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Autorizado y notificado de conformidad con el artículo 29 del Reglamento (UE) n.º 305/2011 del Parlamento Europeo y del Consejo, de 9 de marzo de 2011.1

MIEMBRO DE LA EOTA



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Evaluación Técnica Europea ETA-12/0114 de 12/10/2017

I Parte general

Entidad de Evaluación Técnica que expide la ETA y designada de conformidad con el artículo 29 del Reglamento (UE) n.º 305/2011: ETA-Danmark A/S

Nombre comercial del producto de construcción:

tornillos autorroscantes SPAX

Familia de productos a la que pertenece dicho producto de construcción:

tornillos para uso en construcciones de madera

Fabricante:

SPAX International GmbH & Co. KG
Kölner Strasse 71-77
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Tel. +49 23 33 799-0
Fax + 49 23 33 799-199
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Fábrica:

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Kölner Strasse 71-77
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La presente Evaluación Técnica Europea contiene:

101 páginas con 5 anexos que forman parte integral del documento

La presente Evaluación Técnica Europea se expide de conformidad con el Reglamento (UE) n.º 305/2011 partiendo de:

documento de evaluación europea (DEE) n.º DEE 130118-00-0603 "Tornillos para construcciones de madera"

Esta versión sustituye a:

la ETA anterior con el mismo número expedida el 10/07/2017

Las traducciones de la presente Evaluación Técnica Europea en otros idiomas se corresponderán en su totalidad con el documento original expedido y se identificarán como tales. La comunicación de la presente Evaluación Técnica Europea se realizará de forma integral, incluida su transmisión por medios electrónicos (con excepción de los anexos confidenciales a los que se hace referencia). Sin embargo, es posible efectuar una reproducción parcial con el consentimiento por escrito de la Entidad de Evaluación Técnica que la haya expedido. Cualquier reproducción parcial debe identificarse como tal.

II PARTE ESPECÍFICA DE LA EVALUACIÓN TÉCNICA EUROPEA

1 Descripción técnica del producto y uso previsto

Descripción técnica del producto

Los tornillos SPAX son tornillos autorroscantes para uso en construcciones de madera. Deben atornillarse parcialmente o en toda su longitud. Las varillas roscadas SPAX deben atornillarse en toda su longitud. Los tornillos se fabrican en acero al carbono para diámetros nominales de 2,5 mm a 12,0 mm y en alambre de acero inoxidable para diámetros nominales de 3,0 a 12 mm. Los tornillos autorroscantes SPAX se fabrican en acero al carbono y en alambre de acero inoxidable para un diámetro nominal de 16,0 mm. Cuando se exige una protección anticorrosión, el material o el revestimiento deberán ajustarse de conformidad con la especificación proporcionada en el anexo A de la norma EN 14592.

Geometría y material

El diámetro nominal (diámetro de rosca exterior) (d) de los tornillos SPAX no debe ser inferior a 2,5 mm, ni superior a 12,0 mm. El diámetro nominal de los tornillos autorroscantes SPAX es de 16 mm. La longitud total de los tornillos ℓ no debe ser inferior a 20 mm, ni superior a 1000 mm. La longitud total de los tornillos autorroscantes ℓ no debe exceder los 3.000 mm. En el anexo A se especifican otros tamaños.

La proporción entre el diámetro de rosca interno y el diámetro de rosca externo (d_i/d) oscila entre 0,58 y 0,68.

Los tornillos están roscados a una longitud mínima ℓ_g de $4 \cdot d$ (p.ej. $\ell_g \geq 4 \cdot d$).

El valor/lead p (distancia entre los dos flancos de rosca adyacentes) oscila entre $0,49 \cdot d$ y $0,61 \cdot d$.

El ángulo de curvatura (α) no debe presentar ninguna fractura o ésta debe ser inferior a $(45/d^{0,7} + 20)$ grados.

2 Especificación del uso previsto de conformidad con el DEE aplicable

Los tornillos se utilizan para uniones de elementos de carga. Los tornillos y varillas roscadas se utilizan para efectuar uniones en estructuras de carga en madera entre los elementos de madera maciza (madera blanda), de madera laminada encolada (madera blanda), de madera contralaminada y madera laminada enchapada (madera blanda), así como elementos encolados similares, paneles de madera o acero. Los tornillos también se utilizan para uniones en elementos de carga de madera maciza (madera dura), madera laminada encolada (madera dura) o madera laminada enchapada (madera dura). Los tornillos SPAX con rosca en toda su longitud y las varillas roscadas SPAX también se emplean como refuerzos compresivos o tensores perpendiculares a la fibra de la madera o a modo de refuerzo cortante en elementos de madera blanda.

Es más, los tornillos SPAX con diámetros entre 6 mm y 12 mm también pueden utilizarse para fijar material aislante térmico en cabrios.

Los paneles de madera y planchas de acero, excepto los paneles de madera maciza, de madera laminada enchapada y de madera contralaminada, deben colocarse por el lado de la cabeza del tornillo. Es válido usar los siguientes paneles de madera:

- Paneles de madera contrachapada de conformidad con la norma EN 636 o la Evaluación Técnica Europea o disposiciones nacionales aplicables al lugar de la instalación.
- Paneles de madera prensada de conformidad con la norma EN 312 o la Evaluación Técnica Europea o disposiciones nacionales aplicables al lugar de la instalación.
- Paneles de madera con partículas orientadas (OSB; Oriented Strand Board) de conformidad con la norma EN 300 o la Evaluación Técnica Europea o disposiciones nacionales aplicables al lugar de la instalación.
- Paneles de madera de fibra orientada de conformidad con las normas EN 622-2 y 622-3 o la Evaluación Técnica Europea (650 kg/m³ de densidad mínima) o las disposiciones nacionales aplicables al lugar de la instalación.
- Paneles de madera-cemento de conformidad con la norma EN 634 o la Evaluación Técnica Europea o las disposiciones nacionales aplicables al lugar de la instalación.
- Paneles de madera maciza de conformidad con las normas EN 13353 o la Evaluación Técnica Europea o las disposiciones nacionales aplicables al lugar de la instalación.
- Estructuras de madera laminada cruzada de conformidad con la Evaluación Técnica Europea.
- Paneles de madera laminada chapada de conformidad con la norma EN 14374 o la Evaluación Técnica Europea.
- Productos de ingeniería de la madera de conformidad con la Evaluación Técnica Europea

Los tornillos o varillas roscadas se utilizan en uniones de estructuras que requieren estabilidad y resistencia mecánica y seguridad de uso según exige el cumplimiento de los Requisitos Básicos de las Obras 1 y 4 del Reglamento 305/2011 (UE).

El diseño de las uniones debe basarse en las capacidades de carga de los tornillos. Las capacidades de diseño deben derivar de las capacidades de conformidad con el Eurocódigo 5 o un código nacional apropiado.

El uso previsto para los tornillos es la unión sujeta a una carga estática o casi estática.

Los tornillos y varillas roscadas recubiertos de zinc están pensados para usos en construcciones de madera que cumplan con las condiciones definidas por las clases de calidad de servicio 1 y 2 de la norma EN 1995-1-1:2008 (Eurocódigo 5). Los tornillos y varillas roscadas hechos de acero inoxidable cumplen con los requisitos del Eurocódigo 5 (EN 1995-1-1:2008) para su uso en estructuras sometidas a las condiciones de humedad definidas como clase de calidad de servicio 3.

Las disposiciones efectuadas en la presente Evaluación Técnica Europea se basan en una supuesta vida útil prevista de los tornillos de 50 años.

Las indicaciones dadas sobre la vida útil no pueden interpretarse como una garantía ofrecida por el productor o la Entidad de Evaluación, sino solamente como un medio para elegir los productos adecuados en relación con la vida útil económicamente razonable que se espera de las obras.

3 Rendimiento del producto y referencias a los métodos utilizados para su evaluación

| Característica | Evaluación de la característica |
|---|--|
| 3.1 Resistencia mecánica y estabilidad*) (BWR1) | |
| Fuerza de tracción | Valor característico value $f_{tens,k}$: |
| Tornillos fabricados en acero al carbono | d = 2,5 mm: 1,8 kN d = 3,0 mm: 2,6 kN d = 3,5 mm: 3,8 kN d = 4,0 mm: 5,0 kN d = 4,5 mm o 4,6 mm: 6,4 kN d = 5,0 mm: 7,9 kN d = 5,6 mm: 9,9 kN d = 6,0 mm: 11 kN d = 7,0 mm: 13 kN d = 8,0 mm: 17 kN d = 10,0 mm: 28 kN d = 12,0 mm: 38 kN |
| Varillas roscadas fabricadas en acero al carbono o acero inoxidable | d = 16,0 mm: 63 kN |
| Tornillos fabricados en acero inoxidable | d = 3,0 mm: 2,1 kN d = 3,5 mm: 2,9 kN d = 4,0 mm: 3,8 kN d = 4,5 mm o 4,6 mm: 4,2 kN d = 5,0 mm o 5,2 mm: 4,9 kN d = 5,6 mm: 6,2 kN d = 6,0 mm: 7,1 kN d = 7,0 mm: 10 kN d = 8,0 mm: 13 kN d = 10,0 mm: 20 kN d = 12,0 mm: 28 kN |
| Momento de inserción | Relación de la fuerza de torsión característica con respecto al momento de inserción medio: $f_{tor,k} / R_{tor,mean} \geq 1,5$ |
| Fuerza de torsión | Valor característico $f_{tor,k}$: |
| Tornillos fabricados en acero al carbono | 0,65 Nm d = 2,5 mm: 1,3 Nm d = 3,0 mm: 2,0 Nm d = 3,5 mm: 3,0 Nm d = 4,0 mm: 4,0 Nm d = 4,5 mm o 4,6 mm: 6,0 Nm d = 5,0 mm: 8,0 Nm d = 5,6 mm: 10,5 Nm d = 6,0 mm: 14,2 Nm d = 7,0 mm: 21 Nm d = 8,0 mm: 40 Nm d = 10,0 mm: 70 Nm d = 12,0 mm: |
| Tornillos fabricados en acero inoxidable | d = 3,0 mm: 1,0 Nm d = 3,5 mm: 1,7 Nm d = 4,0 mm: 2,4 Nm d = 4,5 mm o 4,6 mm: 3,2 Nm d = 5,0 mm o 5,2 mm: 4,6 Nm d = 5,6 mm: 5,6 Nm d = 6,0 mm: 7,0 Nm d = 7,0 mm: 8,7 Nm d = 8,0 mm: 17 Nm d = 10 mm: 28 Nm d = 12 mm: 54 Nm |

| Característica | Evaluación de la característica |
|--|---|
| 3.2 Seguridad en caso de incendio (BWR2) | |
| Reacción ante el fuego | Los tornillos están fabricados en acero clasificado como clase de rendimiento A1 de la característica de reacción ante el fuego de conformidad con las disposiciones del Reglamento Delegado de la Comisión 2016/364 y la Decisión 96/603/CE de las Comunidades Europeas, modificada por la Decisión 2000/605/CE. |
| 3.3 Higiene, salud y medioambiente (BWR3) | |
| Influencia en la calidad del aire | El producto no contiene ni emite sustancias peligrosas especificadas en TR 034, con fecha de octubre de 2015 * |
| 3.4 Seguridad de uso (BWR4) | Véanse los aspectos cubiertos por BWR1 |
| 3.7 Uso sostenible de los recursos naturales (BWR7) | Sin evaluación de rendimiento |
| 3.8 Aspectos generales relacionados con el rendimiento del producto | |
| Identificación | Véase el anexo A |

*) Véase la información adicional de las secciones 3.9-3.12.

**) Además de la cláusulas específicas relativas a sustancias peligrosas incluidas en esta Evaluación Técnica Europea, puede haber otros requisitos aplicables a los productos que entran en este ámbito de aplicación (por ejemplo, las disposiciones legales, reglamentarias y administrativas nacionales y europeas transpuestas). Con la finalidad de cumplir las disposiciones del Reglamento en materia de productos de construcción, estos requisitos también deben cumplirse cómo, cuándo y dónde sean de aplicación.

3.9 Resistencia mecánica y estabilidad

La capacidad de carga de los tornillos SPAX es aplicable a los materiales a base de madera mencionados en el párrafo 1, si bien de ahora en adelante se usará el término madera.

La característica de capacidad de carga lateral y la característica de capacidad de arranque axial de los tornillos SPAX o de las varillas roscadas deben emplearse en diseños de acuerdo con el Eurocódigo 5 o un código nacional apropiado.

La longitud del punto de penetración lateral debe ser de $\ell_{ef} \geq 4 \cdot d$, donde, d , es el diámetro de rosca externo del tornillo o varilla roscados. Para fijar el material de aislamiento térmico en la parte superior de los cabrios, la penetración de la punta debe de ser como mínimo de 40 mm, $\ell_{ef} \geq 40$ mm.

Las Evaluaciones Técnicas Europeas para elementos estructurales o paneles a base de madera deben aplicarse.

Las reducciones en el área transversal causadas por los tornillos o varillas roscadas SPAX con un diámetro de 10 mm o más deben tenerse en cuenta en la comprobación de la fuerza de los elementos, tanto en su área de tensión como de compresión.

Para tornillos en agujeros perforados previamente, el diámetro del agujero debería tenerse en cuenta en la comprobación de la fuerza del elemento; para tornillos introducidos sin perforación previa, debería tenerse en cuenta el diámetro interior de la rosca.

Capacidad de carga lateral

La característica de la capacidad de carga lateral de los tornillos o varillas roscadas SPAX debe calcularse de conformidad con la norma EN 1995-1-1 (Eurocódigo 5) usando el diámetro de rosca exterior (d) como diámetro nominal del tornillo. Debe tenerse en cuenta el efecto de aumento de la capacidad de carga (rope effect).

La característica del momento de cedencia o deformación debe calcularse como sigue:

Tornillos SPAX de $2,5 \text{ mm} \leq d \leq 12,0 \text{ mm}$
fabricados en acero al carbono:

$$M_{y,k} = 0,15 \cdot 600 \cdot d^{2,6} \quad [\text{Nmm}]$$

Varillas roscadas SPAX:

$$M_{y,k} = 140000 \quad [\text{Nmm}]$$

Tornillos SPAX de $3,0 \text{ mm} \leq d \leq 12,0 \text{ mm}$
fabricados en acero inoxidable:

$$M_{y,k} = 0,15 \cdot 400 \cdot d^{2,6} \quad [\text{Nmm}]$$

siendo,

d Diámetro exterior de la rosca [mm]
(d_1 en los dibujos del anexo)

La fuerza de inserción para tornillos en agujeros no perforados previamente dispuesta en un ángulo entre el eje del tornillo y la dirección de la fibra, $0^\circ \leq \alpha \leq 90^\circ$ es:

$$f_{h,k} = \frac{0,082 \cdot \rho_k \cdot d^{-0,3}}{2,5 \cdot \cos^2 \alpha + \sin^2 \alpha} \quad [\text{N/mm}^2]$$

para tornillos en agujeros perforados previamente:

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

para varillas roscadas en agujeros perforados previamente:

$$f_{h,k} = \frac{0,082 \cdot \rho_k \cdot (1-0,01 \cdot d)}{(2,5 \cdot \cos^2 \alpha + \sin^2 \alpha) \cdot (k_{90} \cdot \sin^2 \varepsilon + \cos^2 \varepsilon)} \quad [\text{N/mm}^2]$$

siendo,

ρ_k Densidad característica de la madera [kg/m^3];
 d Diámetro exterior de la rosca [mm];
 α Ángulo entre el eje del tornillo y la dirección de la fibra;
 ε ángulo entre la fuerza y la dirección de la fibra;
 k_{90} conforme a la ecuación (8.33) en EN 1995-1-1.

La fuerza de inserción para tornillos dispuestos en paralelo al plano de la madera contralaminada, independientemente del ángulo entre el eje del tornillo y la dirección de la fibra, $0^\circ \leq \alpha \leq 90^\circ$, se debe calcular como sigue:

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

a menos que se especifique de otro modo en la especificación técnica (ETA o hEN) para madera contralaminada.

siendo,

d Diámetro exterior de la rosca [mm]
(d_1 en los dibujos del anexo)

La fuerza de inserción para tornillos o varillas roscadas en la superficie plana de la madera contralaminada debería adoptarse como para madera maciza basada en la densidad característica de la capa externa. Si procede, también debe valorarse el ángulo entre la fuerza y la dirección de la fibra de la capa externa.

