Translation of the original German document; translation not examined by the Deutsches Institut für Bautechnik

General Building Authority Approval

Approval No.:	Z-9.1-449
Applicant:	ABC Verbindungstechnik GmbH & Co. KG Kölner Straße 71-77 58256 Ennepetal
Product:	SPAX®- screws for fastening timber
Valid until:	31st July 2012

General Building Authority Approval has herewith been granted for the above named product.*
This general building authority approval comprises 12 pages and 14 appendices.

* This general building authority approval replaces general building authority approval No. Z-9.1-449 dated 23rd August 2002, revised by notification dated 27th March 2006.
The product was first granted general building authority approval on 2nd March 1999.

I. GENERAL PROVISIONS

1. The general building authority approval certifies the suitability and applicability of the product pursuant to the building regulations of the Federal States of Germany.

2. The general building authority approval shall not exempt the holder from acquiring all approvals permissions and certificates legally required for the completion of the relevant building project.

3. The general building authority approval is granted without prejudice to the rights of third parties, in particular private property rights.

4. Irrespective of other regulations laid down in the “Special Regulations”, the manufacturer and distributor of the approved product must forward copies of the general building authority approval to the user of the approved product and inform him that a copy of the general building authority approval must be kept available at the location at which the product is used. On request, all authorities involved in the realisation of the construction project must be handed a copy of the general building approval.

5. The general building authority approval may only be reproduced in its entirety. The publication of this document is only permitted with the explicit consent of the Deutsches Institut für Bautechnik. Texts and graphics in printed promotional material shall not contradict the general building authority approval. Translations of the general building authority approval must bear the following notice: “Translation of the original German document; translation not examined by Deutsches Institut für Bautechnik”.

6. The general building authority approval can be revoked at any time. The terms and regulations governing general building authority approvals may be amended, and extended at any time, especially if this is warranted as a result of technological development.

II. SPECIAL PROVISIONS

1 Approved Product and Area of Application

1.1 Approved Product

The SPAX® screws covered by this general building authority approval are screws for fastening timber with a thread outer diameter of $d_1 \geq 8$ mm, and are made of carbon steel. The screws are either galvanised or coated with non-electrolytic zinc laminates, in certain cases with an additional organic top coating. They are used to fasten construction components of solid timber (soft wood) or glued laminated timber, general building authority approved laminated veneer lumber or wood based panels or steel components to solid timber (soft wood) and glued laminated timber or general building authority approved laminated veneer lumber.

1.2 Area of Application

SPAX® screws may be used as fasteners for timber components in load-bearing timber structures to be designed and constructed in accordance with the following standards:

DIN 1052-1:1998-04 - Timber Structures; design and construction

DIN 1052-2:1998-04 - Timber Structures; mechanical joints

DIN 1052-3:1998-04 - Timber Structures; buildings constructed from timber panels design and construction

insofar as nothing to the contrary is contained in this general building authority approval.

Dimensioning may also be carried out in accordance with DIN 1052:2004-08: Design of timber structures - General rules and rules for buildings or DIN V ENV 1995-1-1:1994-06- Eurocode 5: Design, structural analysis and dimensioning of timber of structures; Part 1-1: General dimensioning rules and dimensioning rules for structural engineering in conjunction with the National Application Document “Guidelines for the application of DIN V ENV 1995-1-1”, February 1995 issue, provided nothing contrary is specified hereinafter.

The screws may be used for joining timber construction components in accordance with general building authority approval when the general building authority approval granted for the timber component permits the use of general building authority approved screws for joining same.

Timber construction components to which parts are joined must have a minimum thickness of $4 \cdot d_1$ (d_1 = thread outer diameter of the screw in use).

This general building authority approval does not apply to connections to particle boards, including OSB boards, fibre boards or plywood panels.

In building materials of solid timber, glued laminated timber and laminated veneer lumber, the screws may only be applied when spruce, pine, or fir is used. This rule also applies to screws used in connections with timber construction components in accordance with the general building authority approvals.

These screws may be driven in the cover surfaces, narrow edge faces, and end edge faces of “KERTO” veneer timber “KERTO-S” and “KERTO-Q” in accordance with the general building authority approval No. Z-9.1-100, hereinafter called "KERTO-S" and “KERTO-Q”. Screws applied to end edge faces are to be subjected to pull-out loads only.

The screws may only be used for mainly static loads (see DIN 1055-3: 2006-03).

The screws may only be driven at an angle of $45° \leq \alpha \leq 90°$ (α = angle between screw axis and grain direction) into the end grain.

For the area of application for screws, depending upon the environmental conditions, DIN 1052 standard applies. The screws may not be used in the area of application specified in DIN 1052-2:1988-04, Table 1, last column, and DIN 1052:2004-08, Table 2, Column 3, respectively.

2 Provisions specific to SPAX® Screws

2.1 Properties and composition

2.1.1 The shape, dimensions and dimensional deviations of the screw must conform to the specifications in appendices 1 to 9.

2.1.2 The screws specified in appendices 1 to 9 must be made of carbon steel in accordance with factory standards[1] ABC D 21, ABC-D20 or ABC-D21-F05.

2.1.3 The characteristic values of axial load-bearing capacity $R_{t,u,k}$, of the screws shall be at a minimum those specified in Table 1.

Table 1: Characteristic Values of Axial Load-Bearing Capacity $R_{t,u,k}$

Thread Outer Diameter d_1 mm	Characteristic Values of Axial Load-Bearing Capacity $R_{t,u,k}$ N
8.0	17,000
10.0	28,000
12.0	38,000

2.1.4 The characteristic values of torque at fracture $M_{t,u,k}$ shall be at a minimum those specified in Table 2.

Table 2: Characteristic Values of Torque at Fracture $M_{t,u,k}$

Screws made of carbon steel	
Thread Outer Diameter d_1 mm	Characteristic Values of Torque at Fracture $M_{t,u,k}$ Nm
8.0	21.0
10.0	40.0
12.0	70.0

2.1.5 The screws must be capable of being bent to an angle of 45° without breaking.

2.1.6 Shape, dimensions and dimensional variations of the washers must correspond to the specifications contained in the appendices 10 to 12. The washers must be of steel.

2.2 Identification

The packaging of the screws and the manufacturer's delivery note must bear the mark of conformity (Ü mark) in accordance with relevant acts issued by the Federal States. The use of this mark is only permitted if the requirements specified in section 2.3 are met.

The packages and delivery note must also contain the following information:

– The name of the approved product (in the case of screws with a special point as per appendices 6 to 9 the wording “SPAX®*III* screws” is to be added)

– Screw size

1 The internal factory standards are on file at the Deutsches Institut for Bautechnik.

2.3 Proof of conformity

2.3.1 General

Proof of conformity of the screws with this general building authority approval must be provided individually for each manufacturing plant and by means of a certificate of conformity based on internal production inspection and regular external production inspection, including an original inspection of the screw in accordance with the provisions below.

For granting the certificate of conformity and the external product inspection, including all necessary products inspections, the manufacturer of the screw must commission an authorised certification body as well as an approved inspection body.

The certification body must file a copy of the certificate of conformity with the Deutsches Institut für Bautechnik.

2.3.2 Internal Production Inspection

An internal production inspection system must be established and operated at each manufacturing plant. In this context, the internal inspection must provide for the continuous monitoring of production by the manufacturer. The inspection system must ensure that the building products manufactured at the relevant plant conform to the specifications laid down in this general building authority approval.

The internal production inspection system must include the following minimum procedures steps:

– The raw wire must meet the requirements of works certificate “2.2” according to DIN EN 10204[2]; compliance with the requirements specified in Section 2.1.2 must be checked on the basis of the test certificate

– When testing the axial load-bearing capacity of the screws and the torque at fracture, one or the other of the following tests may be omitted if the tests performed demonstrate that fulfilment of the characteristics not tested is assured

– 45° bending test

– Inspection of the screw dimensions

All further provisions associated with the internal production inspection system must be set forth in the supervision contract.

The results of the internal production inspection shall be recorded and evaluated. The records must contain, at a minimum, the following details:

– Name of the building product or the raw material and the parts

– Nature of the inspection or testing

– Date of manufacture and inspection of the product or the raw material and the parts

– Results of the tests and inspection and, as far as applicable, a comparison with the specifications

– Signature of person responsible for the internal production inspection

The records must be kept for at least five years, and must be made available to the external inspection body responsible for the external production control. On request, these records must be made available to the Deutsches Institut für Bautechnik an the relevant building supervisory board.

In the event of inadequate test results, the manufacturer must immediately take the necessary corrective measures. Non-conforming building products must be identified as such and handled in such a way that they cannot be confused at any time with conforming products. After the situation has been rectified, the relevant test must be repeated without delay, as far as this is technically possible and actually required to verify that non-conformity has been eliminated.

---

2 DIN EN 10204:2005-01 Metal Products - Test Certification Methods

2.3.3 External Production Inspection

The internal inspection at the manufacturing plants must be monitored by means of external production inspection, which must take place at regular intervals - at least twice annually.

The external production inspection is to include an original inspection of the screws and may also include random sample tests and checks. The authorised inspection body is responsible for sampling and testing.

The results of the certification and external production inspection must be kept for at least five years. On request, these records must be made available by the certification body or the authorised inspection body to the Deutsches Institut für Bautechnik and the relevant building supervisory board.

3 Provisions for design and dimensioning

3.1 General

For design and dimensioning DIN 1052 applies insofar as nothing which follows is in contradiction thereof. The general building authority approvals for the timber building components in use are to be adhered to.

Provided the following provisions are adhered to, the dimensions may also be determined in accordance with DIN V ENV 1995-1-1:1994-06 (in conjunction with the National Application Document).

Penetration depths of $s < 4 \cdot d_1$ (d_1 = thread outer diameter) shall not be considered for dimensioning.

