}}
k_2	min {1; $\sigma_{10\%}$/0,12}
t_{HI}	thickness of the thermal insulation [mm]
$\sigma_{10\%}$	compressive stress of the thermal insulation under 10 % deformation [N/mm²]

If k_1 and k_2 are considered, the deflection of the battens does not need to be considered. Alternatively, to the battens, panels with a minimum thickness of 20 mm from plywood according to EN 636, particle board according to EN 312, oriented strand board according to EN 300 or ETA and solid wood panels according to EN 13353 or cross laminated timber may be used.