La dirección de la fuerza lateral debe ser perpendicular al eje del tornillo y paralela a la superficie plana de la madera contralaminada.

Para tornillos con carga lateral deben aplicarse las normas para uniones con múltiples medios de fijación en EN 1995-1-1, 8.3.1.1 (8).

Capacidad de arranque axial

La capacidad de arranque axial característica de tornillos y varillas roscadas SPAX a un ángulo de $15^\circ \leq \alpha \leq 90^\circ$ respecto a la fibra en madera maciza (madera blanda y dura con una densidad característica máxima de 730 kg/m^3), madera laminada encolada y madera contralaminada o a un ángulo de $30^\circ \leq \alpha \leq 90^\circ$ de las fibras en madera laminada enchapada (madera blanda y dura con una densidad característica máxima de 750 kg/m^3) debe calcularse de acuerdo con la norma EN 1995-1-1:2008 a partir de:

$$F_{ax,\alpha,Rk} = \frac{n_{ef} \cdot f_{ax,k} \cdot d \cdot \ell_{ef}}{1,2 \cdot \cos^2 \alpha + \sin^2 \alpha} \cdot \left(\frac{\rho_k}{350} \right)^{0,8} \quad [N]$$

siendo,

$F_{ax,\alpha,Rk}$ Capacidad de arranque característica del tornillo a un ángulo α respecto a la fibra de la madera [N]

n_{ef} Número efectivo de tornillos de acuerdo con la norma EN 1995-1-1:2008

$f_{ax,k}$ Parámetro de arranque característico
 $2,5 \text{ mm} \leq d < 6,0 \text{ mm}$: $f_{ax,k} = 14,0 \text{ N/mm}^2$
 $6,0 \text{ mm} \leq d \leq 8,0 \text{ mm}$: $f_{ax,k} = 12,0 \text{ N/mm}^2$
 $d = 10,0 \text{ mm}$: $f_{ax,k} = 11,5 \text{ N/mm}^2$
 $d = 12,0 \text{ mm}$: $f_{ax,k} = 11,0 \text{ N/mm}^2$
 $d = 16,0 \text{ mm}$: $f_{ax,k} = 10,0 \text{ N/mm}^2$

d Diámetro exterior de rosca [mm]
(d_1 en los dibujos del anexo)

ℓ_{ef} Longitud de penetración de la parte roscada de conformidad con EN 1995-1-1 [mm]; para la rosca bajo la cabeza incluida la longitud de la cabeza

α Ángulo entre la fibra y el eje del tornillo

ρ_k Densidad característica [kg/m^3]

Con respecto a los tornillos que atraviesan tableros contralaminados, se debe tener proporcionalmente en cuenta las distintas capas de madera que atraviesan.

La capacidad de arranque axial viene determinada por la capacidad de extracción de la cabeza y la capacidad de compresión o tracción del tornillo o varilla roscada.

Con respecto a los tornillos y varillas roscadas SPAX, la capacidad de arranque de la rosca que está dentro del miembro con la cabeza debe tenerse en cuenta en lugar de la capacidad de extracción de la cabeza.

Para tornillos con carga axial en tensión donde la fuerza externa es paralela a los ejes de los tornillos, deben aplicarse las normas de EN 1995-1-1, 8.7.2 (8).

Para tornillos inclinados en uniones en cortante acero/madera o madera/madera en las que los tornillos se encuentren en un ángulo de $30^\circ \leq \alpha \leq 60^\circ$ entre el plano de corte y el eje del tornillo, el número efectivo de tornillos n_{ef} debería determinarse como se indica a continuación:

Para una fila de n tornillos en paralelo a la carga, la capacidad de carga debería calcularse utilizando el número efectivo de pasadores n_{ef} ; donde

$$n_{ef} = \max \{ n^{0,9}; 0,9 \cdot n \}$$

y n es el número de tornillos inclinados en una fila. Si se utilizan pares cruzados de tornillos en uniones madera/madera, n es el número de pares cruzados de tornillos en una fila.

Observación: Para tornillos como refuerzo a la compresión o tornillos inclinados como pasadores en vigas o columnas unidas mecánicamente o para fijar material de aislamiento térmico, $n_{ef} = n$.

Capacidad de extracción de la cabeza

La capacidad de extracción de los tornillos o varillas roscadas SPAX debe calcularse de conformidad con la norma EN 1995-1-1:2008 a partir de:

$$F_{ax,\alpha,Rk} = \max \left\{ \frac{f_{ax,k} \cdot d \cdot \ell_{ef}}{1,2 \cdot \cos^2 \alpha + \sin^2 \alpha}; k_t \cdot f_{head,k} \cdot d_h^2 \right\} \cdot n_{ef} \cdot \left(\frac{\rho_k}{350} \right)^{0,8} \quad [N]$$

Donde:

$F_{ax,\alpha,Rk}$ Capacidad de extracción característica de la cabeza de la unión en un ángulo $\alpha \geq 30^\circ$ respecto a las fibras [N]

n_{ef} Número efectivo de tornillos de acuerdo con la norma EN 1995-1-1:2008

Para tornillos inclinados:

$$n_{ef} = \max \{ n^{0,9}; 0,9 \cdot n \}$$

(ver capacidad de arranque axial)

k_t Factor que tiene en cuenta el grosor del elemento lateral de la cabeza (t_h)

$$k_t = 1 \text{ para } t_h/d_h < 3$$

$$k_t = 1,3 \text{ para } t_h/d_h \geq 3$$

$f_{head,k}$ Parámetro de extracción de la cabeza [N/mm^2]

d_h Diámetro de la cabeza del tornillo o arandela [mm]. El diámetro exterior de las cabezas o arandelas $d_h > 32 \text{ mm}$ únicamente debe tenerse en cuenta con un diámetro nominal de 32 mm .

ρ_k Densidad característica [kg/m^3], para paneles a base de madera $\rho_k = 380 \text{ kg/m}^3$

El parámetro de extracción de la cabeza característico para tornillos SPAX con cabeza avellanada o hexagonal sin brida en uniones con madera y en uniones con paneles a base de madera de más de 20 mm de espesor es:

$$d_h \leq 16 \text{ mm}: f_{head,k} = 27,0 - d_h \quad [\text{N/mm}^2]$$

$$16 \text{ mm} < d_h \leq 32 \text{ mm}: f_{head,k} = 11,0 - 0,2 \cdot (d_h - 16) \quad [\text{N/mm}^2]$$

El parámetro de extracción característico para tornillos SPAX con cabeza de arandela, cabeza plana, cabeza hexagonal con arandela o cabeza avellanada con arandela o con segunda rosca bajo la cabeza en uniones con madera y en uniones con paneles a base de madera de más de 20 mm de espesor es:

$$\begin{aligned} d_h \leq 16 \text{ mm}: & \quad f_{\text{head,k}} = 29,0 - d_h \text{ [N/mm}^2\text{]} \\ 16 \text{ mm} < d_h \leq 22 \text{ mm}: & \quad f_{\text{head,k}} = 13,0 \text{ [N/mm}^2\text{]} \\ 22 \text{ mm} < d_h \leq 32 \text{ mm}: & \quad f_{\text{head,k}} = 16,0 - 0,5 \cdot (d_h - 16) \text{ [N/mm}^2\text{]} \end{aligned}$$

siendo,

d_h diámetro de la cabeza o de la arandela [mm]

El parámetro de extracción característico para tornillos en uniones con paneles a base de madera de 12 mm a 20 mm de espesor es:

$$f_{\text{head,k}} = 8 \text{ N/mm}^2$$

Tornillos en uniones con paneles a base de madera de 12 mm de espesor (espesor mínimo de los paneles a base de madera de $1,2 \cdot d$, siendo d el diámetro de rosca exterior):

$$f_{\text{head,k}} = 8 \text{ N/mm}^2$$

limitado a $F_{\text{ax,Rk}} = 400 \text{ N}$

Para tornillos parcialmente roscados con vástago debajo de la cabeza, el diámetro de la cabeza o de la arandela debe ser igual o mayor a $1,8 d_s$, donde d_s es el diámetro del vástago o varilla. De lo contrario, la capacidad de extracción de la cabeza es $F_{\text{ax,Rk}} = 0$ para tornillos con un vástago debajo de la cabeza.

Los paneles a base de madera deben contar con un espesor mínimo de conformidad con la cláusula 2.1.

En uniones madera-acero, la capacidad de extracción de la cabeza no prevalece.

Capacidad de tracción

La capacidad de tracción característica $f_{\text{tens,k}}$ de los tornillos SPAX fabricados en acero al carbono o de las varillas roscadas fabricadas en acero al carbono o acero inoxidable es:

| | |
|---|--------|
| $d = 2,5 \text{ mm}:$ | 1,8 kN |
| $d = 3,0 \text{ mm}:$ | 2,6 kN |
| $d = 3,5 \text{ mm}:$ | 3,8 kN |
| $d = 4,0 \text{ mm}:$ | 5,0 kN |
| $d = 4,5 \text{ mm o } 4,6 \text{ mm}:$ | 6,4 kN |
| $d = 5,0 \text{ mm}:$ | 7,9 kN |
| $d = 5,6 \text{ mm}:$ | 9,9 kN |
| $d = 6,0 \text{ mm}:$ | 11 kN |
| $d = 7,0 \text{ mm}:$ | 13 kN |
| $d = 8,0 \text{ mm}:$ | 17 kN |
| $d = 10,0 \text{ mm}:$ | 28 kN |
| $d = 12,0 \text{ mm}:$ | 38 kN |

Varillas roscadas $d = 16 \text{ mm}:$ 63 kN

La capacidad de tracción característica $f_{\text{tens,k}}$ de los tornillos SPAX fabricados en acero inoxidable es:

| | |
|---|--------|
| $d = 3,0 \text{ mm}:$ | 2,1 kN |
| $d = 3,5 \text{ mm}:$ | 2,9 kN |
| $d = 4,0 \text{ mm}:$ | 3,8 kN |
| $d = 4,5 \text{ mm o } 4,6 \text{ mm}:$ | 4,2 kN |
| $d = 5,0 \text{ mm o } 5,2 \text{ mm}:$ | 4,9 kN |
| $d = 5,6 \text{ mm}:$ | 6,2 kN |
| $d = 6,0 \text{ mm}:$ | 7,1 kN |
| $d = 7,0 \text{ mm}:$ | 10 kN |
| $d = 8,0 \text{ mm}:$ | 13 kN |
| $d = 10,0 \text{ mm}:$ | 20 kN |
| $d = 12,0 \text{ mm}:$ | 28 kN |

La resistencia a la rotura por extracción de la cabeza del tornillo es superior a la capacidad de tracción del tornillo.

Capacidad de compresión

La capacidad de compresión del diseño $F_{\text{ax,Rd}}$ de los tornillos y varillas roscados SPAX insertados en toda su longitud de rosca en la madera, se debe calcular a partir de:

$$F_{\text{ax,Rd}} = \min \left\{ \frac{f_{\text{ax,d}} \cdot d \cdot \ell_{\text{ef}}}{1,2 \cdot \cos^2 \alpha + \sin^2 \alpha} \cdot \left(\frac{\rho_k}{350} \right)^{0,8}; \frac{\kappa_c \cdot N_{\text{pl,k}}}{\gamma_{\text{M1}}} \right\} \text{ [N]}$$

siendo,

$$\kappa_c = \begin{cases} 1 & \text{para } \bar{\lambda}_k \leq 0,2 \\ \frac{1}{k + \sqrt{k^2 - \bar{\lambda}_k^2}} & \text{para } \bar{\lambda}_k > 0,2 \end{cases}$$

$$k = 0,5 \cdot [1 + 0,49 \cdot (\bar{\lambda}_k - 0,2) + \bar{\lambda}_k^2]$$

La relación de esbeltez relativa debe calcularse a partir de:

$$\bar{\lambda}_k = \sqrt{\frac{N_{\text{pl,k}}}{N_{\text{ki,k}}}}$$

siendo,

$$N_{\text{pl,k}} = \pi \cdot \frac{d_1^2}{4} \cdot f_{\text{y,k}} \text{ [N]}$$

el valor característico de la capacidad axial en caso de analizar la plasticidad de la sección transversal de la rosca interna

Resistencia a la fluencia

$$f_{\text{y,k}} = 1000 \text{ [N/mm}^2\text{]} \\ \text{para tornillos SPAX fabricados en acero al carbono}$$

$f_{y,k} = 500$ [N/mm²]
para tornillos y varillas roscadas SPAX fabricados en
acero inoxidable

Carga de pandeo elástica ideal:

$$N_{ki,k} = \sqrt{c_h \cdot E_s \cdot I_s} \quad [N]$$

Fundación elástica del tornillo:

$$c_h = (0,19 + 0,012 \cdot d) \cdot \rho_k \cdot \left(\frac{\alpha}{180^\circ} + 0,5 \right) \quad [N/mm^2]$$

para tornillos en madera contralaminada rige la combinación menos favorable de α y ρ_k ;

Módulo de elasticidad:

$$E_s = 210000 \quad [N/mm^2]$$

$$\rho_k = \text{densidad característica} \quad [kg/m^3]$$

Segundo momento de inercia:

$$I_s = \frac{\pi}{64} \cdot d_1^4 \quad [mm^4]$$

d_1 = diámetro interior de la rosca [mm]
(d_2 en los dibujos del anexo)

α = ángulo entre la fibra y el eje del tornillo

Observación: al determinar los valores de diseño de la capacidad de compresión es necesario considerar que el valor $f_{ax,d}$ debe calcularse usando los valores k_{mod} y γ_M para madera, de conformidad con la norma EN 1995, mientras que el valor $N_{pl,d}$ se calcula usando el $\gamma_{M,1}$ para acero de conformidad con la norma EN 1993.

Tornillos o varillas roscadas con carga combinada lateral y axial

Para uniones sometidas a una combinación de carga axial y lateral, se debe cumplir la expresión siguiente:

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

siendo,

$F_{ax,Ed}$ carga de diseño axial del tornillo o varilla roscada
 $F_{la,Ed}$ carga de diseño lateral del tornillo o varilla roscada
 $F_{ax,Rd}$ diseño de la capacidad de carga de un tornillo o varilla roscados cargados axialmente
 $F_{la,Rd}$ diseño de la capacidad de carga de un tornillo o varilla roscados cargados lateralmente

Módulo de deslizamiento

El módulo de deslizamiento axial (K_{ser}) de un tornillo para el estado límite de servicio debería considerarse independientemente del ángulo α respecto a la fibra como:

$$C = K_{ser} = 25 \cdot d \cdot \ell_{ef} \quad [N/mm]$$

siendo,

d Diámetro exterior de la rosca [mm]

ℓ_{ef} Longitud de penetración en el elemento estructural [mm]

Refuerzo a la compresión

Véase el anexo C.

Refuerzo a la tracción

Véase el anexo D.

Refuerzo a cortante

Véase el anexo E.

Material de aislamiento térmico sobre los cabrios

Véase el anexo F.

3.10 Aspectos relativos al funcionamiento

3.10.1 Protección contra la corrosión en clases de servicio 1, 2 y 3. Los tornillos y varillas roscadas SPAX se fabrican en acero al carbono. Presentan un acabado en latón, bronce niquelado o electrogalvanizado y, por ejemplo, cromados en azul o amarillo con una capa de zinc de 4 a 16 μm de grosor o un revestimiento de zinc lamelar de 10 a 20 μm de grosor. Los tornillos fabricados en acero inoxidable utilizan acero de los números 1.4016, 1.4062, 1.4401, 1.4567, 1.4578, 1.4529 y 1.4539.

3.11 Aspectos generales relacionados con el uso previsto del producto

Los tornillos o varillas roscadas se fabrican de acuerdo con las disposiciones de la Evaluación Técnica Europea mediante el proceso de fabricación automatizado, como se identificó durante la inspección de la planta por parte de la entidad aprobadora expedidora de la ETA y el organismo autorizado y establecida en la documentación técnica.

La instalación debe realizarse de acuerdo con el Eurocódigo 5 o un código nacional apropiado, a menos que se especifique de otro modo a continuación. Para la instalación deben tenerse en cuenta las instrucciones de SPAX International GmbH & Co. KG.

Los tornillos y varillas roscadas se utilizan para uniones entre elementos de carga en madera maciza (madera blanda), de madera laminada encolada (madera blanda), de madera contralaminada (diámetro mínimo $d = 6,0$ mm) y madera laminada enchapada así como elementos encolados similares, paneles de madera o elementos de acero. Los tornillos también se utilizan para uniones en elementos de carga de madera maciza (madera dura) o madera laminada encolada (madera dura).