Load-bearing SPAX® screw fastenings shall include at least two wood screws.

The screws may be used to fasten the following timber panels:

– Plywood according DIN EN 13986[3] (DIN EN 636[4]) and DIN V 20000-1[5] or in accordance with general building authority approval

– Particle board bonded with synthetic resin used in construction in accordance with DIN EN 13986 (DIN EN 312[6]) and DIN V 20000-1 or in accordance with general building authority approval

– Boards consisting of long, narrow, oriented strands - OSB boards - of the type OSB/3 and OSB/4 in accordance with DIN EN 13986 (DIN EN 300[7]) and DIN V 20000-1 or OSB boards in accordance with general building authority approval

– Fibreboards in accordance with DIN EN 13986 (DIN EN 622-2[8] and 622-3[9]) and DIN V 20000-1 or in accordance with general building authority approval, minimum gross density 650 kg/m³

– Cement bonded particle boards in accordance with DIN EN 13986 (DIN EN 634-2[10]) and DIN V 20000-1 or in accordance with general building authority approval.

3	DIN EN 13986 :2005-03	Timber materials for use in construction - properties, evaluation of conformity and marking
4	DIN EN 636 :2003-11	Plywood specifications
5	DIN V 20000-1 :2005-12	Use of building products in structures - Part 1: timber materials
6	DIN EN 312 :2003-11	Particle board specifications
7	DIN EN 300 :1997-06	Panels of long, narrow, oriented strands (OSB) - definitions - classification and specifications
8	DIN EN 622-2 :2004-07	Fibreboard specifications Part 2: specifications for hard boards
9	DIN EN 622-2 :2004-07	Fibreboard specifications Part 3: specifications for medium-hard boards
10	DIN EN 634-2:2007-05	Cement bonded particle board – requirements – Part 2: specifications for particle boards bonded with Portland cement (PZ) for use in dry, moist and outdoor areas

The thickness of the timber panels (boards) is to be at least $1.2 \cdot d_1$ (d_1 = thread outer diameter).

Shear loading of screws in the end edge faces of “KERTO-S” and “KERTO-Q” is not to be taken into account.

3.2 Dimensioning in accordance with DIN 1052-1 to -3:1988-04

3.2.1 Load at a right angle to the screw axis

Calculation of the maximum permissible load on the screws in loading case “H” with load at a right angle to the screw axis:

perm. $N = 4 \cdot a_1 \cdot d_1$, maximum $17 \cdot d_1^2$ (in N) (1)

and for the fastening of steel parts to timber:

perm. $N = 1.25 \cdot 17 \cdot d_1^2$ (in N). (2)

For screws driven into the narrow edge faces of “KERTO-Q”, the values in equations (1) and (2) must be reduced by 30 %.

For screws driven into the cover surfaces of “KERTO-S” or “KETO-Q” the maximum screw load is calculated as follows:

perm. $N = 5 \cdot a_1 \cdot d_1$, maximum $20 \cdot d_1^2$ (in N) (3)

and for the fastening of steel parts to timber:

perm. $N = 1.25 \cdot 20 \cdot d_1^2$ (in N) (4)

In this case d_1 represents the thread outer diameter in mm in accordance with appendices 1 to 9, and a_1 the thickness of the fastened timber and wood based panel respectively in mm.

Where the penetration depth s (see DIN 1052-2:1988-04, fig. 21) is less than $8 \cdot d_1$, the permissible load must be reduced by the ratio between the actual penetration depth s to the nominal penetration depth $8 \cdot d_1$.

3.2.2 Load in screw axis direction

Calculation of the maximum permissible short-term and long-term load in axis direction in load case “H” for screws driven at an angle of $45° \leq \alpha \leq 90°$ (α = = angle between screw axis and timber grain direction):

perm. $N_{Z,D} = 5.0 \cdot s_g \cdot d_1$ (in N) (5)

Screws driven into cover surfaces of “KERTO-S” and “KERTO-Q”, at an angle of $45° \leq \alpha \leq 90°$ may be calculated at

perm. $N_{Z,D} = 6.0 \cdot s_g \cdot d_1$ (in N) for $d_1 = 8$ mm (6)

perm. $N_{Z,D} = 5.0 \cdot s_g \cdot d_1$ (in N) for $d_1 > 8$ mm (7)

For screws driven into narrow edge faces or end edge faces these values are to be reduced by factor 0.8.

Here d_1 is the thread outer diameter in mm according to Appendices 1 to 9 and s_g is the penetration depth (see DIN 1052-2:1988-04, Fig. 21) in mm. For penetration depth s_g shall not be more than the thread length l_{gV} and l_{gT} respectively as per the appendices 1 to 9 taken into account. Penetration depths s_g of less than $4 \cdot d_1$ are not to be considered.

Due to the risk of the screw head being pulled through the timber, the permissible loading of the screw on pull-out shall be max

$$\text{perm. } N_Z = 5.0 \cdot d_k^2 \text{ (in N)} \quad (8)$$

and for fastening wood based panels at thicknesses of ≥ 12 to ≤ 20 mm a maximum

$$\text{perm. } N_Z = 4.0 \cdot d_k^2 \text{ (in N)} \quad (9)$$

Here d_k represents the head diameter of the screw and the outer diameter of the washer respectively in mm as per appendices 1 to 12. Washer diameters of > 35 mm shall not be considered. The equations (8) and (9) apply to screws with an outer thread diameter of d_1 = 12 mm when using wood based panals only when using washers.

In the case of fastening wood based panels, a maximum of 200 N may be calculated for panels less than 12 mm in thickness, whereby the minimum thicknesses set forth in Section 3.1. must be complied with.

For sheet metal-to-timber connections the equations (8) and (9) do not apply.

In consideration of the axial load-bearing capacity the loading of the screws may not exceed the values in Table 3.

Table 3: Permissible Values of Tensile Load-Bearing Capacity N_Z

Thread Outer Diameter d_1 mm	Permissible Values of Tensile Load-Bearing Capacity N_Z N
8.0	8,000
10.0	14,000
12.0	19,000

3.2.3 Combined load

The following formula applies to combined loads:

$$\left(\frac{N_Z}{\text{perm. } N_Z}\right)^2 + \left(\frac{N}{\text{perm. } N}\right)^2 \leq 1 \quad (10)$$

3.3 Dimensioning in accordance with DIN 1052: 2004-08 or DIN V ENV 1995-1-1 (in conjunction with the national application document)

3.3.1 Load at a right angle to screw axis

For dimensioning in accordance with DIN 1052:2004-08 or DIN V ENV 1995-1-1:1994-06, the thread outer diameter d_1 in the appendices 1 to 9 may be applied as the nominal screw diameter d.

For the characteristic value of yield moment $M_{y,k}$ the given values of Table 4 are valid.

Table 4: Characteristic Values of Yield Moment $M_{y,k}$

Thread Outer Diameter d_1 mm	Characteristic Values of Yield Moment $M_{y,k}$ Nmm
8.0	20,000
10.0	30,000
12.0	48,000

For screws subject to shear loads driven into the narrow edge faces of “KERTO-Q”, an actual embedding strength of one third of that of the cover surface must be assumed.

3.3.2 Load in screw axis direction

The characteristic value of the pull-out resistance for screws driven at an angle of $45° \leq \alpha \leq 90°$ (α = angle between screw axis and direction of timber grain) can be calculated as follows:

$$R_{ax,k} = \frac{f_{1,k} \cdot l_{ef} \cdot d_1}{\sin^2 \alpha + \frac{4}{3} \cos^2 \alpha} \text{ (in N)} \quad (11)$$

with

$$f_{1,k} = 80 \cdot 10^{-6} \cdot \rho_k^2 \text{ (in N/mm}^2\text{)} \quad (12)$$

For screws driven at an angle of $45° \leq \alpha \leq 90°$ into the cover surfaces of "KERTO-S" and "KERTO-Q" $f_{1,k}$ is to be assumed at a value of

$$f_{1,k} = 70 \cdot 10^{-6} \cdot \rho_k^2 \text{ (in N/mm}^2\text{) for } d_1 = 8 \text{ mm and} \quad (13)$$

$$f_{1,k} = 60 \cdot 10^{-6} \cdot \rho_k^2 \text{ (in N/mm}^2\text{) for } d_1 \geq 8 \text{ mm} \quad (14)$$

For screws driven into the narrow edge faces or end edge faces the above values must be reduced by factor 0.8

The following definitions apply:

d_1 = thread outer diameter in mm

l_{ef} = length of the thread in the timber component with point in mm. For penetration depth l_{ef} shall not be more than the thread length l_{gV} and l_{gT} respectively as per appendices 1 to 9 into account. Penetration depths l_{ef} smaller than $4 \cdot d_1$ are not to be considered.

$f_{1,k}$ = characteristic value of pull-out parameter in N/mm²

ρ_k = characteristic value the raw density of the timber in kg/m³

α = angle between screw axis and grain direction $45° \leq \alpha \leq 90°$

Due to the risk of the screw head being pulled through of the screws, the characteristic value of the pull-out resistance on screws subject to pull-out is to be calculated at a maximum of

$$R_{ax,k} = 10.0 \cdot d_k^2 \text{ (in N)} \quad (15)$$

and for fastening wood based panels at thicknesses of ≥ 12 à ≤ 20 mm at a maximum of

$$R_{ax,k} = 8.0 \cdot d_k^2 \text{ (in N)} \quad (16)$$

Here d_k represents the head diameter of the screw and the outer diameter of the washer respectively in mm as per appendices 1 to 12. Washer diameters of > 35 mm shall not be considered. The equations (15) and (16) apply to screws with an outer thread diameter of d_1 = 12 mm when using wood based panels only when using washers.