Los tornillos o varillas roscadas pueden utilizarse para uniones en estructuras de carga en madera con elementos estructurales de conformidad con una Evaluación Técnica Europea si conforme a la Evaluación.

Técnica Europea del elemento estructural se permite una unión en estructuras de carga en madera con tornillos según una Evaluación Técnica Europea.

Los tornillos totalmente roscados o varillas roscadas SPAX también se emplean como refuerzos compresivos o tensores perpendiculares a la fibra o a modo de refuerzo cortante en elementos de madera blanda.

Es más, los tornillos con diámetros entre 6 mm y 12 mm también pueden utilizarse para fijar material aislante térmico en la parte superior de cabrios.

Para uniones en estructuras de carga en madera, deben utilizarse como mínimo dos tornillos o varillas roscadas. Esto no se aplica para refuerzos u otras aplicaciones especificadas en los anexos nacionales a EN 1995-1-1.

La profundidad de penetración mínima en elementos estructurales de madera maciza, encolada o contralaminada es 4·d.

Paneles a base de madera y placas de acero sólo deberían colocarse en el lado de la cabeza del tornillo. El grosor mínimo de los paneles a base de madera debería ser de 1,2·d.

Además, el espesor mínimo para los siguientes paneles a base de madera debería ser:

- Paneles de madera contrachapada, paneles de fibra: 6 mm
- Paneles de madera prensada, tableros de virutas orientadas (OSB), paneles de madera prensada con cemento: 8 mm
- Paneles de madera maciza: 12 mm

Para elementos estructurales conforme a Evaluaciones Técnicas Europeas, deben tenerse en cuenta los términos de dichas evaluaciones.

Si se utilizan tornillos con un diámetro exterior de rosca de $d \geq 8$ mm en estructuras de carga en madera, la madera maciza o laminada encolada, la madera laminada enchapada, así como elementos encolados similares, deben ser de píceas, pino o abeto. Esto no se aplica a tornillos o varillas roscadas en agujeros perforados previamente.

Los tornillos deben introducirse en la madera blanda sin perforación previa o después de realizar la perforación previa. Los tornillos deben introducirse en madera dura con una densidad característica máxima de 750 kg/m^3 y las varillas roscadas en madera blanda con perforación previa. Los diámetros de los agujeros perforados son:

| Diámetro exterior de rosca | Diámetro del agujero perforado | |
|----------------------------|--------------------------------|-------------|
| | Madera blanda | Madera dura |
| 4,0 | 2,5 | 3,0 |
| 4,5 | 3,0 | 3,0 |
| 4,6 | 3,0 | 3,0 |
| 5,0 | 3,0 | 3,5 |
| 5,2 | 3,0 | 3,5 |
| 5,6 | 3,0 | 4,0 |
| 6,0 | 4,0 | 4,0 |
| 7,0 | 4,0 | 5,0 |
| 8,0 | 5,0 | 6,0 |
| 10,0 | 6,0 | 7,0 |
| 12,0 | 7,0 | 8,0 |
| 16,0 | 13,0 | - |

El diámetro del agujero previamente perforado en elementos de acero debe ser adecuado.

Para introducir los tornillos sólo debe utilizarse el equipo indicado por SPAX GmbH & Co. KG.

En uniones con tornillos con cabeza avellanada conforme al anexo A, la cabeza debe estar al mismo nivel que la superficie del elemento estructural unido. No está permitido un avellanado más profundo.

A menos que se especifique de otro modo, el espesor mínimo para elementos estructurales sin perforación previa es de $t = 24$ mm para tornillos con un diámetro exterior de rosca $d < 8$ mm, $t = 30$ mm para tornillos con un diámetro exterior de rosca $d = 8$ mm, $t = 40$ mm para tornillos con un diámetro exterior de rosca $d = 10$ mm y $t = 80$ mm para tornillos con un diámetro exterior de rosca $d = 12$ mm.

Las distancias mínimas desde los extremos con carga o sin carga deben ser $15 \cdot d$ para tornillos en agujeros no perforados previamente con diámetro exterior de rosca $d \geq 8$ mm y espesor de la madera $t < 5 \cdot d$.

Las distancias mínimas desde el canto sin carga en perpendicular a la fibra pueden reducirse a $3 \cdot d$, también para espesor de madera $t < 5 \cdot d$, si la separación paralela a la fibra y la distancia al extremo es al menos de $25 \cdot d$.

Para elementos de abeto de Douglas, las separaciones y distancias mínimas paralelas a la fibra deben incrementarse en 50%.

Para elementos estructurales de madera, las distancias y separaciones mínimas para tornillos en agujeros perforados previamente se indican en la norma EN 1995-1-1:2008 (Eurocódigo 5), cláusula 8.3.1.2 y tabla 8.2, así como para clavos en agujeros perforados previamente. Estas distancias y separaciones mínimas se aplican también para tornillos SPAX con punta CUT o 4CUT en agujeros no perforados previamente. Aquí debe tenerse en cuenta el diámetro exterior de la rosca d . Para tornillos SPAX con punta CUT o 4CUT en agujeros no perforados previamente, deben cumplirse las siguientes condiciones:

- $a_1 \geq 5 \cdot d$
- $a_{3,c} \geq 12 \cdot d$
- $a_{3,t} \geq 12 \cdot d$
- Sección transversal mínima $\geq 40 \text{ d}^2$
- Tornillos con punta CUT:

| | |
|---|----------------------------|
| $t_{\min} = \max \{5 \cdot d ; 20 \text{ mm}\}$ | para $d \leq 6 \text{ mm}$ |
| $t_{\min} = 7 \cdot d$ | para $d \geq 8 \text{ mm}$ |
- Tornillos con punta 4CUT:

| | |
|---|----------------------------|
| $t_{\min} = \max \{6 \cdot d ; 20 \text{ mm}\}$ | para $d \leq 6 \text{ mm}$ |
| $t_{\min} = 7 \cdot d$ | para $d \geq 8 \text{ mm}$ |

Para tornillos SPAX que no cumplan las condiciones arriba mencionadas o para tornillos en madera laminada enchapada, las separaciones y distancias mínimas se indican en la norma EN 1995-1-1:2008, cláusula 8.3.1.2 y tabla 8.2, así como para clavos en agujeros no perforados previamente.

Alternativamente, las distancias y separaciones mínimas para tornillos SPAX con carga exclusivamente axial y punta CUT o 4CUT o con $d \leq 8$ mm en agujeros no perforados previamente en elementos de madera maciza, madera laminada encolada o productos encolados similares con un espesor mínimo $t = 12 \cdot d$ pueden tomarse como:

| | |
|--|-----------------------|
| Separación a_1 paralela a la fibra | $a_1 = 5 \cdot d$ |
| Separación a_2 perpendicular a la fibra | $a_2 = 5 \cdot d$ |
| Distancia $a_{3,c}$ desde el centro de la parte del tornillo en la madera hasta el corte transversal | $a_{3,c} = 5 \cdot d$ |
| Distancia $a_{4,c}$ desde el centro de la parte del tornillo en la madera hasta el canto | $a_{4,c} = 4 \cdot d$ |
| Distancia $a_{4,c}$ desde el centro de la parte del tornillo en la madera hasta el canto, sólo para tornillos con punta CUT o 4CUT | $a_{4,c} = 3 \cdot d$ |

La separación a_2 perpendicular a la fibra puede reducirse de $5 \cdot d$ a $2,5 \cdot d$, si se cumple la condición $a_1 \cdot a_2 \geq 25 \cdot d^2$.

Alternativamente, las distancias y separaciones mínimas para tornillos SPAX de carga exclusivamente axial en madera laminada enchapada (madera blanda) con un espesor mínimo de $t = 6 \cdot d$ pueden tomarse como:

| | |
|--|-----------------------|
| Separación a_1 paralela a la fibra | $a_1 = 5 \cdot d$ |
| Separación a_2 perpendicular a la fibra | $a_2 = 5 \cdot d$ |
| Distancia $a_{3,c}$ desde el centro de la parte del tornillo en la madera hasta el corte transversal | $a_{3,c} = 5 \cdot d$ |
| Distancia $a_{4,c}$ desde el centro de la parte del tornillo en la madera hasta el canto | $a_{4,c} = 3 \cdot d$ |

La separación a_2 perpendicular a la fibra puede reducirse de $5 \cdot d$ a $2,5 \cdot d$, si se cumple la condición $a_1 \cdot a_2 \geq 25 \cdot d^2$.

A menos que se indique de otro modo en la especificación técnica (ETA o hEN) de madera contralaminada, las distancias y separaciones mínimas para tornillos en la superficie plana de elementos de madera contralaminada con un espesor mínimo $t_{CLT} = 10 \cdot d$ deben tomarse como (ver anexo B):

| | |
|--|-------------------------|
| Separación a_1 paralela a la fibra | $a_1 = 4 \cdot d$ |
| Separación a_2 perpendicular a la fibra | $a_2 = 2,5 \cdot d$ |
| Distancia $a_{3,c}$ desde el centro de la parte del tornillo en la madera hasta el corte transversal sin carga | $a_{3,c} = 6 \cdot d$ |
| Distancia $a_{3,t}$ desde el centro de la parte del tornillo en la madera hasta el corte transversal con carga | $a_{3,t} = 6 \cdot d$ |
| Distancia $a_{4,c}$ desde el centro de la parte del tornillo en la madera hasta el canto sin carga | $a_{4,c} = 2,5 \cdot d$ |
| Distancia $a_{4,t}$ desde el centro de la parte del tornillo en la madera hasta el canto con carga | $a_{4,t} = 6 \cdot d$ |

A menos que se indique de otro modo en la especificación técnica (ETA o hEN) de madera contralaminada, las separaciones y distancias mínimas para tornillos en la superficie del canto de elementos de madera contralaminada con un espesor mínimo $t_{CLT} = 10 \cdot d$ y una profundidad mínima de penetración perpendicular a la superficie del canto de $10 \cdot d$ debe tomarse como (ver anexo B):

| | |
|--|------------------------|
| Separación a_1 paralela al plano de la madera contralaminada | $a_1 = 10 \cdot d$ |
| Separación a_2 perpendicular al plano de la madera contralaminada | $a_2 = 4 \cdot d$ |
| Distancia $a_{3,c}$ desde el centro de la parte del tornillo en la madera hasta el extremo sin carga | $a_{3,c} = 7 \cdot d$ |
| Distancia $a_{3,t}$ desde el centro de la parte del tornillo en la madera hasta el extremo con carga | $a_{3,t} = 12 \cdot d$ |
| Distancia $a_{4,c}$ desde el centro de la parte del tornillo en la madera hasta el canto sin carga | $a_{4,c} = 3 \cdot d$ |
| Distancia $a_{4,t}$ desde el centro de la parte del tornillo en la madera hasta el canto con carga | $a_{4,t} = 6 \cdot d$ |

Para tornillos SPAX o varillas roscadas en agujeros perforados previamente no se aplican los requisitos anteriores para el espesor mínimo.

Para pares de tornillos cruzados, la separación mínima entre tornillos cruzados se indica en el anexo B.

Las distancias y separaciones mínimas para tornillos SPAX en vigas unidas mecánicamente se indican en el anexo B.

4 Evaluación y verificación de la constancia en el rendimiento (EVCR)

4.1 Sistema de EVCR

De conformidad con la Decisión 97/176/CE de la Comisión Europea, modificada según corresponda, los sistemas de evaluación y verificación de la constancia en el rendimiento (véase anexo V del Reglamento n.º 305/2011 de la UE) son 3.

5 Detalles técnicos necesarios para la implementación del sistema de EVCR según lo previsto en el DEE aplicable

Los detalles técnicos necesarios para la implementación del sistema de EVCR están establecidos en el plan de control depositado en ETA-Danmark antes del marcado CE.

Expedido en Copenhague por

Thomas Bruun
Director ejecutivo de ETA-Danmark

S1.1 Traducción de los términos técnicos para el anexo A

Gráficos, designación y especificación de material de tornillos SPAX

| english | español |
|---|--|
| 1 (Encabezado) | |
| Self-drilling screw with full and partial thread | Tornillo autoperforante con rosca completa y parcial |
| Self-drilling screw with double thread | Tornillo autoperforante con doble rosca |
| Self-drilling screw with full thread | Tornillo autoperforante con rosca completa |
| Full- thread, self-drilling screw | Tornillo autoperforante, rosca completa |
| Washer for screws with countersunk and raised countersunk head | Arandela para tornillos con cabeza avellanada y cabeza de gota de sebo |
| Threaded rod with full thread | Varilla roscada con rosca completa |
| Self-tapping screw with CUT-point | Tornillo autorroscante con punta CUT |
| Self-tapping cylindric head screw with fixing thread | Tornillo autorroscante de cabeza cilíndrica con rosca de fijación |
| Self-tapping flat countersunk head screw with CUT-point | Tornillo autorroscante de cabeza avellanada con punta CUT |
| Self-tapping flat countersunk head screw with fixing thread | Tornillo autorroscante de cabeza avellanada con rosca de fijación |
| Self-tapping raised countersunk head screw with fixing thread | Tornillo autorroscante de cabeza de gota de sebo con rosca de fijación |
| Self-tapping cylindric head screw with fixing thread | Tornillo autorroscante de cabeza cilíndrica con rosca de fijación |
| Self-tapping raised countersunk head screw with CUT-point | Tornillo autorroscante de cabeza de gota de sebo con punta CUT |
| Flat countersunk head | Tornillo de cabeza avellanada |
| Washer head | Cabeza con arandela |
| Raised countersunk head | Cabeza de gota de sebo |
| Pan head | Cabeza redonda |
| Countersunk head with cutting ribs | Cabeza avellanada con nervios de fresado |
| Countersunk with head hole | Avellanado con agujero en la cabeza |
| Hex. head with/without flange | Cabeza hex. con/sin unión |
| Washer | Arandela |
| Material: cold rolled wire according to SPAX - Factory Standard | Material: alambre laminado en frío conforme a SPAX – Estándar de fábrica |
| Screws of high carbon steel | Tornillos con alto contenido de acero al carbono |
| Stainless steel screws | Tornillos de acero inoxidable |
| Material: machining steel Dimensions in mm | Material: acero para constucciones mecánicas, dimensiones en mm |
| Material: Steel or Stainless steel | Material: Acero o acero inoxidable |
| Stainless steel | Acero inoxidable |
| Steel | Acero |


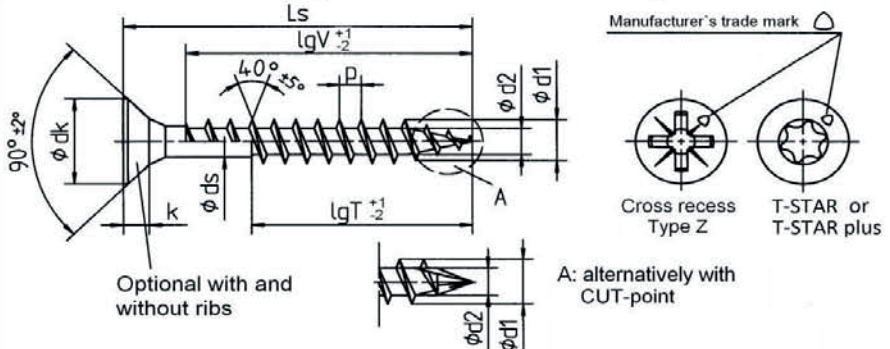
S1.1 Traducción de los términos técnicos para el anexo A


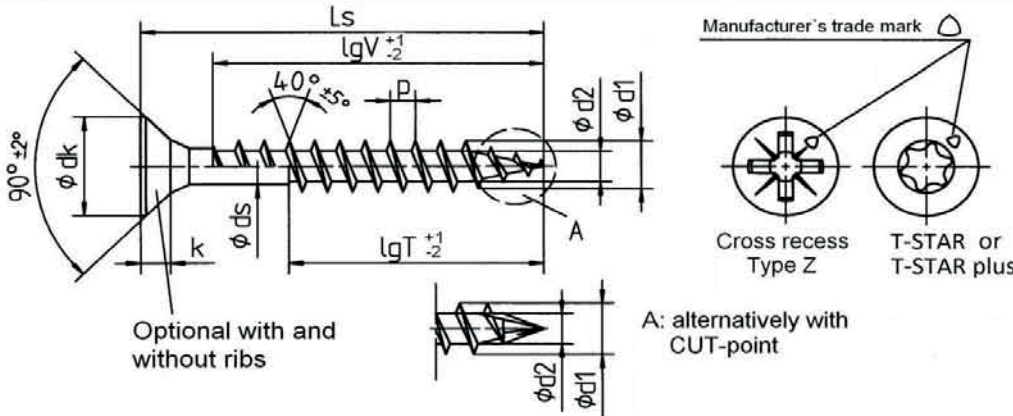
Gráficos, designación y especificación de material de tornillos SPAX


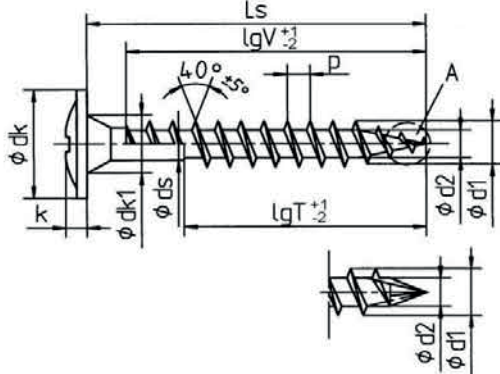
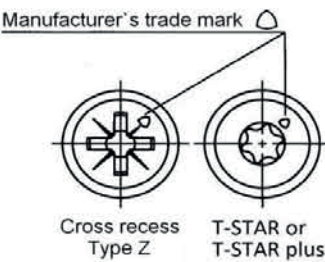
| english | español |
|--|--|
| 2 (Área de gráficos) | |
| Manufacturer's trade mark \triangle | Marca comercial del fabricante \triangle |
| Manufacturer's trade mark "SPAX" | Marca comercial del fabricante "SPAX" |
| Manufacturer's trade mark \triangle or "SPAX" | Marca comercial del fabricante \triangle o "SPAX" |
| Manufacturer's trade mark T-STAR plus T10 | Marca comercial del fabricante T-STAR plus T10 |
| Cross recess Type Z | Ranura en cruz tipo Z |
| Design with hexagon head | Diseño con cabeza hexagonal |
| Design without head | ADiseño sin cabeza |
| Cross section A - B | Sección transversal A - B |
| 4CUT-point: Square point in core | Punta 4CUT: Punta cuadrada en el núcleo |
| Optional with and without ribs | Opcional con o sin nervios |
| Optional with or without ribs or Multihead | Opcional con o sin nervios o cabeza múltiple |
| Cutting ribs | Nervios de fresado |
| Head-end thread corresponds of the point thread geometry | La rosca del extremo de la cabeza corresponde con la geometría de la rosca de la punta |
| A: alternatively with CUT-point | A: Alternativamente con punta CUT |
| C: alternatively with 4CUT-cutter* | C: Alternativamente con cúter 4CUT* |
| D: 4CUT-point | D: Punta 4CUT |
| alternativ head geometry | Geometría de cabeza alternativa |
| Screw adapter available as accessory | Adaptador de tornillo disponible como accesorio |
| Screw with CUT-point | Tornillo con punta CUT |
| Square Point in core | Punta cuadrada en el núcleo |


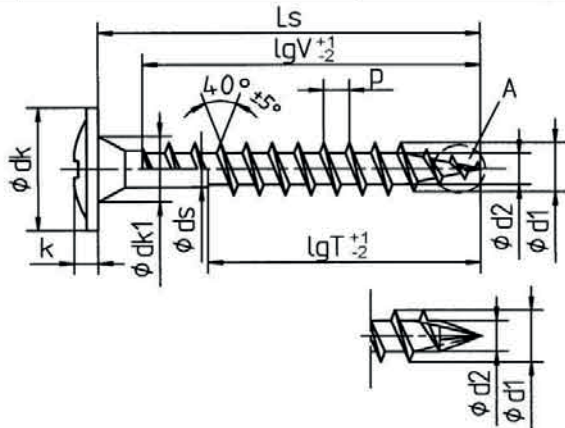

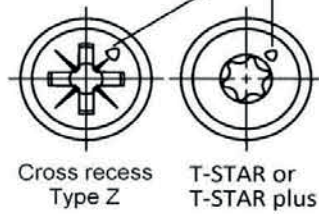
S1.1 Traducción de los términos técnicos para el anexo A (continuación)


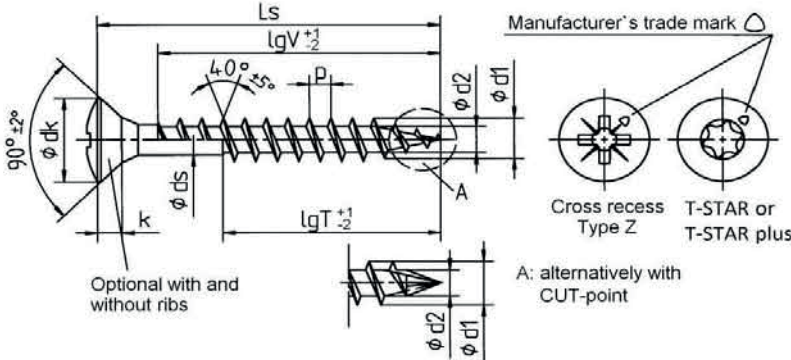
| english | español |
|---|--|
| 3 (Dimensiones) | |
| Nominal diameter | Diámetro nominal |
| Type of Head | Tipo de cabeza |
| d1 - thread size | d1 - tamaño de la rosca |
| permissible tolerance | Tolerancia admisible |
| Tolerance | Tolerancia |
| SW - wrench size/width across flat | SW – tamaño/ancho de la llave a través de plano |
| Dc - flange diameter | Dc - diámetro de la unión |
| dk - head diameter | dk - diámetro de la cabeza |
| dk1 - countersink diameter | dk1 - diámetro del avellanado |
| db - hole diameter | db - diámetro del agujero |
| d2 - core diameter | d2 - diámetro del núcleo |
| ds, ds1, ds2 - shank diameter | ds, ds1, ds2 - diámetro del vástago |
| k - head height max. | k - altura máx. de la cabeza |
| p - thread pitch | p - paso de la rosca |
| 4 (Dimensiones) | |
| Nom.dim. | Dim.nom. |
| Standard thread lengths (full thread = lgV / partial thread = lgT) | Longitudes estándar de la rosca (rosca completa = lgV / rosca parcial = lgT) |
| Thread-free length X | Longitud sin rosca X |
| permissible tolerance of screw length | Tolerancia admisible de longitud de tornillo |
| to | hasta |
| 5 (Pie de página) | |
| Screws of Ø 6,0 mm with partial thread additionally in length of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm | Tornillos de Ø 6,0 mm con rosca parcial adicionalmente en longitud de 180 hasta 300 mm, en pasos de 20 mm, LgT=68,0 mm |
| Lengths over 200 mm to 400 mm in steps of 20 mm | Longitudes por encima de 200 mm hasta 400 mm en pasos de 20 mm |
| Other thread lengths in the range $\geq 4 \times d1$ to max. standard length permitted. | Otras longitudes de rosca en el rango $>4 \times d1$ hasta la longitud estándar máx. permitida. |
| Intermediate lengths on Ls possible | Longitudes intermedias posibles en Ls |
| Screw lengths Ls up to 600 mm (Lengths > 400 mm with cut point) | Longitudes de rosca Ls hasta 600 mm (Longitudes > 400 mm con punta cut) |
| Screw lengths Ls to 600 mm possible | Longitudes de tornillo Ls posibles hasta 600 mm |
| Screw lengths Ls up to 600 mm possible (at a nominal diameter of 8,0 mm lengths > 400 mm with CUT-point) | Longitudes de tornillos Ls posibles hasta 600 mm (a un diámetro nominal de longitudes de 8,0 mm > 400 mm con punta CUT) |
| * Design C with lgT= max. 65,0 mm | * Diseño C con lgT = máx. 65,0 mm |
| = Preferred size | = Tamaño preferido |
| Other lengths 100 - 3000 mm possible | Otras longitudes posibles. de 100 a 3000 mm |
| Other thread lengths (lgT) are acceptable if $lgT > 4 \times 3,5$ | Se admiten otras longitudes de rosca (lgT) si $lgT > 4 \times 3,5$ |
| Length can be changed by cutting the threaded part | La longitud puede modificarse cortando la parte roscada |
| Annex A54 | Anexo A54 |


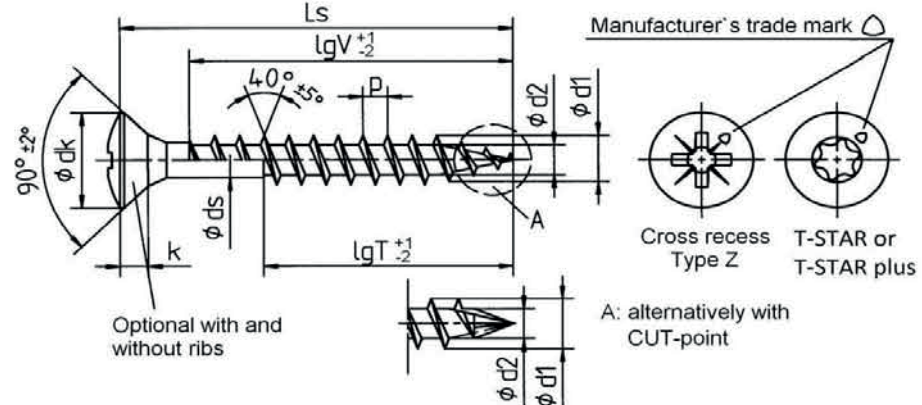
|  SPAX®-S Flat countersunk head | | Self-tapping screw with full and partial thread | | | | | | |
|---|-----------------------|--|-------------|--|------------|------------|------------|------------|
| | | Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | |
|  | | | | | | | | |
| Nominal diameter | | 2,5 | 3,0 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 |
| d1 | thread size | 2,5 | 3,1 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 |
| | permissible tolerance | ±0,3 | | | | | | |
| dk | head diameter | 5,1 | 6,0 | 7,0 | 8,0 | 8,8 | 9,7 | 11,6 |
| | permissible tolerance | ±0,5 | | | | | | ±0,6 |
| d2 | core diameter | 1,7 | 1,9 | 2,2 | 2,5 | 2,8 | 3,2 | 3,8 |
| | permissible tolerance | -0,30 | +0,15/-0,25 | -0,30 | ±0,3 | | | |
| ds | shank diameter | 1,8 | 2,15 | 2,45 | 2,85 | 3,20 | 3,55 | 4,30 |
| | permissible tolerance | ±0,10 | | | | | | |
| k | head height max. | 1,6 | 1,8 | 2,1 | 2,4 | 2,7 | 2,9 | 3,4 |
| p | thread pitch | 1,3 | 1,5 | 1,8 | 2,0 | 2,2 | 2,5 | 3,0 |
| | permissible tolerance | ±0,1 x p | | | | | | |
| T-STAR | size | T8 | T10 | T15 / T20 | T20 | | T25 | T30 |
| Cross recess size Type Z | | 1 | | | 2 | | | 3 |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | |
| Nom.dim. | min | max | lgV | lgT | lgV | lgT | lgV | lgT |
| 12 | 12,0 | 13,5 | 10,0 | | | | | |
| 15 | 14,0 | 15,5 | 12,0 | 12,5 | | | | |
| 16 | 16,0 | 17,5 | 14,0 | 14,0 | | | | |
| 20 | 18,5 | 20,5 | 17,0 | 12,0 | 17,0 | | 16,0 | 16,0 |
| 25 | 23,5 | 25,5 | 22,0 | 18,0 | 22,0 | 18,0 | 21,0 | 18,0 |
| 30 | 28,5 | 30,5 | 27,0 | 18,0 | 26,0 | 18,0 | 25,0 | 18,0 |
| 35 | 33,5 | 36,0 | | 22,0 | 31,0 | 23,0 | 30,0 | 23,0 |
| 40 | 38,5 | 41,0 | | 22,0 | 36,0 | 23,0 | 35,0 | 23,0 |
| 45 | 43,5 | 46,0 | | 28,0 | 36,0 | 28,0 | 40,0 | 30,0 |
| 50 | 48,5 | 51,0 | | | 28,0 | 40,0 | 32,0 | 45,0 |
| 55 | 53,5 | 56,0 | | | 36,0 | | 35,0 | 50,0 |
| 60 | 58,5 | 61,0 | | | | | 35,0 | 50,0 |
| 65 | 63,5 | 66,0 | | | | | 40,0 | 50,0 |
| 70 | 68,5 | 71,0 | | | | | | 37,5 |
| 75 | 73,5 | 76,0 | | | | | | 37,5 |
| 80 | 78,5 | 81,0 | | | | | | 37,5 |
| 90 | 88,5 | 91,5 | | | | | | 47,0 |
| 100 | 98,5 | 101,5 | | | | | | |
| 110 | 108,5 | 111,5 | | | | | | |
| 120 | 118,5 | 121,5 | | | | | | |
| 130 | 128,0 | 132,0 | | | | | | |
| 140 | 138,0 | 142,0 | | | | | | |
| 150 | 148,0 | 152,0 | | | | | | |
| 160 | 158,0 | 162,0 | | | | | | |
| Screws of Ø6,0 mm with partial thread additionally in length of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | |
| Intermediate lengths on Ls possible | | | | | | | | |
| | | | | | | | | Annex A1 |


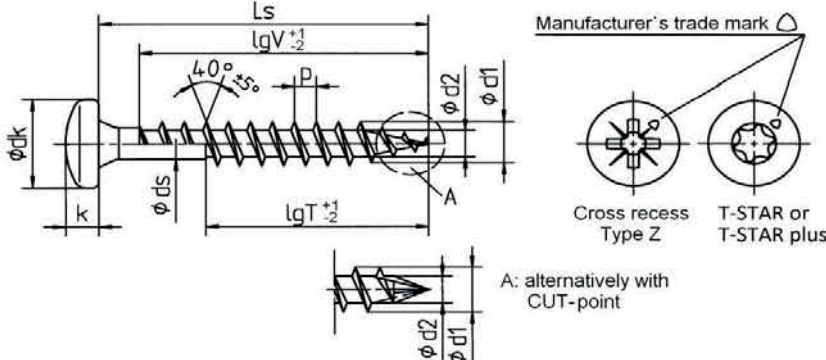
|  SPAX[®]-S Flat countersunk head | | Self-tapping screw with full and partial thread | | | | | | | |
|--|-----------------------|--|-------------|-------------|--|--|--|--|--|
| | | Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | |
|  | | | | | | | | | |
| Nominal diameter | | 7,0 | | | | | | | |
| d1 | thread size | 7,0 | | | | | | | |
| | permissible tolerance | ±0,35 | | | | | | | |
| dk | head diameter | 13,1 | | | | | | | |
| | permissible tolerance | ±0,65 | | | | | | | |
| d2 | core diameter | 4,5 | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | |
| ds | shank diameter | 4,90 | | | | | | | |
| | permissible tolerance | ±0,10 | | | | | | | |
| k | head height max. | 3,8 | | | | | | | |
| p | thread pitch | 3,5 | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | |
| T - STAR size | | T30 | | | | | | | |
| Cross recess size Type Z | | 3 | | | | | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | |
| Nom.dim. | min | max | lgV | lgT | | | | | |
| 40 | 38,5 | 41,0 | 33,0 | | | | | | |
| 45 | 43,5 | 46,0 | 38,0 | | | | | | |
| 50 | 48,5 | 51,0 | 43,0 | 33,0 | | | | | |
| 55 | 53,5 | 56,0 | 48,0 | 33,0 | | | | | |
| 60 | 58,5 | 61,0 | 53,0 | 38,0 | | | | | |
| 65 | 63,5 | 66,0 | 58,0 | 38,0 | | | | | |
| 70 | 68,5 | 71,0 | 61,0 | 43,0 | | | | | |
| 75 | 73,5 | 76,0 | 68,0 | 43,0 | | | | | |
| 80 | 78,5 | 81,0 | 68,0 | 48,0 | | | | | |
| 90 | 88,5 | 91,5 | 68,0 | 53,0 | | | | | |
| 100 | 98,5 | 101,5 | 68,0 | 58,0 | | | | | |
| 110 | 108,5 | 111,5 | | 68,0 | | | | | |
| 120 | 118,5 | 121,5 | | 68,0 | | | | | |
| 130 | 128,0 | 132,0 | | 68,0 | | | | | |
| 140 | 138,0 | 142,0 | | 68,0 | | | | | |
| 150 | 148,0 | 152,0 | | 68,0 | | | | | |
| 160 | 158,0 | 162,0 | | 68,0 | | | | | |
| 180 | 178,0 | 182,0 | | 68,0 | | | | | |
| 200 | 198,0 | 202,0 | | 68,0 | | | | | |
| <i>bis</i> | | | | | | | | | |
| 400 | 397,0 | 402,0 | | 68,0 | | | | | |
| Lengths over 200 mm to 400 mm in steps of 20 mm | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | |
| Annex A2 | | | | | | | | | |