In the case of fastening wood based panels, a maximum of 400 N may be calculated for panels less than 12 mm in thickness, whereby the minimum thicknesses set forth in Section 3.1. must be complied with.

For sheet-metal-to-timber connections the equations (15) and (16) do not apply.

In consideration of the axial load-bearing capacity of the screws, the values according to Table 1 are not to be exceeded.

3.3.3 Combined Load

On fastenings subject to both axial (F_{ax}) and right angle (F_{la}) loads it must be demonstrated that

$$\left(\frac{F_{ax,d}}{R_{ax,d}}\right)^2 + \left(\frac{F_{la,d}}{R_{la,d}}\right)^2 \leq 1 \quad (17)$$

is the case.

Here $F_{ax,d}$ and $F_{la,d}$ represent the dimensioning values of the forces parallel and at a right angle to the screw axis respectively. $R_{ax,d}$ and $R_{la,d}$ represent the design values of the load-bearing capacity of the fastenings in the case of single-force-component loading parallel and at a right angle to the screw axis respectively.

4 Provisions for production

4.1 For production DIN 1052 applies, insofar as nothing that follows hereunder is in contradiction thereof. The general building authority approvals for timber building components are to be observed.

4.2 The screws may only be used for the fastening of solid timber parts (soft wood) and elements made of glued-laminated timber, general building authority approved laminated veneer lumber and wood based panels in accordance with section 3.1, or for the fastening of steel parts to solid timber parts (soft wood), and elements made of glued-laminated timber or general building authority approved laminated veneer lumber.

The screws may be used for joining timber construction components in accordance with general building authority approval when the general building authority approval granted for the timber component permits the use of general building authority approved screws for joining same.

Timber construction elements to which parts are joined must have a minimum thickness of $4 \cdot d_1$ (d_1 = thread outer diameter of the screw in use).

This general building authority approval does not apply to connections to particle boards including OSB boards, fibre boards or plywood panels.

For fastening in solid timber, glued-laminated timber, laminated veneer lumber, the screws may only be used for products made of spruce, pine or spruce fir. This applies also to the use of screws for the fastening of timber construction components in accordance with general building authority approval.

These screws may be driven in the cover surfaces, narrow edge faces, and end edge faces of “KERTO” veneer timber “KERTO-S” and “KERTO-Q” in accordance with the general building authority approval No. Z-9.1-100, hereinafter called "KERTO-S" and “KERTO-Q”. Screws applied to end edge faces are to be subjected to pull-out loads only.

4.3 The screws may only be driven with the tools recommended for that purpose by the manufacturer.

The holes in steel components are to be pre-drilled at a suitable diameter. In cement-bonded particle board, the screw holes must be predrilled with a diameter $0.7 \cdot d_1$. In timber building components the screws must be driven without pre-drilling.

The screw thread may also be in the fastened timber component.

The screws must be countersunk into the timber construction components such that the screw head is flush with the surface of the fastened part, but for washer head, pan head and hex head with head part k protruding. Deeper countersinking is not permitted.

The countersink screws may be used together with the washers in accordance with appendices 10 to 12. The full surface of the washer must rest against the timber when the screw has been driven.

4.4 Minimum pitches

4.4.1 The minimum distances of the screws must correspond to the values laid down in DIN 1052 as is the case for nails with no pre-drilled holes, whereby the thread outer diameter d_1 as specified in appendices 1 to 9 is to be calculated as the as the screw diameter.

For screws with a thread outer diameter of $d_1 \geq 8$ mm the distance from the end grain face in grain direction must be at least $15 \cdot d_1$.

If the distance in grain direction between one screw and the next, and between the screw and the end grain edge is at least $25 \cdot d_1$, the distance at right angle to grain direction to the edge that is not load-bearing may be reduced to $3 \cdot d_1$.

For minimum distances in timber construction components in accordance with general building authority approval, the provisions of the general building authority approvals apply.

For screws with a thread outer diameter of $d_1 = 8$ mm or a CUT-point, which according to the construction design are subject to loads in screw axis direction exclusively, the following minimum distances apply, provided a minimum timber thickness of $t = 12 \cdot d_1$ is adhered to (see appendices 13 and 14):

Distance a_1 between the screw axes in a plane parallel to grain direction: $a_1 = 5 \cdot d_1$

Distance a_2 between the screw axes at right angles to a plane parallel to grain direction: $a_2 = 5 \cdot d_1$

Distance $a_{3,c}$ between the centre of gravity of the portion of the screw in the timber and the end grain face: $a_{3,c} = 5 \cdot d_1$

Distance $a_{4,c}$ between the centre of gravity of the portion of the screw in the timber and the side face: $a_{4,c} = 4 \cdot d_1$

The distance a_2 between the screw axes may be reduced to $2.5 \cdot d_1$ provided each screw has a connecting face of $a_1 \cdot a_2 = 25 \cdot d_1^2$.

4.4.2 Minimum distances for connections using “KERTO-S” and “KERTO-Q”.

For connections with “KERTO-Q” (narrow edge faces) and “KERTO-S” subject to shear loads, the minimum distances laid down in DIN 1052, must be complied with, as is the case for nails with no pre-drilling, whereby the screw diameter d_1 is to be calculated as the thread outer diameter as specified in appendices 1 to 9.

For the distances of screws driven into the cover surfaces of “KERTO-Q” the values in Table 5 of the general building authority approval No. Z-9.1-100 dated 26.05.2006 apply.

For screws, which according to the construction design are subject to loads in screw axis direction exclusively and driven into “KERTO-Q” or “KERTO-S” with a minimum thickness of $t = 6 \cdot d_1$, the following minimum distances apply (see appendices 13 to 14):

Distance a_1 between the screw axes in a plane parallel to grain direction: $a_1 = 5 \cdot d_1$

Distance a_2 between the screw axes at right angles to a plane parallel to grain direction: $a_2 = 5 \cdot d_1$

Distance $a_{3,c}$ between the centre of gravity of the portion of the screw in the timber and the end grain face: $a_{3,c} = 5 \cdot d_1$

Distance $a_{4,c}$ between the centre of gravity of the portion of the screw in the timber and the side face: $a_{4,c} = 3 \cdot d_1$

The distance a_2 between the screw axes may be reduced to $2.5 \cdot d_1$ provided each screw has a connecting face of $a_1 \cdot a_2 = 25 \cdot d_1^2$.

4.5 For screws with a thread outer diameter of d_1 = 8 mm, the timber construction parts to be fastened must have a thickness of at least 30 mm; for screws with d_1 = 10 mm, the components must be at least 40 mm thick, and for screws with d_1 = 12 mm, the timber thickness must be at least 80 mm.

For the minimum thicknesses of wood based panels see specifications in section 3.1.

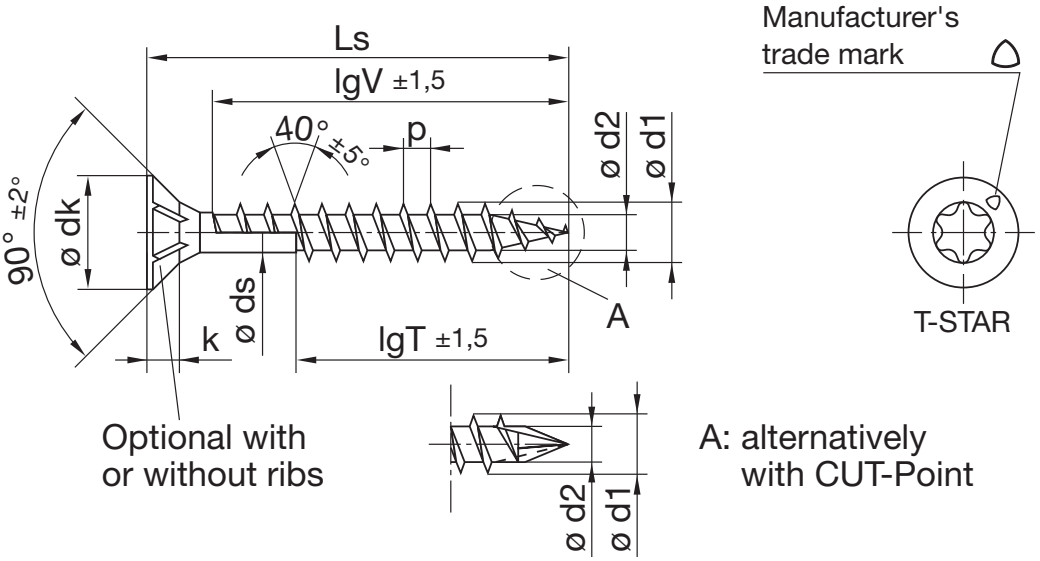
For minimum thicknesses of timber construction components in accordance with the general building authority approvals the provisions specified in the general building authority approvals apply additionally.

4.6 For end grain connections solid timber must be at least half-cut and the timber may not have a moisture content of more than 18 % at the time of fastening.