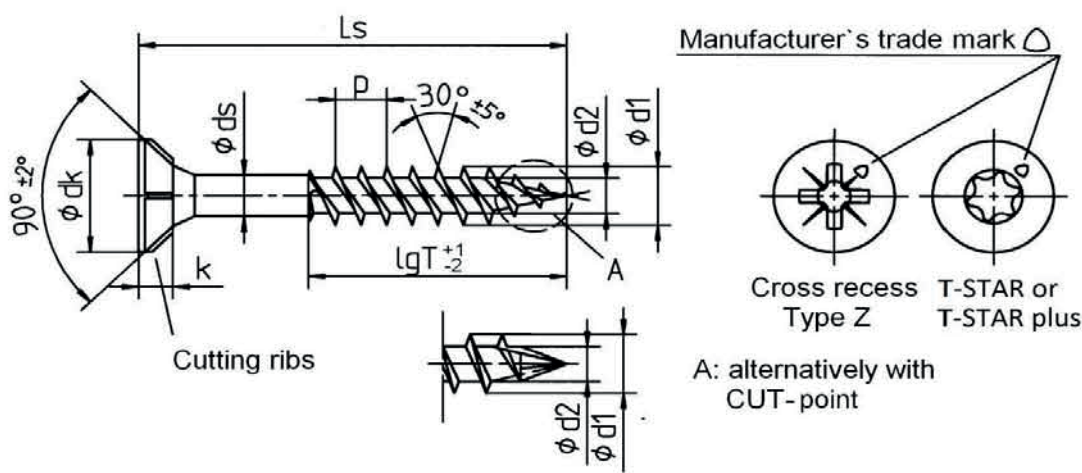
|  SPAX®-S Washer head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | | | | |
|---|--|---|------------|------------|--|--|------------|------|------|------|------|------|------|------|
| | |  | | | |  | | | | | | | | |
| Nominal diameter | | 3,0 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | |
| d1 | thread size | 3,1 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | |
| | permissible tolerance | | | | ±0,3 | | | | | | | | | |
| dk | head diameter | 7,9 | 8,6 | 9,6 | 10,6 | 11,6 | 13,6 | | | | | | | |
| | permissible tolerance | ±0,5 | | | ±0,6 | | ±0,68 | | | | | | | |
| dk1 | contersink diameter | 4,9 | 4,9 | 5,0 | 5,4 | 5,9 | 6,9 | | | | | | | |
| | permissible tolerance | | | | -0,2 | | | | | | | | | |
| d2 | core diameter | 1,9 | 2,2 | 2,5 | 2,8 | 3,2 | 3,8 | | | | | | | |
| | permissible tolerance | +0,15/-0,25 | -0,30 | | ±0,3 | | | | | | | | | |
| ds | shank diameter | 2,15 | 2,45 | 2,85 | 3,20 | 3,55 | 4,30 | | | | | | | |
| | permissible tolerance | | | | ±0,10 | | | | | | | | | |
| k | head height max. | 1,5 | 1,8 | 1,9 | 2,0 | 2,2 | 2,4 | | | | | | | |
| p | thread pitch | 1,5 | 1,8 | 2,0 | 2,2 | 2,5 | 3,0 | | | | | | | |
| | permissible tolerance | | | | ±0,1 x p | | | | | | | | | |
| T - STAR | size | T10 | T15 / T20 | T20 | | T25 | T30 | | | | | | | |
| Cross recess size | Type Z | 2 | | | | | | | | | | | | |
| 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 |
| 15 | 14,0 | 15,5 | 13,0 | | | | | | | | | | | |
| 16 | 16,0 | 17,5 | 15,0 | | 15,0 | | | | | | | | | |
| 20 | 18,5 | 20,5 | 18,0 | 12,5 | 18,0 | | 18,0 | | | | | | | |
| 25 | 23,5 | 25,5 | 23,0 | 18,0 | 23,0 | 18,0 | 23,0 | 17,0 | 22,5 | | 22,0 | | | |
| 30 | 28,5 | 30,5 | 28,0 | 18,0 | 27,0 | 18,0 | 27,5 | 18,0 | 27,5 | | 27,0 | | 27,0 | |
| 35 | 33,5 | 36,0 | 33,0 | 23,0 | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 | 32,0 | 24,0 |
| 40 | 38,5 | 41,0 | 36,0 | 23,0 | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 | 37,0 | 24,0 |
| 45 | 43,5 | 46,0 | 36,0 | 28,0 | 40,0 | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 | 41,0 | 29,0 |
| 50 | 48,5 | 51,0 | | 28,0 | | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 | 46,0 | 32,0 |
| 55 | 53,5 | 56,0 | | 36,0 | | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 | 51,0 | 37,0 |
| 60 | 58,5 | 61,0 | | | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 | 56,0 | 37,0 |
| 65 | 63,5 | 66,0 | | | | 40,0 | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | | | 37,5 | | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | | 37,5 | | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | | | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | 61,0 | | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | 69,0 | | | 68,0 |
| 120 | 118,5 | 121,5 | | | | | | | | | 69,0 | | | 68,0 |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | 68,0 |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | 68,0 |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | 68,0 |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | 68,0 |
| Screws of Ø6,0 mm with partial thread additionally in length of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | | | | | |


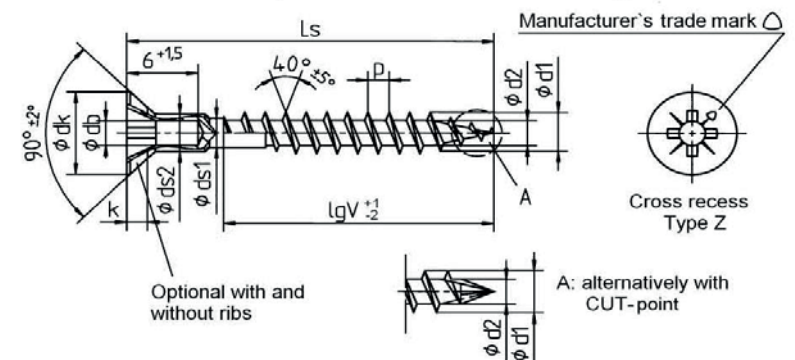
| | | | | | | | | | | | |
|---|-----------------------|---|--|-------------|--|--|--|--|--|--|--|
|  SPAX®-S Washer head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | |
| | |  | | | | | Manufacturer's trade mark   Cross recess Type Z T-STAR or T-STAR plus A: alternatively with CUT-point | | | | |
| Norminal diameter | | 7,0 | | | | | | | | | |
| d1 | thread size | 7,0 | | | | | | | | | |
| | permissible tolerance | ±0,35 | | | | | | | | | |
| dk | head diameter | 18,0 | | | | | | | | | |
| | permissible tolerance | ±0,9 | | | | | | | | | |
| dk1 | contersink diameter | 7,8 | | | | | | | | | |
| | permissible tolerance | -0,30 | | | | | | | | | |
| d2 | core diameter | 4,5 | | | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | | | |
| ds | shank diameter | 4,90 | | | | | | | | | |
| | permissible tolerance | ±0,1 | | | | | | | | | |
| k | head height max. | 3,7 | | | | | | | | | |
| p | thread pitch | 3,5 | | | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | | | |
| T - STAR size | | T30 | | | | | | | | | |
| Cross recess size Type Z | | 3 | | | | | | | | | |
| Ls | | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | |
| Nom.dim. | min | max | lgV | lgT | | | | | | | |
| 50 | 48,5 | 51,0 | 46,0 | 33,0 | | | | | | | |
| 55 | 53,5 | 56,0 | 51,0 | 33,0 | | | | | | | |
| 60 | 58,5 | 61,0 | 56,0 | 38,0 | | | | | | | |
| 65 | 63,5 | 66,0 | 61,0 | 38,0 | | | | | | | |
| 70 | 68,5 | 71,0 | 61,0 | 43,0 | | | | | | | |
| 75 | 73,5 | 76,0 | 68,0 | 43,0 | | | | | | | |
| 80 | 78,5 | 81,0 | 68,0 | 48,0 | | | | | | | |
| 90 | 88,5 | 91,5 | 68,0 | 53,0 | | | | | | | |
| 100 | 98,5 | 101,5 | 68,0 | 58,0 | | | | | | | |
| 110 | 108,5 | 111,5 | | 68,0 | | | | | | | |
| 120 | 118,5 | 121,5 | | 68,0 | | | | | | | |
| 130 | 128,0 | 132,0 | | 68,0 | | | | | | | |
| 140 | 138,0 | 142,0 | | 68,0 | | | | | | | |
| 150 | 148,0 | 152,0 | | 68,0 | | | | | | | |
| 160 | 158,0 | 162,0 | | 68,0 | | | | | | | |
| 180 | 178,0 | 182,0 | | 68,0 | | | | | | | |
| 200 | 198,0 | 202,0 | | 68,0 | | | | | | | |
| <i>to</i> | | | | | | | | | | | |
| 400 | 397,0 | 402,0 | | 68,0 | | | | | | | |
| Lengths over 200 mm to 400 mm in steps of 20 mm | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | | |
| Annex A4 | | | | | | | | | | | |


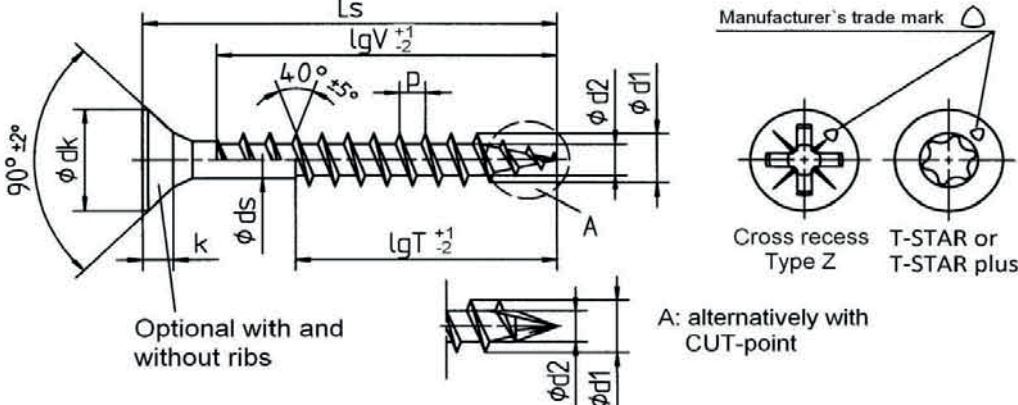
|  SPAX[®]-S Raised countersunk head | | Self-tapping screw with full and partial thread | | | | | | | | | | | | | | |
|--|--|--|-------------|------------|------------|------------|------------|------------|------|------|------|------|------|------|------|------|
| | | Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| Norminal diameter | | 2,5 | 3,0 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | | |
| d1 | thread size | 2,5 | 3,1 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | | |
| | permissible tolerance | | | | | | | ±0,3 | | | | | | | | |
| dk | head diameter | 5,1 | 6,0 | 7,0 | 8,0 | 8,8 | 9,7 | 11,6 | | | | | | | | |
| | permissible tolerance | | | | | | | ±0,5 | | | | | | | | |
| d2 | core diameter | 1,7 | 1,9 | 2,2 | 2,5 | 2,8 | 3,2 | 3,8 | | | | | | | | |
| | permissible tolerance | -0,30 | +0,15/-0,25 | -0,30 | | | | ±0,3 | | | | | | | | |
| ds | shank diameter | 1,8 | 2,15 | 2,45 | 2,85 | 3,20 | 3,55 | 4,30 | | | | | | | | |
| | permissible tolerance | | | | | | | ±0,10 | | | | | | | | |
| k | head height max. | 1,6 | 1,8 | 2,1 | 2,4 | 2,7 | 2,9 | 3,4 | | | | | | | | |
| p | thread pitch | 1,3 | 1,5 | 1,8 | 2,0 | 2,2 | 2,5 | 3,0 | | | | | | | | |
| | permissible tolerance | | | | | | | ±0,1 x p | | | | | | | | |
| T - STAR size | | T8 | T10 | T15 / T20 | T20 | | T25 | T30 | | | | | | | | |
| Cross recess size Type Z | | 1 | | 2 | | | | | 3 | | | | | | | |
| 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 | lgV | lgT |
| 12 | 12,0 | 13,5 | 10,0 | | | | | | | | | | | | | |
| 15 | 14,0 | 15,5 | 12,0 | | 12,5 | | | | | | | | | | | |
| 16 | 16,0 | 17,5 | 14,0 | | 14,0 | | | | | | | | | | | |
| 20 | 18,5 | 20,5 | 17,0 | 12,0 | 17,0 | 12,5 | 16,0 | | 16,0 | | | | | | | |
| 25 | 23,5 | 25,5 | 22,0 | 18,0 | 22,0 | 18,0 | 21,0 | 18,0 | 21,0 | | 20,0 | | 20,0 | | | |
| 30 | 28,5 | 30,5 | | 18,0 | 26,0 | 18,0 | 25,0 | 18,0 | 25,0 | 18,0 | 25,0 | | 25,0 | | 24,0 | |
| 35 | 33,5 | 36,0 | | 22,0 | 31,0 | 23,0 | 30,0 | 23,0 | 30,0 | 22,5 | 30,0 | 25,0 | 30,0 | 25,0 | 29,0 | |
| 40 | 38,5 | 41,0 | | 22,0 | 36,0 | 23,0 | 35,0 | 23,0 | 35,0 | 22,5 | 34,0 | 25,0 | 35,0 | 27,0 | 34,0 | 24,0 |
| 45 | 43,5 | 46,0 | | 28,0 | 36,0 | 28,0 | 40,0 | 30,0 | 40,0 | 30,0 | 39,0 | 30,0 | 39,0 | 30,0 | 38,0 | 29,0 |
| 50 | 48,5 | 51,0 | | | | 28,0 | 40,0 | 32,0 | 45,0 | 32,0 | 44,0 | 32,0 | 44,0 | 32,0 | 43,0 | 32,0 |
| 55 | 53,5 | 56,0 | | | | 36,0 | | 35,0 | 50,0 | 35,0 | 49,0 | 37,0 | 49,0 | 37,0 | 48,0 | 37,0 |
| 60 | 58,5 | 61,0 | | | | | | 35,0 | 50,0 | 35,0 | 54,0 | 37,0 | 54,0 | 37,0 | 53,0 | 37,0 |
| 65 | 63,5 | 66,0 | | | | | | 40,0 | | 37,5 | 59,0 | 42,0 | 59,0 | 41,0 | 58,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | | | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | | | | | 37,5 | | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | | | | 37,5 | | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | | | | | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | | | | 61,0 | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | | | | 69,0 | | 68,0 |
| 120 | 118,5 | 121,5 | | | | | | | | | | | | 69,0 | | 68,0 |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | | | 68,0 |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | | | 68,0 |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | | | 68,0 |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | | | 68,0 |
| Screws of Ø6,0 mm with partial thread additionally in length of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | | | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | | | | | | | |
| | | Annex A5 | | | | | | | | | | | | | | |


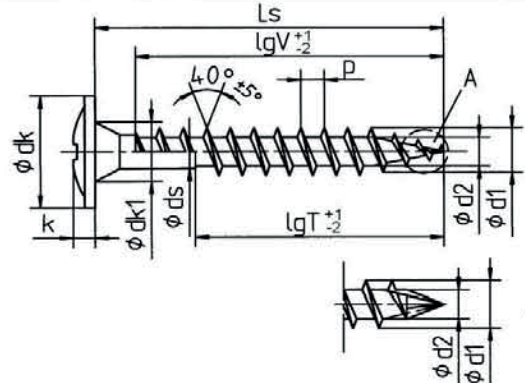
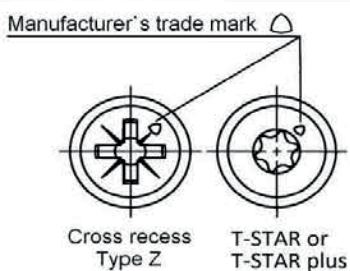
|  SPAX®-S Raised countersunk head | | Self-tapping screw with full and partial thread | | | | | | | | | |
|---|-----------------------|--|-------------|-------------|--|--|--|--|--|--|--|
| | | Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | |
|  | | | | | | | | | | | |
| Norminal diameter | | 7,0 | | | | | | | | | |
| d1 | thread size | 7,0 | | | | | | | | | |
| | permissible tolerance | ±0,35 | | | | | | | | | |
| dk | head diameter | 13,1 | | | | | | | | | |
| | permissible tolerance | ±0,65 | | | | | | | | | |
| d2 | core diameter | 4,5 | | | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | | | |
| ds | shank diameter | 4,90 | | | | | | | | | |
| | permissible tolerance | ±0,10 | | | | | | | | | |
| k | head height max. | 3,8 | | | | | | | | | |
| p | thread pitch | 3,5 | | | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | | | |
| T - STAR size | | T30 | | | | | | | | | |
| Cross recess size Type Z | | 3 | | | | | | | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | |
| Nom. dim. | min | max | lgV | lgT | | | | | | | |
| 40 | 38,5 | 41,0 | 33,0 | | | | | | | | |
| 45 | 43,5 | 46,0 | 38,0 | | | | | | | | |
| 50 | 48,5 | 51,0 | 43,0 | 33,0 | | | | | | | |
| 55 | 53,5 | 56,0 | 48,0 | 33,0 | | | | | | | |
| 60 | 58,5 | 61,0 | 53,0 | 38,0 | | | | | | | |
| 65 | 63,5 | 66,0 | 58,0 | 38,0 | | | | | | | |
| 70 | 68,5 | 71,0 | 61,0 | 43,0 | | | | | | | |
| 75 | 73,5 | 76,0 | 68,0 | 43,0 | | | | | | | |
| 80 | 78,5 | 81,0 | 68,0 | 48,0 | | | | | | | |
| 90 | 88,5 | 91,5 | 68,0 | 53,0 | | | | | | | |
| 100 | 98,5 | 101,5 | 68,0 | 58,0 | | | | | | | |
| 110 | 108,5 | 111,5 | | 68,0 | | | | | | | |
| 120 | 118,5 | 121,5 | | 68,0 | | | | | | | |
| 130 | 128,0 | 132,0 | | 68,0 | | | | | | | |
| 140 | 138,0 | 142,0 | | 68,0 | | | | | | | |
| 150 | 148,0 | 152,0 | | 68,0 | | | | | | | |
| 160 | 158,0 | 162,0 | | 68,0 | | | | | | | |
| 180 | 178,0 | 182,0 | | 68,0 | | | | | | | |
| 200 | 198,0 | 202,0 | | 68,0 | | | | | | | |
| to | | | | | | | | | | | |
| 400 | 397,0 | 402,0 | | 68,0 | | | | | | | |
| Lengths over 200 mm to 400 mm in steps of 20 mm | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | | |
| Annex A6 | | | | | | | | | | | |


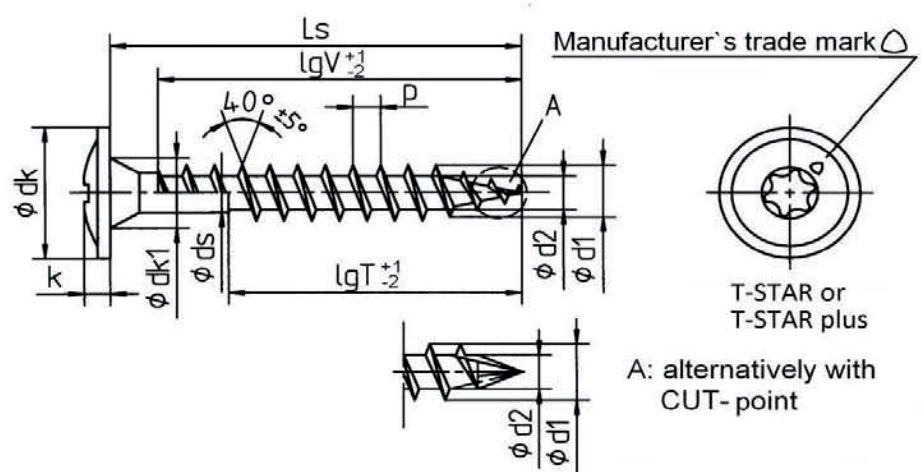
| | | | | | | | | | | | | | | | | |
|--|-----------------------|--|-------------|---|--|------------|------------|------------|------|----------|------|------|------|------|------|------|
|  | | SPAX®-S Pan head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | | | | |
| | | | |  | | | | | | | | | | | | |
| Nominal diameter | | 2,5 | 3,0 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | | |
| d1 | thread size | 2,5 | 3,1 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | | |
| | permissible tolerance | | | | | | | | | ±0,3 | | | | | | |
| dk | head diameter | 5,0 | 6,0 | 7,0 | 8,0 | 9,0 | 9,9 | 11,9 | | | | | | | | |
| | permissible tolerance | | | | | | | | | ±0,6 | | | | | | |
| d2 | core diameter | 1,7 | 1,9 | 2,2 | 2,5 | 2,8 | 3,2 | 3,8 | | | | | | | | |
| | permissible tolerance | -0,30 | +0,15/-0,25 | -0,30 | | | | | | | | | ±0,3 | | | |
| ds | shank diameter | 1,8 | 2,15 | 2,45 | 2,85 | 3,20 | 3,55 | 4,30 | | | | | | | | |
| | permissible tolerance | | | | | | | | | ±0,10 | | | | | | |
| k | head height max. | 2,1 | 2,3 | 2,7 | 2,9 | 3,1 | 3,4 | 4,0 | | | | | | | | |
| p | thread pitch | 1,3 | 1,5 | 1,8 | 2,0 | 2,2 | 2,5 | 3,0 | | | | | | | | |
| | permissible tolerance | | | | | | | | | ±0,1 x p | | | | | | |
| T-STAR | size | T8 | T10 | T15 / T20 | T20 | | T25 | T30 | | | | | | | | |
| Cross recess size Type Z | | 1 | | | 2 | | | 3 | | | | | | | | |
| 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 | lgV | lgT |
| 12 | 12,0 | 13,5 | 12,0 | | | | | | | | | | | | | |
| 15 | 14,0 | 15,5 | 13,0 | | 13,0 | | | | | | | | | | | |
| 16 | 16,0 | 17,5 | 15,0 | | 15,0 | | 15,0 | | | | | | | | | |
| 20 | 18,5 | 20,5 | 18,0 | 12,0 | 18,0 | | 18,0 | | 18,0 | | | | | | | |
| 25 | 23,5 | 25,5 | 23 | 18,0 | 23,0 | | 23,0 | 18,0 | 23,0 | | 22,5 | 22,0 | | | | |
| 30 | 28,5 | 30,5 | 28,0 | 18,0 | 28,0 | 18,0 | 27,0 | 18,0 | 27,5 | 18,0 | 27,5 | | 27,0 | 27,0 | | |
| 35 | 33,5 | 36,0 | | 22,0 | 33,0 | 23,0 | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 | 32,0 | 24,0 |
| 40 | 38,5 | 41,0 | | 22,0 | 36,0 | 23,0 | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 | 37,0 | 24,0 |
| 45 | 43,5 | 46,0 | | 28,0 | 36,0 | 28,0 | | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 | 41,0 | 29,0 |
| 50 | 48,5 | 51,0 | | | | 28,0 | | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 | 46,0 | 32,0 |
| 55 | 53,5 | 56,0 | | | | 36,0 | | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 | 51,0 | 37,0 |
| 60 | 58,5 | 61,0 | | | | | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 | 56,0 | 37,0 |
| 65 | 63,5 | 66,0 | | | | | | 40,0 | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 60,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | | | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 60,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | | | | | 37,5 | | 42,0 | 61,0 | 41,0 | 60,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | | | | 37,5 | | 47,0 | 61,0 | 46,0 | 60,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | | | | | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | | | | 61,0 | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | | | | | 69,0 | 68,0 |
| 120 | 118,5 | 121,5 | | | | | | | | | | | | | 69,0 | 68,0 |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | | | 68,0 |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | | | 68,0 |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | | | 68,0 |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | | | 68,0 |
| Screws of Ø6,0 mm with partial thread additionally in length of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | | | | | | | |
| Annex A7 | | | | | | | | | | | | | | | | |


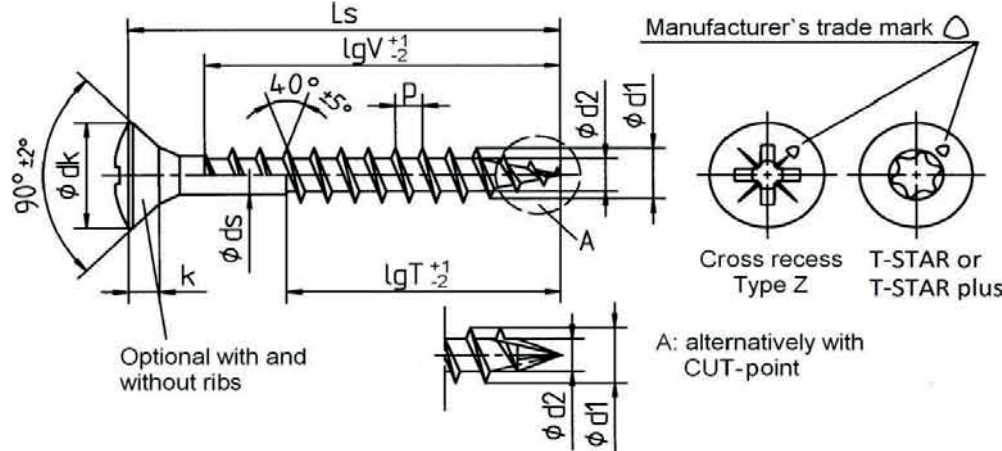
| | | | | | |
|--|-----------------------|--|--|--|-------------|
|  | | SPAX®-S Countersunk head with cutting ribs | | Self-tapping screw with double thread | |
| | | | | Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel | |
|  | | | | | |
| Norminal diameter | | | | | |
| d1 | thread size | | | 4,0 | 4,5 |
| | permissible tolerance | | | ±0,3 | |
| dk | head diameter | | | 8,0 | 8,8 |
| | permissible tolerance | | | ±0,5 | ±0,6 |
| d2 | core diameter | | | 2,5 | 2,8 |
| | permissible tolerance | | | ±0,3 | |
| ds | shank diameter | | | 2,85 | 3,20 |
| | permissible tolerance | | | ±0,10 | |
| k | head height max. | | | 2,4 | 2,7 |
| p | thead pitch | | | 3,3 | 3,5 |
| | permissible tolerance | | | ±0,1 x p | |
| T - STAR | size | | | T20 | |
| Cross recess size | Type Z | | | 2 | |
| Ls | | Standard thread lengths (partial thread = lgT) | | | |
| Nom.dim. | min | max | | lgT | lgT |
| 35 | 33,5 | 36,0 | | 22,5 | 24,0 |
| 40 | 38,5 | 41,0 | | 22,5 | 24,0 |
| 45 | 43,5 | 46,0 | | 30,0 | 29,0 |
| 50 | 48,5 | 51,0 | | 30,0 | 29,0 |
| 55 | 53,5 | 56,0 | | 35,0 | 34,0 |
| 60 | 58,5 | 61,0 | | 35,0 | 34,0 |
| 65 | 63,5 | 66,0 | | 37,5 | 42,0 |
| 70 | 68,5 | 71,0 | | 37,5 | 42,0 |
| 75 | 73,5 | 76,0 | | 50,0 | 49,0 |
| 80 | 78,5 | 81,0 | | | 49,0 |
| 90 | 88,5 | 91,5 | | | 49,0 |
| Intermediate lengths on Ls possible | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted | |
| Annex A9 | | | | | |


|  SPAX®-S Countersunk with head hole | | Self-tapping screw with full thread | | | | | |
|--|-----------------------|--|--|---|-------------|-------------|-------------|
| | | Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | |
|  | | | | | | | |
| Nominal diameter | | | | 4,0 | 4,5 | 5,0 | 6,0 |
| d1 | thread size | | | 4,0 | 4,5 | 5,0 | 6,0 |
| | permissible tolerance | | | ± 0,3 | | | |
| dk | head diameter | | | 8,0 | 8,8 | 9,7 | 11,6 |
| | permissible tolerance | | | ±0,5 | ±0,6 | | |
| db | hole diameter | | | 2,50 | | | |
| | permissible tolerance | | | ± 0,15 | | | |
| d2 | core diameter | | | 2,5 | 2,8 | 3,2 | 3,8 |
| | permissible tolerance | | | ±0,3 | | | |
| ds1 | shank diameter | | | 2,85 | 3,20 | 3,55 | 4,30 |
| | permissible tolerance | | | ± 0,10 | | | |
| ds2 | shank diameter | | | 3,60 | 3,80 | 4,10 | ohne |
| | permissible tolerance | | | ±0,10 | | ±0,2 | |
| k | head height max. | | | 2,4 | 2,7 | 2,9 | 3,4 |
| p | thread pitch | | | 2,0 | 2,2 | 2,5 | 3,0 |
| | permissible tolerance | | | ± 0,1 x p | | | |
| Cross recess size Z | | | | 2 | | | 3 |
| Ls | | Standard thread lengths (full thread = lgV) | | | | | |
| Nom. dim. | min | max | | lgV | lgV | lgV | lgV |
| 25 | 23,5 | 26,0 | | 18,0 | | | |
| 30 | 28,5 | 31,0 | | 23,0 | 20,0 | | |
| 35 | 33,5 | 36,0 | | 27,5 | 25,0 | | |
| 40 | 38,5 | 41,0 | | 32,5 | 30,0 | 30,0 | |
| 45 | 43,5 | 46,0 | | 37,5 | 34,0 | 35,0 | |
| 50 | 48,5 | 51,0 | | 42,5 | 39,0 | 39,0 | 41,0 |
| 55 | 53,5 | 56,0 | | 47,5 | 44,0 | 44,0 | 46,0 |
| 60 | 58,5 | 61,0 | | 50,0 | 49,0 | 49,0 | 51,0 |
| 65 | 63,5 | 66,0 | | | 54,0 | 54,0 | 56,0 |
| 70 | 68,5 | 71,0 | | | 59,0 | 61,0 | 61,0 |
| 75 | 73,5 | 76,0 | | | 59,0 | 61,0 | 61,0 |
| 80 | 78,5 | 81,0 | | | 59,0 | 61,0 | 61,0 |
| 90 | 88,5 | 91,5 | | | 59,0 | 61,0 | 61,0 |
| 100 | 98,5 | 101,5 | | | | 61,0 | 61,0 |
| 110 | 108,5 | 111,5 | | | | 69,0 | 68,0 |
| 120 | 118,5 | 121,5 | | | | 69,0 | 68,0 |
| 130 | 128,0 | 132,0 | | | | | 68,0 |
| 140 | 138,0 | 142,0 | | | | | 68,0 |
| 150 | 148,0 | 152,0 | | | | | 68,0 |
| 160 | 158,0 | 162,0 | | | | | 68,0 |
| Screw of Ø 6,0 mm with partial thread additionally in lengths of 180 to 300 mm , in steps of 20 mm, lgV = 68,0 mm | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | |
| Intermediate lengths on Ls possible | | | | | | | |
| Annex A10 | | | | | | | |