SPAX®-S
Countersunk head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel



Nominal diameter		**8.0**	**10.0**	**12.0**				
d1	thread size	8.0	10.0	12.0				
	permissible tolerance	± 0.20						
dk	head diameter	15.1	18.6	22.6				
	permissible tolerance	- 0.60						
d2	core diameter	5.0	6.1	7.5				
	permissible tolerance	- 0.30		- 0.50				
ds	shank diameter	5.60	6.80	8.50				
	permissible tolerance	± 0.15						
k	height of head, max.	4.4	5.4	6.6				
p	thread pitch	4.0	5.0	6.0				
	permissible tolerance	± 0.1 x p						
T-STAR size		T40	T50	T50				

Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)									
Nom. dim.	min.	max.	lgV	lgT	lgV	lgT	lgV	lgT				
40	38.5	41.0	32.0									
45	***43.5***	***46.0***	***37.0***									
50	48.5	51.0	42.0	27.0	40.0		40.0					
55	***53.5***	***56.0***	***47.0***	***32.0***	***45.0***		***45.0***					
60	58.5	61.0	52.0	37.0	50.0		50.0					
65	***63.5***	***66.0***	***57.0***	***37.0***	***55.0***	***40.0***	***55.0***	***40.0***				
70	68.5	71.0	61.0	42.0	60.0	40.0	60.0	40.0				
75	***73.5***	***76.0***	***61.0***	***42.0***	***60.0***	***45.0***	***60.0***	***45.0***				
80	78.5	81.0	70.0	47.0	70.0	50.0	70.0	50.0				
90	***88.5***	***91.5***	***80.0***	***52.0***	***80.0***	***55.0***	***80.0***	***55.0***				
100	98.5	101.5	80.0	57.0	80.0	60.0	80.0	60.0				
110	***108.5***	***111.5***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
120	118.5	121.5	80.0	70.0	80.0	70.0		80.0				
130	***128.0***	***132.0***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
140	138.0	142.0		80.0		80.0		80.0				
150	***148.0***	***152.0***		***80.0***		***80.0***		***100.0***				
160	158.0	162.0		80.0		80.0		100.0				
180	***178.0***	***182.0***		***80.0***		***80.0***		***100.0***				
200	198.0	202.0		80.0		80.0		100.0				
to												
600	***597.0***	***602.0***		***80.0***		***80.0***		***100.0***				

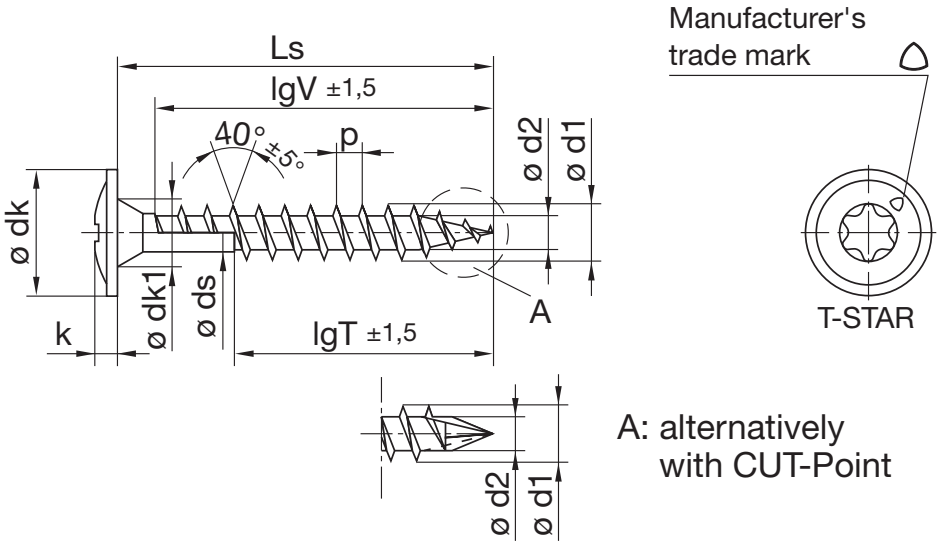
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.

SPAX®-S
Washer head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel



Nominal diameter			**8.0**		**10.0**		**12.0**					
d1	thread size		8.0		10.0		12.0					
	permissible tolerance		± 0.20									
dk	head diameter		20.0		25.0		30.0					
	permissible tolerance		- 0.60									
dk1	countersink diameter		9.0		12.0		14.0					
	permissible tolerance		+ 0.3									
d2	core diameter		5.0		6.1		7.5					
	permissible tolerance		- 0.30				- 0.50					
ds	shank diameter		5.60		6.80		8.50					
	permissible tolerance		± 0.15									
k	height of head, max.		4.0		4.7		5.6					
p	thread pitch		4.0		5.0		6.0					
	permissible tolerance		± 0.1 x p									
T-STAR size			T40		T50		T50					
Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)									
Nom. dim.	min.	max.	lgV	lgT	lgV	lgT	lgV	lgT				
50	48.5	51.0	46.0	32.0	45.0		45.0					
55	***53.5***	***56.0***	***51.0***	***32.0***	***50.0***		50.0					
60	58.5	61.0	56.0	37.0	55.0		55.0					
65	***63.5***	***66.0***	***61.0***	***37.0***	***60.0***	***40.0***	***60.0***	***40.0***				
70	68.5	71.0	61.0	42.0	60.0	40.0	60.0	40.0				
75	***73.5***	***76.0***	***70.0***	***42.0***	***70.0***	***45.0***	***70.0***	***45.0***				
80	78.5	81.0	70.0	47.0	70.0	50.0	70.0	50.0				
90	***88.5***	***91.5***	***80.0***	***52.0***	***80.0***	***55.0***	***80.0***	***55.0***				
100	98.5	101.5	80.0	57.0	80.0	60.0	80.0	60.0				
110	***108.5***	***111.5***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
120	118.5	121.5	80.0	70.0	80.0	70.0		80.0				
130	***128.0***	***132.0***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
140	138.0	142.0		80.0		80.0		80.0				
150	***148.0***	***152.0***		***80.0***		***80.0***		***100.0***				
160	158.0	162.0		80.0		80.0		100.0				
180	***178.0***	***182.0***		***80.0***		***80.0***		***100.0***				
200	198.0	202.0		80.0		80.0		100.0				
to												
600	***597.0***	***602.0***		***80.0***		***80.0***		***100.0***				

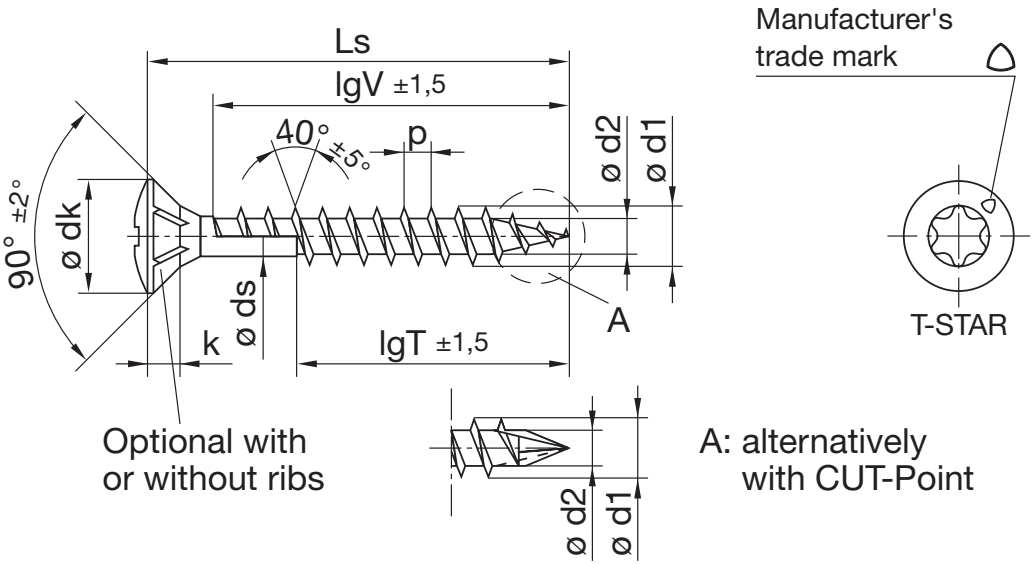
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.

SPAX®-S
Raised countersunk head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel



Nominal diameter			**8.0**		**10.0**		**12.0**					
d1	thread size		8.0		10.0		12.0					
	permissible tolerance		± 0.20									
dk	head diameter		15.1		18.6		22.6					
	permissible tolerance		- 0.60									
d2	core diameter		5.0		6.1		7.5					
	permissible tolerance		- 0.30				- 0.50					
ds	shank diameter		5.60		6.80		8.50					
	permissible tolerance		± 0.15									
k	height of head, max.		4.4		5.4		6.6					
p	thread pitch		4.0		5.0		6.0					
	permissible tolerance		± 0.1 x p									
T-STAR size			T40		T50		T50					
Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)									
Nom. dim.	min.	max.	lgV	lgT	lgV	lgT	lgV	lgT				
40	38.5	41.0	32.0									
45	***43.5***	***46.0***	***37.0***									
50	48.5	51.0	42.0	27.0	40.0		40.0					
55	***53.5***	***56.0***	***47.0***	***32.0***	***45.0***		***45.0***					
60	58.5	61.0	52.0	37.0	50.0		50.0					
65	***63.5***	***66.0***	***57.0***	***37.0***	***55.0***	***40.0***	***55.0***	***40.0***				
70	68.5	71.0	61.0	42.0	60.0	40.0	60.0	40.0				
75	***73.5***	***76.0***	***61.0***	***42.0***	***60.0***	***45.0***	***60.0***	***45.0***				
80	78.5	81.0	70.0	47.0	70.0	50.0	70.0	50.0				
90	***88.5***	***91.5***	***80.0***	***52.0***	***80.0***	***55.0***	***80.0***	***55.0***				
100	98.5	101.5	80.0	57.0	80.0	60.0	80.0	60.0				
110	***108.5***	***111.5***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
120	118.5	121.5	80.0	70.0	80.0	70.0		80.0				
130	***128.0***	***132.0***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
140	138.0	142.0		80.0		80.0		80.0				
150	***148.0***	***152.0***		***80.0***		***80.0***		***100.0***				
160	158.0	162.0		80.0		80.0		100.0				
180	***178.0***	***182.0***		***80.0***		***80.0***		***100.0***				
200	198.0	202.0		80.0		80.0		100.0				
to												
600	***597.0***	***602.0***		***80.0***		***80.0***		***100.0***				