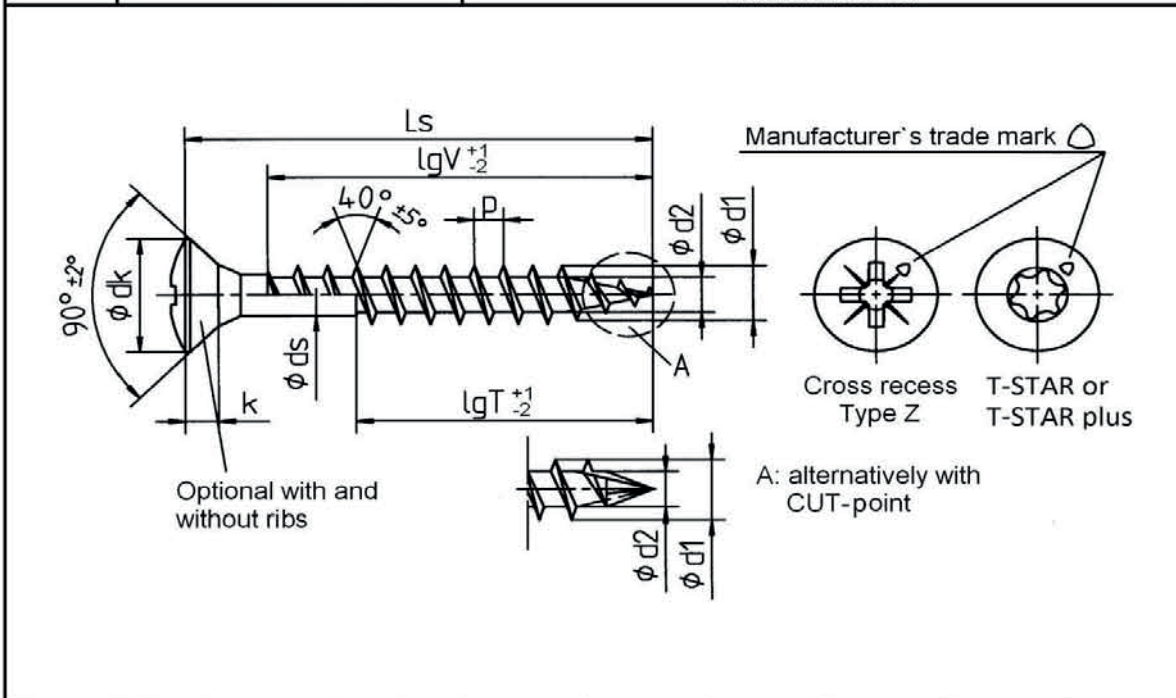
|  SPAX®-S Flat countersunk head | | Self-tapping screw with full and partial thread | | | | | | | | | | | | | | |
|---|--|---|------------|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | | Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |
| Nominal diameter | | 3,0 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | | | |
| d1 | thread size | 3,0 | 3,5 | 4,0 | 4,5 | 5,1 | 6,1 | | | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | | | | | | | | |
| dk | head diameter | 6,0 | 7,0 | 8,0 | 8,8 | 9,7 | 11,6 | | | | | | | | | |
| | permissible tolerance | ±0,5 | | | | | | | | | | | | | | |
| d2 | core diameter | 2,1 | 2,4 | 2,8 | 3,0 | 3,4 | 3,8 | | | | | | | | | |
| | permissible tolerance | -0,30 | | | | | | | | | | | | | | |
| ds | shank diameter | 2,25 | 2,60 | 3,00 | 3,30 | 3,75 | 4,30 | | | | | | | | | |
| | permissible tolerance | ±0,10 | | | | | | | | | | | | | | |
| k | head height max. | 1,8 | 2,1 | 2,4 | 2,7 | 2,9 | 3,4 | | | | | | | | | |
| p | thread pitch | 1,5 | 1,8 | 2,0 | 2,2 | 2,5 | 3,0 | | | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | | | | | | | | |
| T-STAR size | | T10 | T15 / T20 | T20 | | T25 | T30 | | | | | | | | | |
| Cross recess size Type Z | | 1 | 2 | | | | 3 | | | | | | | | | |
| 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 | lgV | lgT |
| 15 | 14,0 | 15,5 | | | 12,5 | | | | | | | | | | | |
| 16 | 16,0 | 17,5 | | | 14,0 | | | | | | | | | | | |
| 20 | 18,5 | 20,5 | | | 17,0 | | 16,0 | | 16,0 | | | | | | | |
| 25 | 23,5 | 25,5 | | | 21,0 | 18,0 | 21,0 | 18,0 | 21,0 | | 20,0 | | 20,0 | | | |
| 30 | 28,5 | 30,5 | | | 26,0 | 18,0 | 25,0 | 18,0 | 25,0 | 18,0 | 25,0 | | 25,0 | | 24,0 | |
| 35 | 33,5 | 36,0 | | | 31,0 | 23,0 | 30,0 | 23,0 | 30,0 | 23,0 | 30,0 | 25,0 | 30,0 | 25,0 | 29,0 | 24,0 |
| 40 | 38,5 | 41,0 | | | 36,0 | 23,0 | 35,0 | 23,0 | 35,0 | 23,0 | 34,0 | 25,0 | 35,0 | 27,0 | 34,0 | 24,0 |
| 45 | 43,5 | 46,0 | | | 36,0 | 28,0 | 40,0 | 30,0 | 40,0 | 30,0 | 39,0 | 30,0 | 39,0 | 30,0 | 38,0 | 29,0 |
| 50 | 48,5 | 51,0 | | | | 28,0 | 40,0 | 32,0 | 45,0 | 32,0 | 44,0 | 32,0 | 44,0 | 32,0 | 43,0 | 32,0 |
| 55 | 53,5 | 56,0 | | | | 36,0 | | 35,0 | 50,0 | 35,0 | 49,0 | 37,0 | 49,0 | 37,0 | 48,0 | 37,0 |
| 60 | 58,5 | 61,0 | | | | | | 35,0 | 50,0 | 35,0 | 54,0 | 37,0 | 54,0 | 37,0 | 53,0 | 37,0 |
| 65 | 63,5 | 66,0 | | | | | | 40,0 | | 37,5 | 59,0 | 42,0 | 59,0 | 41,0 | 58,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | | | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | | | | | 37,5 | | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | | | | 37,5 | | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | | | | | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | | | | 61,0 | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | | | | 69,0 | | 68,0 |
| 120 | 118,5 | 121,5 | | | | | | | | | | | | 69,0 | | 68,0 |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | | | 68,0 |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | | | 68,0 |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | | | 68,0 |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | | | 68,0 |
| Intermediate lengths on Ls possible | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | | | | | | | |
| Annex A11 | | | | | | | | | | | | | | | | |

|  | | Self-tapping screw with full and partial thread | | | | | | | | | | | | |
|---|-----------------------|---|-------------|-------------|-------------|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | | Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | | | | | | | |
|   <p>A: alternatively with CUT-point</p> | | | | | | | | | | | | | | |
| Nominal diameter | | | 3,0 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | |
| d1 | thread size | | 3,0 | 3,5 | 4,0 | 4,5 | 5,1 | 6,1 | | | | | | |
| | permissible tolerance | | | | | | | ±0,3 | | | | | | |
| dk | head diameter | | 7,9 | 8,6 | 9,6 | 10,6 | 11,6 | 13,6 | | | | | | |
| | permissible tolerance | | ±0,5 | | | | | ±0,6 | | | | | | |
| dk1 | contersink diameter | | 4,9 | 4,9 | 5,0 | 5,4 | 5,9 | 6,9 | | | | | | |
| | permissible tolerance | | | | | | | +0,20 | | | | | | |
| d2 | core diameter | | 2,1 | 2,4 | 2,8 | 3,0 | 3,4 | 3,8 | | | | | | |
| | permissible tolerance | | -0,30 | | | | | ±0,3 | | | | | | |
| ds | shank diameter | | 2,25 | 2,60 | 3,00 | 3,30 | 3,75 | 4,30 | | | | | | |
| | permissible tolerance | | | | | | | +0,10 | | | | | | |
| k | head height max. | | 1,5 | 1,8 | 1,9 | 2,0 | 2,2 | 2,4 | | | | | | |
| p | thread pitch | | 1,5 | 1,8 | 2,0 | 2,2 | 2,5 | 3,0 | | | | | | |
| | permissible tolerance | | | | | | | ±0,1 x p | | | | | | |
| T - STAR size | | | T10 | T15 / T20 | T20 | | | T25 | T30 | | | | | |
| Cross recess size Type Z | | | 2 | | | | | | | | | | | |
| 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 |
| 12 | 12,0 | 13,5 | 13,0 | | | | | | | | | | | |
| 15 | 16,0 | 17,5 | 14,0 | | | | | | | | | | | |
| 16 | 16,0 | 17,5 | 15,0 | | 15,0 | | | | | | | | | |
| 20 | 18,5 | 20,5 | 18,0 | 12,5 | 18,0 | | 18,0 | | | | | | | |
| 25 | 23,5 | 25,5 | 23,0 | 18,0 | 23,0 | 18,0 | 23,0 | | 22,5 | | 22,0 | | | |
| 30 | 28,5 | 30,5 | 28,0 | 18,0 | 27,0 | 18,0 | 27,5 | 18,0 | 27,5 | | 27,0 | | 27,0 | |
| 35 | 33,5 | 36,0 | 33,0 | 23,0 | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 | 32,0 | 24,0 |
| 40 | 38,5 | 41,0 | 36,0 | 23,0 | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 | 37,0 | 24,0 |
| 45 | 43,5 | 46,0 | 36,0 | 28,0 | 30,0 | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 | 41,0 | 29,0 |
| 50 | 48,5 | 51,0 | | 28,0 | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 | 46,0 | 32,0 | |
| 55 | 53,5 | 56,0 | | 36,0 | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 | 51,0 | 37,0 | |
| 60 | 58,5 | 61,0 | | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 | 56,0 | 37,0 | |
| 65 | 63,5 | 66,0 | | | 40,0 | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | |
| 70 | 68,5 | 71,0 | | | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | |
| 75 | 73,5 | 76,0 | | | | | 37,5 | | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | |
| 80 | 78,5 | 81,0 | | | | | 37,5 | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 | 46,0 | |
| 90 | 88,5 | 91,5 | | | | | | 47,0 | | 61,0 | | 61,0 | 61,0 | |
| 100 | 98,5 | 101,5 | | | | | | | | 61,0 | | 61,0 | 61,0 | |
| 110 | 108,5 | 111,5 | | | | | | | | 69,0 | | 68,0 | 68,0 | |
| 120 | 118,5 | 121,5 | | | | | | | | 69,0 | | 68,0 | 68,0 | |
| 130 | 128,5 | 131,5 | | | | | | | | | | | 68,0 | |
| 140 | 138,5 | 141,5 | | | | | | | | | | | 68,0 | |
| 150 | 148,5 | 151,5 | | | | | | | | | | | 68,0 | |
| 160 | 158,5 | 161,5 | | | | | | | | | | | 68,0 | |
| Intermediate lengths on Ls possible | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | |
| Annex A13 | | | | | | | | | | | | | | |

| | | | | | | | | | | | |
|---|-----------------------|---|-------------|-------------|--|--|--|--|--|--|--|
|  SPAX®-S Washer head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screw | | | | | | | | | |
| | |  | | | | | | | | | |
| Norminal diameter | | 7,0 | | | | | | | | | |
| d1 | thread size | 7,1 | | | | | | | | | |
| | permissible tolerance | ±0,35 | | | | | | | | | |
| dk | head diameter | 18,0 | | | | | | | | | |
| | permissible tolerance | ±0,9 | | | | | | | | | |
| dk1 | contersink diameter | 7,8 | | | | | | | | | |
| | permissible tolerance | -0,30 | | | | | | | | | |
| d2 | core diameter | 4,5 | | | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | | | |
| ds | shank diameter | 4,90 | | | | | | | | | |
| | permissible tolerance | ±0,10 | | | | | | | | | |
| k | head height max. | 3,7 | | | | | | | | | |
| p | thread pitch | 3,5 | | | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | | | |
| T - STAR | size | T30 | | | | | | | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | |
| Nom. dim. | min | max | lgV | lgT | | | | | | | |
| 50 | 48,5 | 51,0 | 46,0 | 33,0 | | | | | | | |
| 55 | 53,5 | 56,0 | 51,0 | 33,0 | | | | | | | |
| 60 | 58,5 | 61,0 | 56,0 | 38,0 | | | | | | | |
| 65 | 63,5 | 66,0 | 61,0 | 38,0 | | | | | | | |
| 70 | 68,5 | 71,0 | 61,0 | 43,0 | | | | | | | |
| 75 | 73,5 | 76,0 | 68,0 | 43,0 | | | | | | | |
| 80 | 78,5 | 81,0 | 68,0 | 48,0 | | | | | | | |
| 90 | 88,5 | 91,5 | 68,0 | 53,0 | | | | | | | |
| 100 | 98,5 | 101,5 | 68,0 | 58,0 | | | | | | | |
| 110 | 108,5 | 111,5 | | 68,0 | | | | | | | |
| 120 | 118,5 | 121,5 | | 68,0 | | | | | | | |
| Intermediate lengths on Ls possible | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | |
| Annex A14 | | | | | | | | | | | |

|  SPAX®-S Raised countersunk head | | Self-tapping screw with full and partial thread | | | | | | | | | | | | |
|---|-----------------------|---|------------|------------|------------|--|------------|------------|------|------|------|------|------|------|
| | | Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | |
| Norminal diameter | | | 3,0 | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | |
| d1 | thread size | | 3,0 | 3,5 | 4,0 | 4,5 | 5,1 | 6,1 | | | | | | |
| | permissible tolerance | | ±0,3 | | | | | | | | | | | |
| dk | head diameter | | 6,0 | 7,0 | 8,0 | 8,8 | 9,7 | 11,6 | | | | | | |
| | permissible tolerance | | ±0,5 | | | | | ±0,6 | | | | | | |
| d2 | core diameter | | 2,1 | 2,4 | 2,8 | 3,0 | 3,4 | 3,8 | | | | | | |
| | permissible tolerance | | -0,30 | ±0,3 | | | | | | | | | | |
| ds | shank diameter | | 2,25 | 2,60 | 3,00 | 3,30 | 3,75 | 4,30 | | | | | | |
| | permissible tolerance | | ±0,10 | | | | | | | | | | | |
| k | head hight max. | | 1,8 | 2,1 | 2,4 | 2,7 | 2,9 | 3,4 | | | | | | |
| p | thread pitch | | 1,5 | 1,8 | 2,0 | 2,2 | 2,5 | 3,0 | | | | | | |
| | permissible tolerance | | ±0,1 x p | | | | | | | | | | | |
| T - STAR size | | | T10 | | T15 / T20 | | T20 | | T25 | | T30 | | | |
| Cross recess size Type Z | | | 1 | | | | 2 | | | | 3 | | | |
| 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 |
| 15 | 14,0 | 15,5 | 12,5 | | | | | | | | | | | |
| 16 | 16,0 | 17,5 | 14,0 | | | | | | | | | | | |
| 20 | 18,5 | 20,5 | 17,0 | 12,5 | 16,0 | | 16,0 | | | | | | | |
| 25 | 23,5 | 25,5 | 22,0 | 18,0 | 21,0 | 18,0 | 21,0 | | 20,0 | | 20,0 | | | |
| 30 | 28,5 | 30,5 | 26,0 | 18,0 | 25,0 | 18,0 | 25,0 | 18,0 | 25,0 | | 25,0 | | 24,0 | |
| 35 | 33,5 | 36,0 | 31,0 | 23,0 | 30,0 | 23,0 | 30,0 | 23,0 | 30,0 | 25,0 | 30,0 | 25,0 | 29,0 | 24,0 |
| 40 | 38,5 | 41,0 | 36,0 | 23,0 | 35,0 | 23,0 | 35,0 | 23,0 | 34,0 | 25,0 | 35,0 | 27,0 | 34,0 | 24,0 |
| 45 | 43,5 | 46,0 | 36,0 | 28,0 | 40,0 | 30,0 | 40,0 | 30,0 | 39,0 | 30,0 | 39,0 | 30,0 | 38,0 | 29,0 |
| 50 | 48,5 | 51,0 | | 28,0 | 40,0 | 32,0 | 45,0 | 32,5 | 44,0 | 32,5 | 44,0 | 32,0 | 43,0 | 32,0 |
| 55 | 53,5 | 56,0 | | 36,0 | | 35,0 | 50,0 | 35,0 | 49,0 | 37,0 | 49,0 | 37,0 | 48,0 | 37,0 |
| 60 | 58,5 | 61,0 | | | | 35,0 | 50,0 | 35,0 | 54,0 | 37,0 | 54,0 | 37,0 | 53,0 | 37,0 |
| 65 | 63,5 | 66,0 | | | | 40,0 | | 37,5 | 59,0 | 42,0 | 59,0 | 41,0 | 58,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | | | 37,5 | | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | | 37,5 | | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | | | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | | 61,0 | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | | 69,0 | | 68,0 |
| 120 | 118,5 | 121,5 | | | | | | | | | | 69,0 | | 68,0 |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | 68,0 |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | 68,0 |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | 68,0 |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | 68,0 |
| Intermediate lengths on Ls possible | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | |
| Annex A15 | | | | | | | | | | | | | | |

| | | |
|---|---|---|
|  | SPAX®-S Raised countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screw |
| | | |