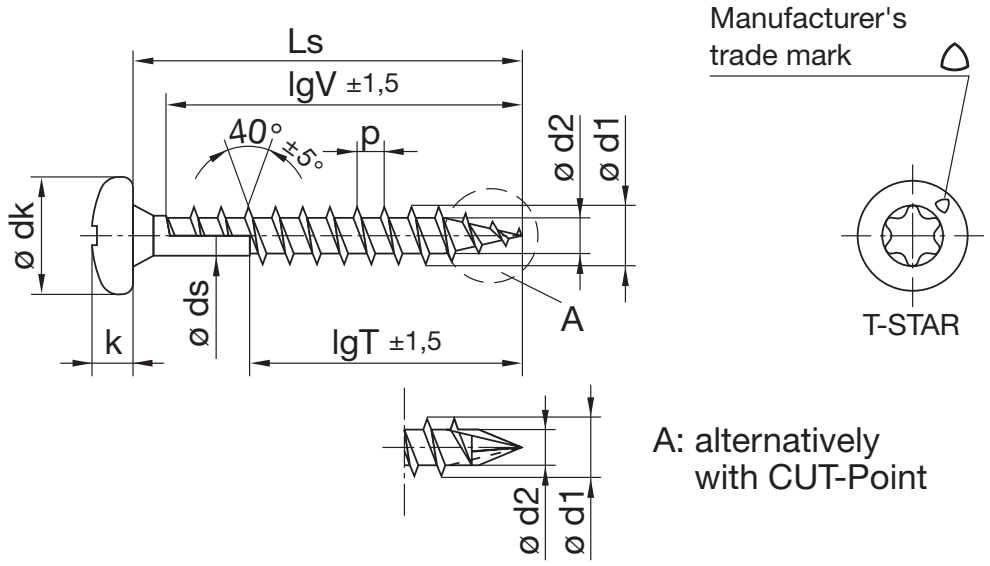
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.

SPAX®-S
Pan head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel



Nominal diameter			**8.0**		**10.0**		**12.0**					
d1	thread size		8.0		10.0		12.0					
	permissible tolerance		± 0.20									
dk	head diameter		15.5		19.0		23.0					
	permissible tolerance		- 0.60									
d2	core diameter		5.0		6.1		7.5					
	permissible tolerance		- 0.30				- 0.50					
ds	shank diameter		5.60		6.80		8.50					
	permissible tolerance		± 0.15									
k	height of head, max.		5.7		7.1		8.5					
R	pan radius	approx.	16.0		20.0		24.0					
p	thread pitch		4.0		5.0		6.0					
	permissible tolerance		± 0.1 x p									
T-STAR size			T40		T50		T50					
Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)									
Nom. dim.	min.	max.	lgV	lgT	lgV	lgT	lgV	lgT				
50	48.5	51.0	46.0	32.0	45.0		45.0					
55	***53.5***	***56.0***	***51.0***	***32.0***	***50.0***		***50.0***					
60	58.5	61.0	56.0	37.0	55.0		55.0					
65	***63.5***	***66.0***	***61.0***	***37.0***	***60.0***	***40.0***	***60.0***	***40.0***				
70	68.5	71.0	61.0	42.0	60.0	40.0	60.0	40.0				
75	***73.5***	***76.0***	***70.0***	***42.0***	***70.0***	***45.0***	***70.0***	***45.0***				
80	78.5	81.0	70.0	47.0	70.0	50.0	70.0	50.0				
90	***88.5***	***91.5***	***80.0***	***52.0***	***80.0***	***55.0***	***80.0***	***55.0***				
100	98.5	101.5	80.0	57.0	80.0	60.0	80.0	60.0				
110	***108.5***	***111.5***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
120	118.5	121.5	80.0	70.0	80.0	70.0		80.0				
130	***128.0***	***132.0***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***				
140	138.0	142.0		80.0		80.0		80.0				
150	***148.0***	***152.0***		***80.0***		***80.0***		***100.0***				
160	158.0	162.0		80.0		80.0		100.0				
180	***178.0***	***182.0***		***80.0***		***80.0***		***100.0***				
200	198.0	202.0		80.0		80.0		100.0				
to												
600	***597.0***	***602.0***		***80.0***		***80.0***		***100.0***				

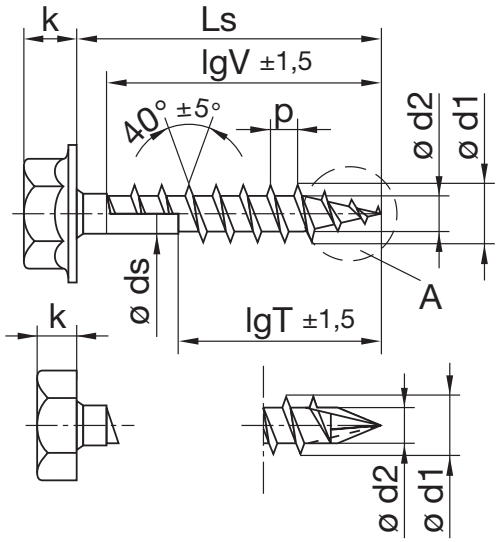
Intermediate lengths on Ls possible

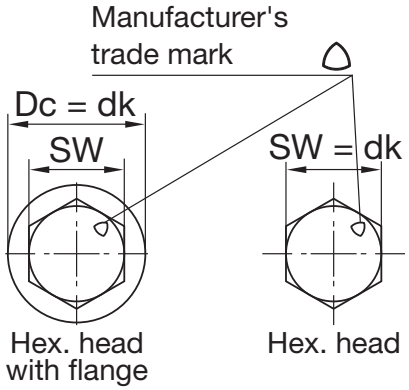
Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.

SPAX®-S
Hex. head with/without flange

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel





A: alternatively with CUT-Point

			with flange			no flange		
Nominal diameter			**8.0**	**10.0**	**12.0**	**8.0**	**10.0**	**12.0**
d1	thread size		8.0	10.0	12.0	8.0	10.0	12.0
	permissible tolerance		± 0.20			± 0.20		
SW	width across flat		13.0	16.0	18.0	13.0	16.0	18.0
Dc	flange diameter		18.0	22.3	26.6			
	permissible tolerance		- 0.60					
d2	core diameter		5.0	6.1	7.5	5.0	6.1	7.5
	permissible tolerance		- 0.30		- 0.50	- 0.30	- 0.50	
ds	shank diameter		5.60	6.80	8.50	5.60	6.80	8.50
	permissible tolerance		± 0.15			± 0.15		
k	height of head, max.		8.1	9.2	10.4	5.68	6.85	7.95
p	thread pitch		4.0	5.0	6.0	4.0	5.0	6.0
	permissible tolerance		± 0.1 x p			± 0.1 x p		

Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)											
Nom. dim.	min.	max.	lgV	lgT	lgV	lgT	lgV	lgT	lgV	lgT	lgV	lgT	lgV	lgT
40	38.5	41.0	32.0						32.0					
45	***43.5***	***46.0***	***37.0***						***37.0***					
50	48.5	51.0	46.0	32.0	45.0		45.0		46.0	32.0	45.0		45.0	
55	***53.5***	***56.0***	***51.0***	***32.0***	***50.0***		***50.0***		***51.0***	***32.0***	***50.0***		***50.0***	
60	58.5	61.0	56.0	37.0	55.0		55.0		56.0	37.0	55.0		55.0	
65	***63.5***	***66.0***	***61.0***	***37.0***	***60.0***	***40.0***	***60.0***	***40.0***	***51.0***	***37.0***	***60.0***	***40.0***	***60.0***	***40.0***
70	68.5	71.0	61.0	42.0	60.0	40.0	60.0	40.0	61.0	42.0	60.0	40.0	60.0	40.0
75	***73.5***	***76.0***	***70.0***	***42.0***	***70.0***	***45.0***	***70.0***	***45.0***	***70.0***	***42.0***	***70.0***	***45.0***	***70.0***	***45.0***
80	78.5	81.0	70.0	47.0	70.0	50.0	70.0	50.0	70.0	47.0	70.0	50.0	70.0	50.0
90	***88.5***	***91.5***	***80.0***	***52.0***	***80.0***	***55.0***	***80.0***	***55.0***	***80.0***	***52.0***	***80.0***	***55.0***	***80.0***	***55.0***
100	98.5	101.5	80.0	57.0	80.0	60.0	80.0	60.0	80.0	57.0	80.0	60.0	80.0	60.0
110	***108.5***	***111.5***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***
120	118.5	121.5	80.0	70.0	80.0	70.0		80.0	80.0	70.0	80.0	70.0		80.0
130	***128.0***	***132.0***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***	***80.0***	***70.0***	***80.0***	***70.0***		***80.0***
140	138.0	142.0		80.0		80.0		80.0		80.0		80.0		80.0
150	***148.0***	***152.0***		***80.0***		***80.0***		***100.0***		***80.0***		***80.0***		***100.0***
160	158.0	162.0		80.0		80.0		100.0		80.0		80.0		100.0
180	***178.0***	***182.0***		***80.0***		***80.0***		***100.0***		***80.0***		***80.0***		***100.0***
200	198.0	202.0		80.0		80.0		100.0		80.0		80.0		100.0
to														
600	***597.0***	***602.0***		***80.0***		***80.0***		***100.0***		***80.0***		***80.0***		***100.0***

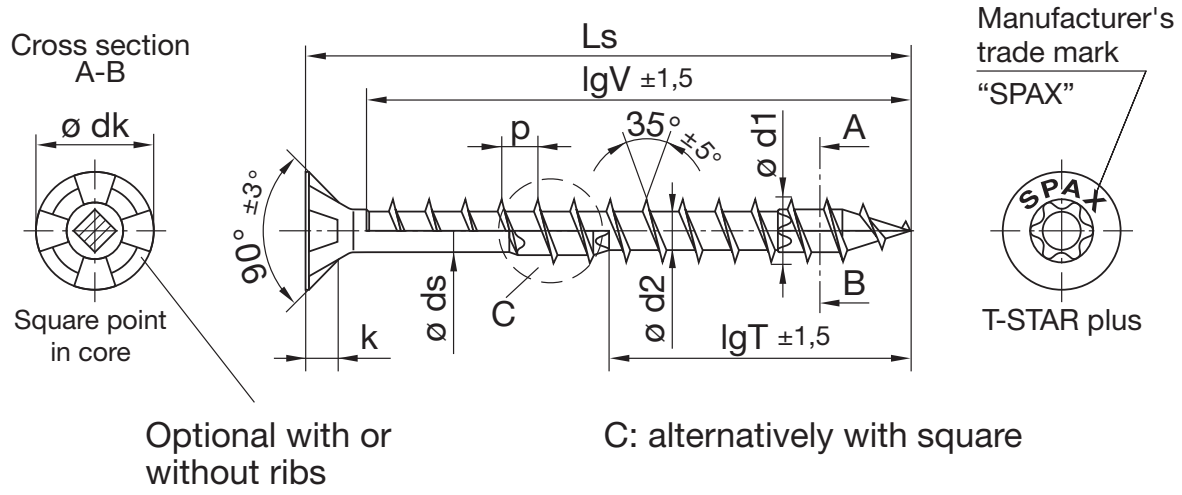
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1 to max. standard length permitted.

SPAX®
Countersunk head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel



Optional with or without ribs

C: alternatively with square

Nominal diameter		**8.0**							
d1	thread size	8.0							
	permissible tolerance	± 0.25							
dk	head diameter	15.1							
	permissible tolerance	- 0.60							
d2	core diameter	5.0							
	permissible tolerance	± 0.20							
ds	shank diameter	5.60							
	permissible tolerance	± 0.15							
k	height of head, max.	4.4							
p	thread pitch	4.8							
	permissible tolerance	± 0.1 x p							
T-STAR plus size		T40							

Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)							
Nom. dim.	min.	max.	lgV	lgT						
40	38.5	41.0	32.0							
45	***43.5***	***46.0***	***37.0***							
50	48.5	51.0	42.0	27.0						
55	***53.5***	***56.0***	***47.0***	***32.0***						
60	58.5	61.0	52.0	37.0						
65	***63.5***	***66.0***	***57.0***	***37.0***						
70	68.5	71.0	61.0	42.0						
75	***73.5***	***76.0***	***61.0***	***42.0***						
80	78.5	81.0	70.0	47.0						
90	***88.5***	***91.5***	***80.0***	***52.0***						
100	98.5	101.5	80.0	57.0						
110	***108.5***	***111.5***	***80.0***	***70.0***						
120	118.5	121.5	80.0	70.0						
130	***128.0***	***132.0***	***80.0***	***70.0***						
140	138.0	142.0		80.0						
150	***148.0***	***152.0***		***80.0***						
160	158.0	162.0		80.0						
180	***178.0***	***182.0***		***80.0***						
200	198.0	202.0		80.0						
to										
600	***597.0***	***602.0***		***80.0***						

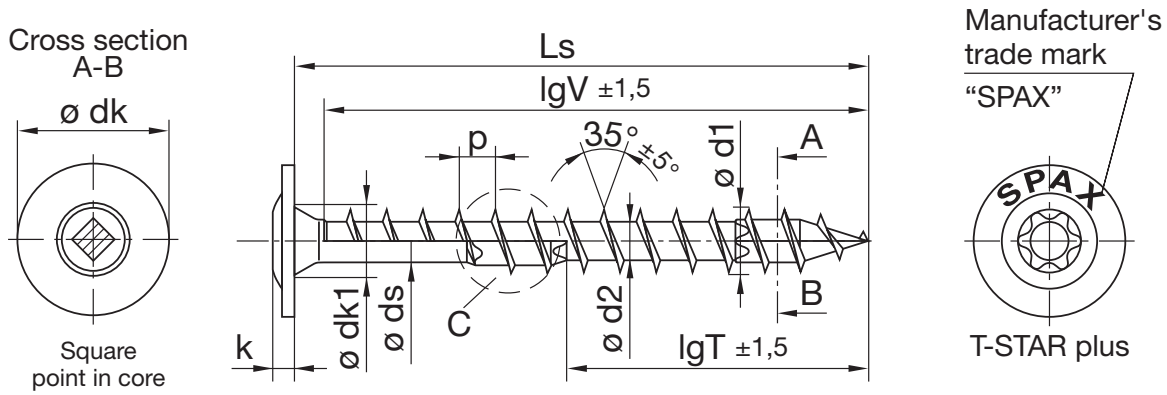
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.

SPAX®
Washer head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel



C: alternatively with square

Nominal diameter		**8.0**						
d1	thread size	8.0						
	permissible tolerance	± 0.25						
dk	head diameter	20.0						
	permissible tolerance	- 0.60						
dk1	countersink diameter	9.00						
	permissible tolerance	+ 0.50						
d2	core diameter	5.0						
	permissible tolerance	± 0.20						
ds	chank diameter	5.60						
	permissible tolerance	± 0.15						
k	height of head, max.	4.3						
p	thread pitch	4.8						
	permissible tolerance	± 0.1 x p						
T-STAR plus size		T40						

Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)						
Nom. dim.	min.	max.	lgV	lgT					
50	48.5	51.0	46.0	32.0					
55	***53.5***	***56.0***	***51.0***	***32.0***					
60	58.5	61.0	56.0	37.0					
65	***63.5***	***66.0***	***61.0***	***37.0***					
70	68.5	71.0	61.0	42.0					
75	***73.5***	***76.0***	***70.0***	***42.0***					
80	78.5	81.0	70.0	47.0					
90	***88.5***	***91.5***	***80.0***	***52.0***					
100	98.5	101.5	80.0	57.0					
110	***108.5***	***111.5***	***80.0***	***70.0***					
120	118.5	121.5	80.0	70.0					
130	***128.0***	***132.0***	***80.0***	***70.0***					
140	138.0	142.0		80.0					
150	***148.0***	***152.0***		***80.0***					
160	158.0	162.0		80.0					
180	***178.0***	***182.0***		***80.0***					
200	198.0	202.0		80.0					
to									
600	***597.0***	***602.0***		***80.0***					

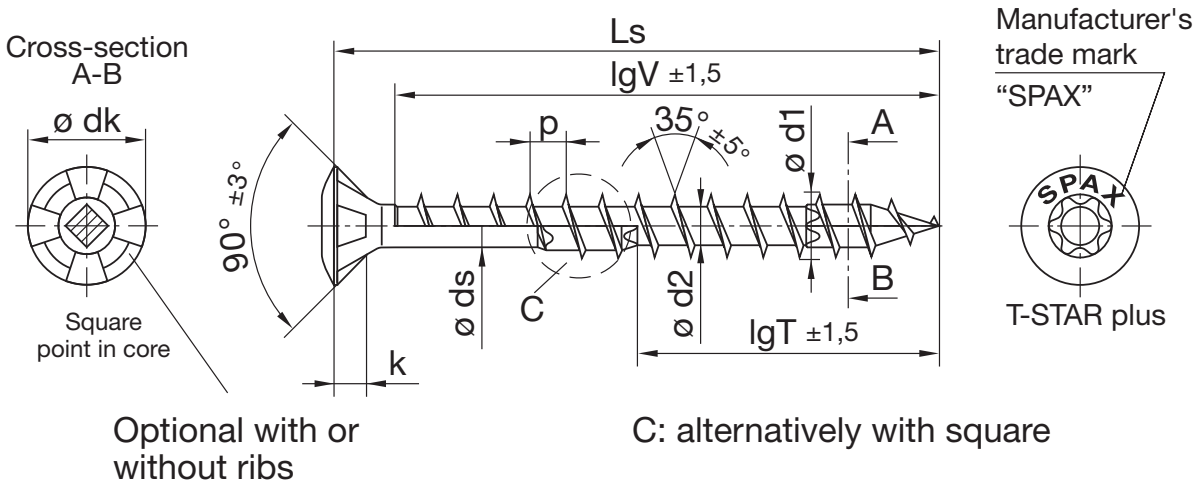
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.

SPAX® Raised countersunk head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel



Optional with or without ribs

C: alternatively with square

Nominal diameter		**8.0**							
d1	thread size	8.0							
	permissible tolerance	± 0.25							
dk	head diameter	15.1							
	permissible tolerance	- 0.60							
d2	core diameter	5.0							
	permissible tolerance	± 0.20							
ds	shank diameter	5.60							
	permissible tolerance	± 0.15							
k	height of head, max.	4.4							
p	thread pitch	4.8							
	permissible tolerance	± 0.1 x p							
T-STAR plus size		T40							

Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)							
Nom. dim.	min.	max.	lgV	lgT						
40	38.5	41.0	32.0							
45	***43.5***	***46.0***	***37.0***							
50	48.5	51.0	42.0	27.0						
55	***53.5***	***56.0***	***47.0***	***32.0***						
60	58.5	61.0	52.0	37.0						
65	***63.5***	***66.0***	***57.0***	***37.0***						
70	68.5	71.0	61.0	42.0						
75	***73.5***	***76.0***	***61.0***	***42.0***						
80	78.5	81.0	70.0	47.0						
90	***88.5***	***91.5***	***80.0***	***52.0***						
100	98.5	101.5	80.0	57.0						
110	***108.5***	***111.5***	***80.0***	***70.0***						
120	118.5	121.5	80.0	70.0						
130	***128.0***	***132.0***	***80.0***	***70.0***						
140	138.0	142.0		80.0						
150	***148.0***	***152.0***		***80.0***						
160	158.0	162.0		80.0						
180	***178.0***	***182.0***		***80.0***						
200	198.0	202.0		80.0						
to										
600	***597.0***	***602.0***		***80.0***						

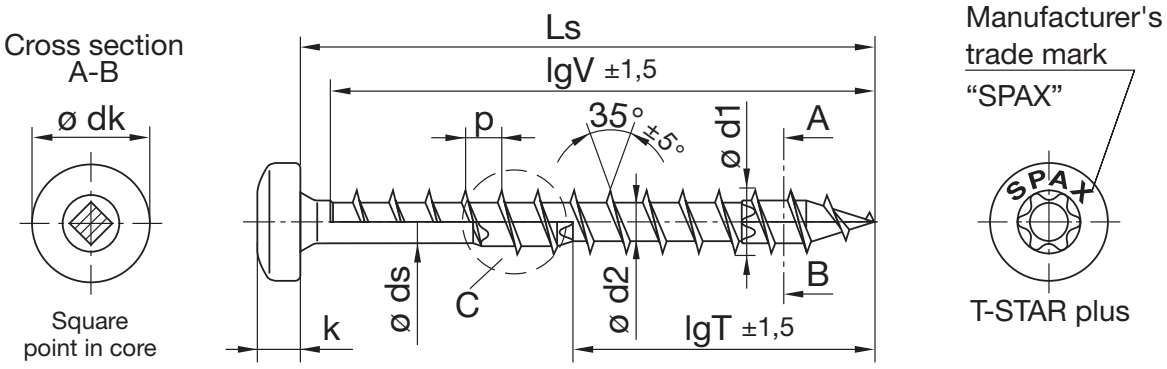
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.

SPAX® Pan head

Self-drilling screw with full and partial thread

Material: cold rolled wire according to ABC Factory Norm
Screws of high carbon steel

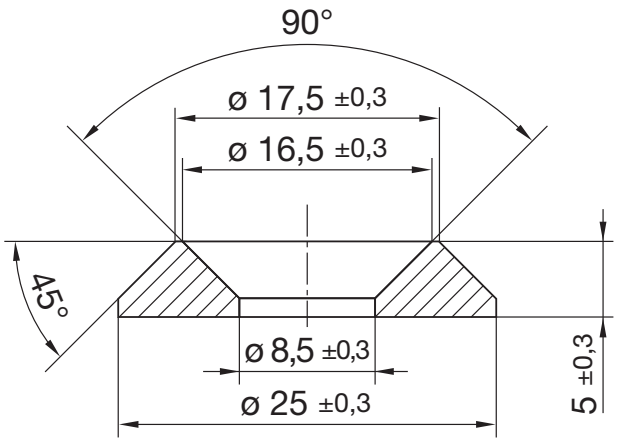


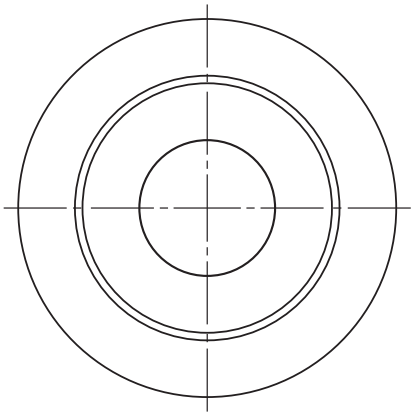
C: alternatively with square

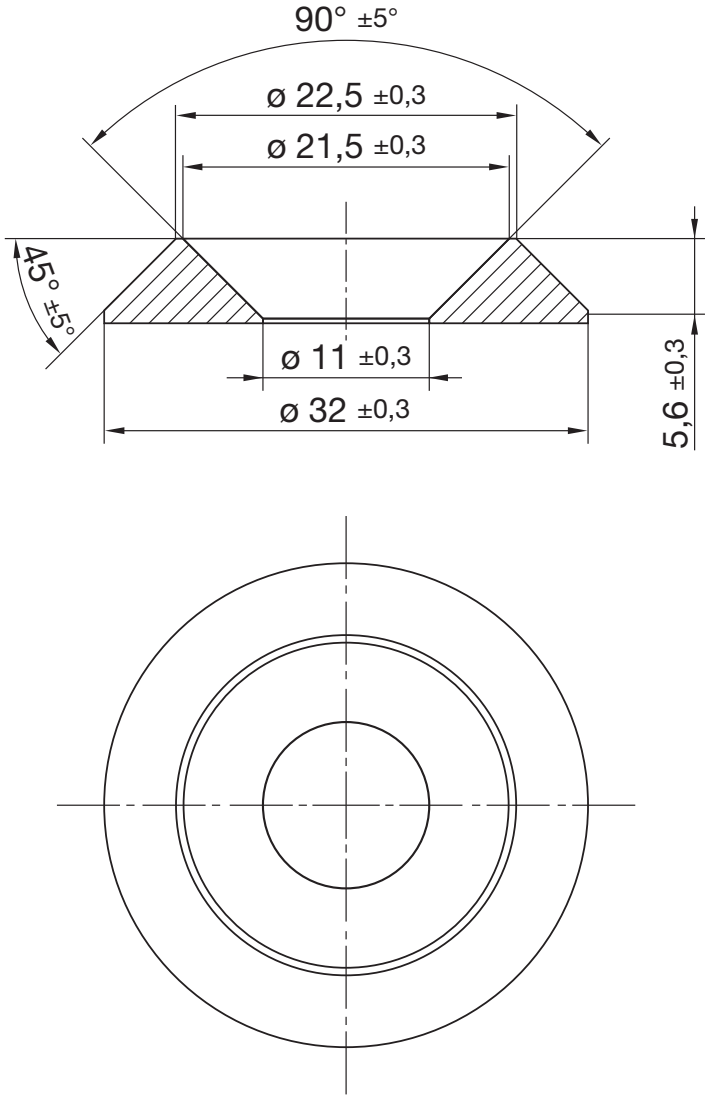
Nominal diameter			**8.0**							
d1	thread size		8.0							
	permissible tolerance		± 0.25							
dk	head diameter		15.5							
	permissible tolerance		- 0.60							
d2	core diameter		5.0							
	permissible tolerance		± 0.25							
ds	shank diameter		5.60							
	permissible tolerance		± 0.15							
k	height of head, max.		6.0							
p	thread pitch		4.8							
	permissible tolerance		± 0.1 x p							
T-STAR plus size			T40							
Ls			Standard thread lengths (full thread = lgV / partial thread = lgT)							
Nom. dim.	min.	max.	lgV	lgT						
50	48.50	51.00	46.0	32.0						
55	***53.50***	***56.00***	***51.0***	***32.0***						
60	58.50	61.00	56.0	37.0						
65	***63.50***	***66.00***	***61.0***	***37.0***						
70	68.50	71.00	61.0	42.0						
75	***73.50***	***76.00***	***70.0***	***42.0***						
80	78.50	81.00	70.0	47.0						
90	***88.50***	***91.50***	***80.0***	***52.0***						
100	98.50	101.50	80.0	57.0						
110	***108.50***	***111.50***	***80.0***	***70.0***						
120	118.50	121.50	80.0	70.0						
130	***128.00***	***132.00***	***80.0***	***70.0***						
140	138.00	142.00		80.0						
150	***148.00***	***152.00***		***80.0***						
160	158.00	162.00		80.0						
180	***178.00***	***182.00***		***80.0***						
200	198.00	202.00		80.0						
to										
600	***597.00***	***602.00***		***80.0***						

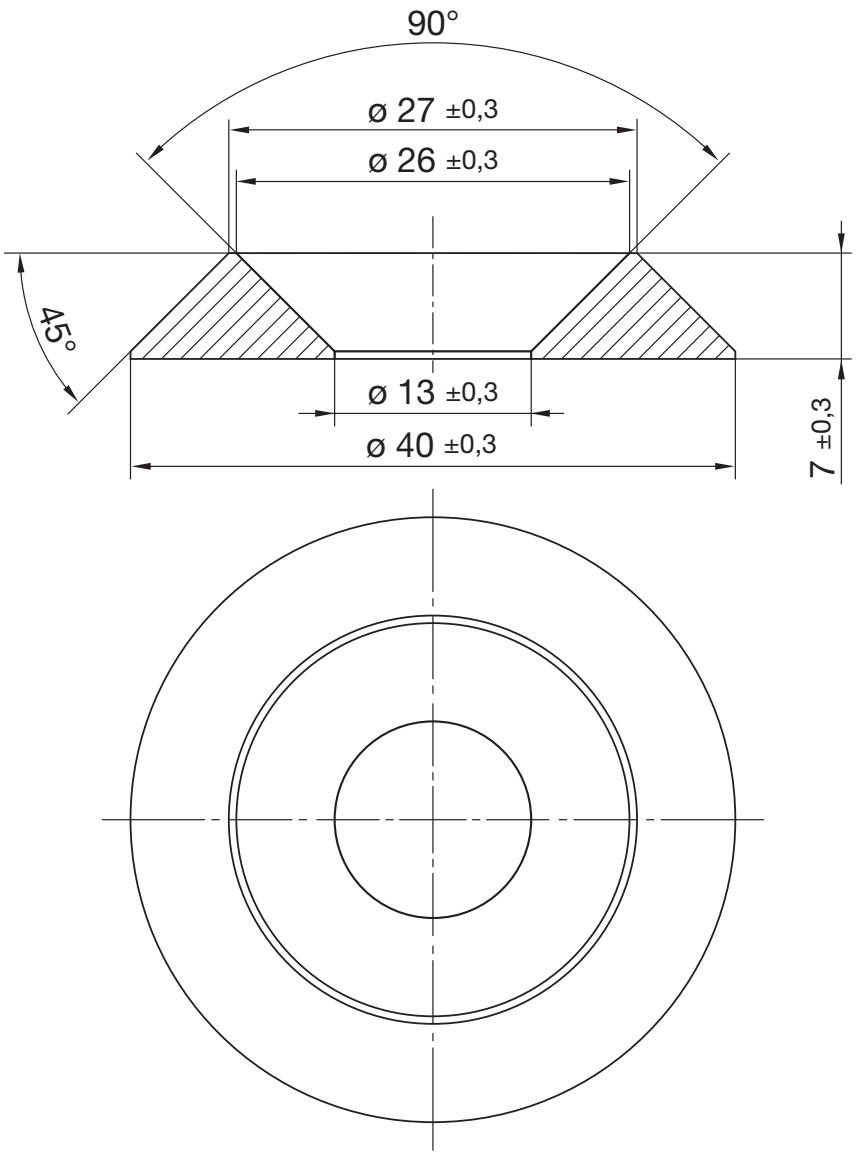
Intermediate lengths on Ls possible

Other thread lengths in the range ≥ 4 · d1
to max. standard length permitted.


90°
ø 17,5 ±0,3
ø 16,5 ±0,3
45°
ø 8,5 ±0,3
ø 25 ±0,3
5 ±0,3



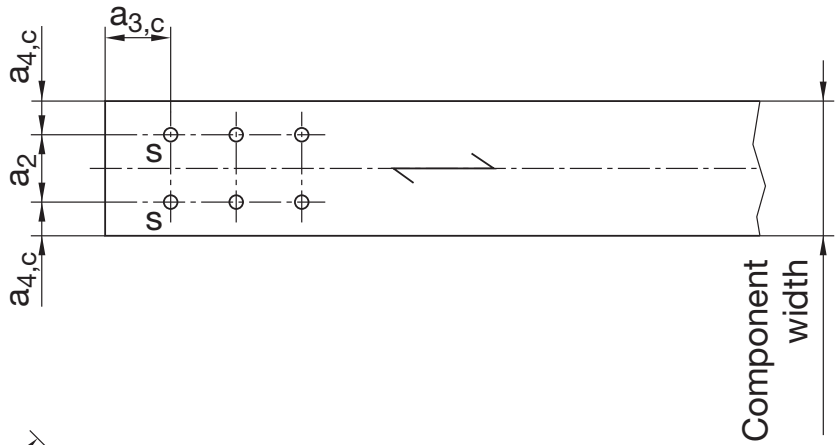

90° ±5°
ø 22,5 ±0,3
ø 21,5 ±0,3
45° ±5°
ø 11 ±0,3
ø 32 ±0,3
5,6 ±0,3


90°
ø 27 ±0,3
ø 26 ±0,3
45°
ø 13 ±0,3
ø 40 ±0,3
7 ±0,3

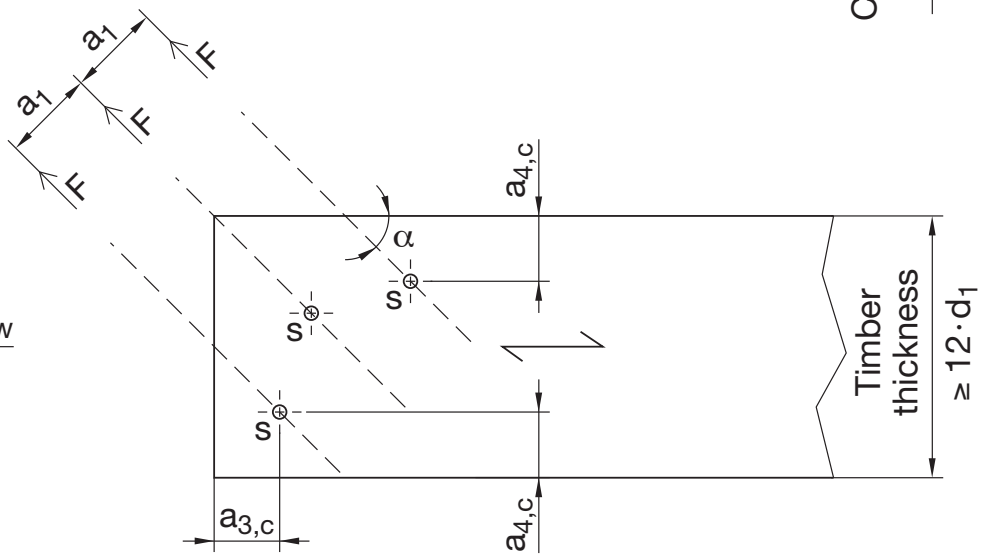
Minimum distances of screws with $d_1 \leq 8$ mm or with CUT-Point and which are purely designed for pull-out loading.

Parallel arrangement (example for 3 pairs of screws)

Top view



Side view



= direction of grain

S = centre of gravity of the embedded portion of the screw

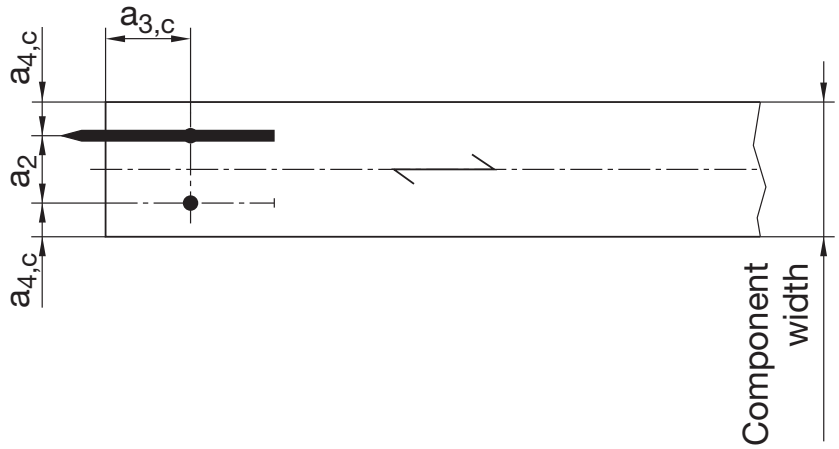
The required minimum timber thickness may be less than $12 \cdot d_1$ provided the requirements for minimum distances for nail fastenings with no pre-drilled holes are observed.

$45° \leq \alpha \leq 90°$	$a_1 \geq 5 \cdot d_1$	$a_{3,c} \geq 5 \cdot d_1$	$a_1 \cdot a_2 \geq 25 \cdot d_1^2$
	$a_2 \geq 2.5 \cdot d_1$	$a_{4,c} \geq 4 \cdot d_1$	
		$a_{4,c} \geq 3 \cdot d_1$	for KERTO-S and KERTO-Q

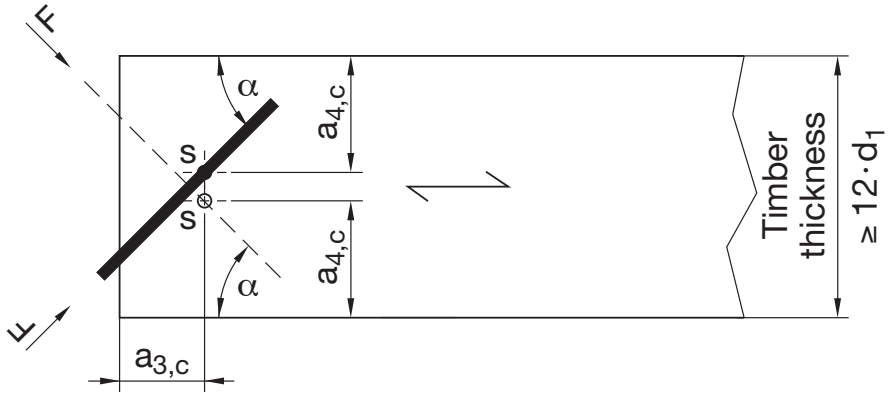
Minimum distances of screws with $d_1 \leq 8$ mm or with CUT-Point and which are purely designed for pull-out loading.

Crosswise arrangement (example for 1 pair of screws)

Top view



Side view



= direction of grain

S = centre of gravity of the embedded portion of the screw

The required minimum timber thickness may be less than $12 \cdot d_1$ provided the requirements for minimum distances for nail fastenings with no pre-drilled holes are observed.

$45° \leq \alpha \leq 90°$	$a_1 \geq 5 \cdot d_1$	$a_{3,c} \geq 5 \cdot d_1$	$a_1 \cdot a_2 \geq 25 \cdot d_1^2$
	$a_2 \geq 2.5 \cdot d_1$	$a_{4,c} \geq 4 \cdot d_1$	
		$a_{4,c} \geq 3 \cdot d_1$	for KERTO-S and KERTO-Q

Translation of the original German document; translation not examined by MPA (Otto-Graf-Institut · Materialprüfungsamt · Universität Stuttgart)

CERTIFICATE OF COMPLIANCE

No. ÜZ-BWU03-I 14.12.19

Pursuant to Article 25, Paragraph 2, No.2 of the Building Regulations of the State of North Rhine Westphalia (BauO-NRW) as per version dated 1st March 2000, we, hereby, certify that

the building product:	**SPAX screws for fastening timber**
manufactured at the plant in:	**58256 Ennepetal, Germany**
of:	**ABC Verbindungstechnik GmbH & Co. KG** **Kölner Strasse 71-77** **58256 Ennepetal**

complies, in accordance with the results of the internal production inspection and the external production inspection carried out by the Material Testing Laboratory of the University of Stuttgart, with the provisions of the

general building authority approval

Z-9.1-449 of the Deutsches Institut für Bautechnik, Berlin.

In accordance with the Conformity Regulations the company is thus entitled to apply the mark of conformity (Ü mark) to the building product manufactured at the plant in

58256 Ennepetal.

Stuttgart, 30.10. 2007

Material Testing Laboratory
University of Stuttgart
Timber Construction Dept.
Certification Dept.

Dr. Simon Aicher
Academic Director
Head of Certification Department