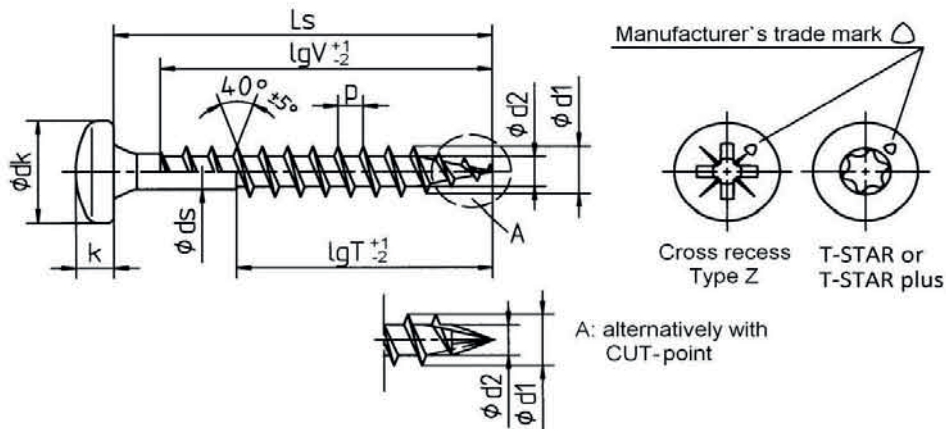



| | | | | | | | | | |
|--------------------------|-----------------------|----------|--|--|--|--|--|--|--|
| Norminal diameter | 7,0 | | | | | | | | |
| d1 | thread size | 7,1 | | | | | | | |
| | permissible tolerance | ±0,35 | | | | | | | |
| dk | head diameter | 13,1 | | | | | | | |
| | permissible tolerance | ±0,65 | | | | | | | |
| d2 | core diameter | 4,5 | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | |
| ds | shank diameter | 4,90 | | | | | | | |
| | permissible tolerance | ±0,10 | | | | | | | |
| k | head height max. | 3,8 | | | | | | | |
| p | thread pitch | 3,5 | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | |
| T - STAR | size | T30 | | | | | | | |
| Cross recess size | Type Z | 3 | | | | | | | |

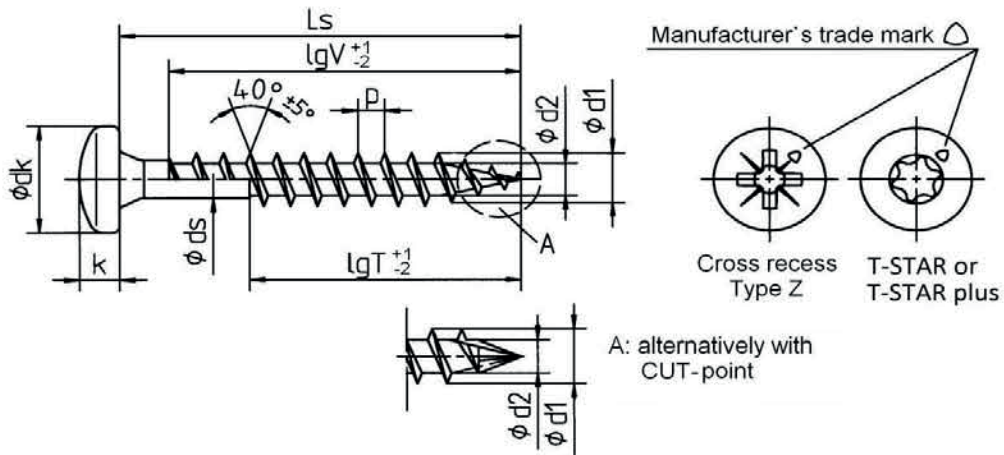
| Ls | | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | |
|------------|--------------|--------------|--|-------------|--|--|--|--|--|
| Nom dim. | min | max | lgV | lgT | | | | | |
| 40 | 38,5 | 41,0 | 33,0 | | | | | | |
| 45 | 43,5 | 46,0 | 38,0 | | | | | | |
| 50 | 48,5 | 51,0 | 43,0 | 33,0 | | | | | |
| 55 | 53,5 | 56,0 | 48,0 | 33,0 | | | | | |
| 60 | 58,5 | 61,0 | 53,0 | 38,0 | | | | | |
| 65 | 63,5 | 66,0 | 58,0 | 38,0 | | | | | |
| 70 | 68,5 | 71,0 | 61,0 | 43,0 | | | | | |
| 75 | 73,5 | 76,0 | 68,0 | 43,0 | | | | | |
| 80 | 78,5 | 81,0 | 68,0 | 48,0 | | | | | |
| 90 | 88,5 | 91,5 | 68,0 | 53,0 | | | | | |
| 100 | 98,5 | 101,5 | 68,0 | 58,0 | | | | | |
| 110 | 108,5 | 111,5 | | 68,0 | | | | | |
| 120 | 118,5 | 121,5 | | 68,0 | | | | | |

Intermediate lengths on Ls possible

Other thread lengths in the range $\geq 4 \times d1$ to max. standard length permitted.

| | | | | | | | | | | | | | | | | | | |
|---|---|-------|--|------|------------|------|------------|------|------------|--|------------|------|------------|------|------|-----|--|--|
|  |  Pan head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | | | | | | | | | | |
| |  | | | | | | | | | | | | | | | | | |
| Nominal diameter | | | 3,0 | | 3,5 | | 4,0 | | 4,5 | | 5,0 | | 6,0 | | | | | |
| d1 | thread size | | 3,0 | | 3,5 | | 4,0 | | 4,5 | | 5,1 | | 6,1 | | | | | |
| | permissible tolerance | | ±0,3 | | | | | | | | | | | | | | | |
| dk | head diameter | | 6,0 | | 7,0 | | 8,0 | | 9,0 | | 9,9 | | 11,9 | | | | | |
| | permissible tolerance | | ±0,5 | | | | ±0,6 | | | | | | | | | | | |
| d2 | core diameter | | 2,1 | | 2,4 | | 2,8 | | 3,0 | | 3,4 | | 3,8 | | | | | |
| | permissible tolerance | | -0,30 | | ±0,3 | | | | | | | | | | | | | |
| ds | shank diameter | | 2,25 | | 2,60 | | 3,00 | | 3,30 | | 3,75 | | 4,30 | | | | | |
| | permissible tolerance | | ±0,10 | | | | | | | | | | | | | | | |
| k | head height max. | | 2,3 | | 2,5 | | 2,9 | | 3,1 | | 3,4 | | 4,0 | | | | | |
| p | thread pitch | | 1,5 | | 1,8 | | 2,0 | | 2,2 | | 2,5 | | 3,0 | | | | | |
| | permissible tolerance | | ±0,1 x p | | | | | | | | | | | | | | | |
| T - STAR size | | | T10 | | T15 / T20 | | T20 | | T25 | | T30 | | | | | | | |
| Cross recess size Type Z | | | 1 | | 2 | | 3 | | | | | | | | | | | |
| 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 | lgV | lgT | | |
| 15 | 14,0 | 15,5 | 13,0 | | | | | | | | | | | | | | | |
| 16 | 16,0 | 17,5 | 15,0 | | 15,0 | | | | | | | | | | | | | |
| 20 | 18,5 | 20,5 | 18,0 | 12,5 | 18,0 | | 18,0 | | | | | | | | | | | |
| 25 | 23,5 | 25,5 | 23,0 | 18,0 | 23,0 | 18,0 | 23,0 | | 22,5 | | 22,0 | | | | | | | |
| 30 | 28,5 | 30,5 | 28,0 | 18,0 | 27,0 | 18,0 | 27,5 | 18,0 | 27,5 | | 27,0 | | 27,0 | | | | | |
| 35 | 33,5 | 36,0 | 33,0 | 23,0 | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 | 32,0 | 24,0 | | | | |
| 40 | 38,5 | 41,0 | 36,0 | 23,0 | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 | 37,0 | 24,0 | | | | |
| 45 | 43,5 | 46,0 | 36,0 | 28,0 | | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 | 41,0 | 29,0 | | | | |
| 50 | 48,5 | 51,0 | | 28,0 | | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 | 46,0 | 32,0 | | | | |
| 55 | 53,5 | 56,0 | | 36,0 | | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 | 51,0 | 37,0 | | | | |
| 60 | 58,5 | 61,0 | | | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 | 56,0 | 37,0 | | | | |
| 65 | 63,5 | 66,0 | | | | 40,0 | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 60,0 | 41,0 | | | |
| 70 | 68,5 | 71,0 | | | | | | | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 60,0 | 41,0 | | | |
| 75 | 73,5 | 76,0 | | | | | | | 37,5 | | 42,0 | 61,0 | 41,0 | 60,0 | 41,0 | | | |
| 80 | 78,5 | 81,0 | | | | | | | 37,5 | | 47,0 | 61,0 | 46,0 | 60,0 | 46,0 | | | |
| 90 | 88,5 | 91,5 | | | | | | | | | 47,0 | | 61,0 | | 61,0 | | | |
| 100 | 98,5 | 101,5 | | | | | | | | | | | 61,0 | | 61,0 | | | |
| 110 | 108,5 | 111,5 | | | | | | | | | | | 69,0 | | 68,0 | | | |
| 120 | 118,5 | 121,5 | | | | | | | | | | | 69,0 | | 68,0 | | | |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | | 68,0 | | | |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | | 68,0 | | | |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | | 68,0 | | | |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | | 68,0 | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | |
| Annex A17 | | | | | | | | | | | | | | | | | | |

| | | |
|---|----------------------------|--|
|  | SPAX®-S Pan head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws |
|---|----------------------------|--|




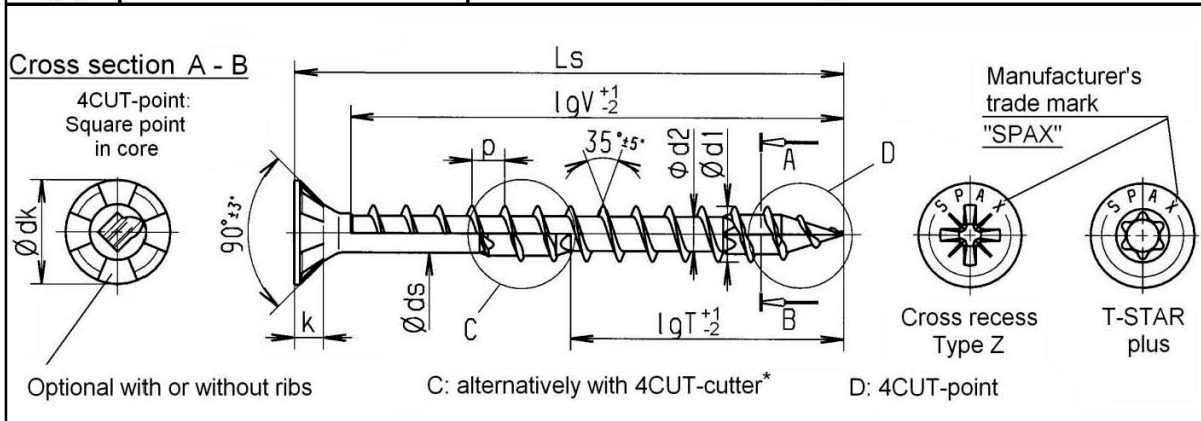
| | | | | | | | | | |
|-------------------------|-----------------------|----------|--|--|--|--|--|--|--|
| Nominal diameter | 7,0 | | | | | | | | |
| d1 | thread size | 7,1 | | | | | | | |
| | permissible tolerance | ±0,35 | | | | | | | |
| dk | head diameter | 13,5 | | | | | | | |
| | permissible tolerance | ±0,65 | | | | | | | |
| d2 | core diameter | 4,5 | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | |
| ds | shank diameter | 4,90 | | | | | | | |
| | permissible tolerance | ±0,10 | | | | | | | |
| k | head height max. | 5 | | | | | | | |
| p | thread pitch | 3,5 | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | |
| T - STAR | size | T30 | | | | | | | |
| Cross recess size | Type Z | 3 | | | | | | | |

| Ls | | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | |
|------------|--------------|--------------|--|-------------|--|--|--|--|--|--|--|
| Nom. dim. | min | max | lgV | lgT | | | | | | | |
| 50 | 48,5 | 51,0 | 46,0 | 33,0 | | | | | | | |
| 55 | 53,5 | 56,0 | 51,0 | 33,0 | | | | | | | |
| 60 | 58,5 | 61,0 | 56,0 | 38,0 | | | | | | | |
| 65 | 63,5 | 66,0 | 61,0 | 38,0 | | | | | | | |
| 70 | 68,5 | 71,0 | 61,0 | 43,0 | | | | | | | |
| 75 | 73,5 | 76,0 | 68,0 | 43,0 | | | | | | | |
| 80 | 78,5 | 81,0 | 68,0 | 48,0 | | | | | | | |
| 90 | 88,5 | 91,5 | 68,0 | 53,0 | | | | | | | |
| 100 | 98,5 | 101,5 | 68,0 | 58,0 | | | | | | | |
| 110 | 108,5 | 111,5 | | 68,0 | | | | | | | |
| 120 | 118,5 | 121,5 | | 68,0 | | | | | | | |

Intermediate lengths on Ls possible

Other thread lengths in the range $\geq 4 \times d1$ to max. standard length permitted.

| | |
|--|--|
|  SPAX® Flat countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel |
|--|--|



| Nominal diameter | | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 |
|--------------------------|-----------------------|-----------|------|------|------|------|
| d1 | thread size | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 |
| | permissible tolerance | | | ±0,3 | | |
| dk | head diameter | 7,0 | 8,0 | 8,8 | 9,6 | 11,6 |
| | permissible tolerance | ±0,5 | | ±0,6 | | |
| d2 | core diameter | 2,25 | 2,6 | 2,9 | 3,2 | 3,9 |
| | permissible tolerance | +0,1/-0,3 | | ±0,3 | | |
| ds | shank diameter | 2,45 | 2,85 | 3,20 | 3,55 | 4,30 |
| | permissible tolerance | ±0,10 | | | | |
| k | head height max. | 2,1 | 2,4 | 2,7 | 2,9 | 3,4 |
| p | thread pitch | 2,1 | 2,4 | 2,7 | 3,0 | 3,6 |
| | permissible tolerance | ±0,1 x p | | | | |
| T-STAR plus size | | T15 / T20 | | T20 | | T30 |
| Cross recess size Type Z | | 2 | | | | 3 |


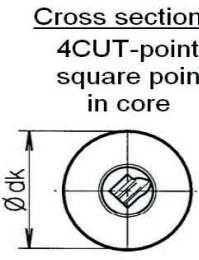
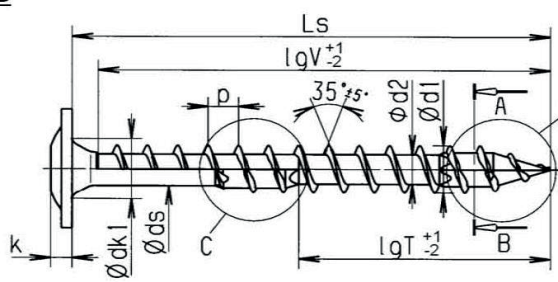
| Ls | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | | | |
|-----|--|-------|------|------|------|------|------|------|------|------|-------|------|-------|
| | Nom. dim. | min | max | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT |
| 20 | 18,5 | 20,5 | 16,0 | | 16,0 | | | | | | | | |
| 25 | 23,5 | 25,5 | 21,0 | 18,0 | 21,0 | | 20,0 | | 20,0 | | | | |
| 30 | 28,5 | 30,5 | 25,0 | 18,0 | 25,0 | 18,0 | 25,0 | | 25,0 | | 24,0 | | |
| 35 | 33,5 | 36,0 | 30,0 | 23,0 | 30,0 | 23,0 | 30,0 | 25,0 | 30,0 | 25,0 | 29,0 | 24,0 | 24,0 |
| 40 | 38,5 | 41,0 | 35,0 | 23,0 | 35,0 | 23,0 | 34,0 | 25,0 | 35,0 | 27,0 | 34,0 | 24,0 | 24,0 |
| 45 | 43,5 | 46,0 | 40,0 | 30,0 | 40,0 | 30,0 | 39,0 | 30,0 | 39,0 | 30,0 | 38,0 | 29,0 | 29,0 |
| 50 | 48,5 | 51,0 | 40,0 | 32,0 | 45,0 | 32,5 | 44,0 | 32,5 | 44,0 | 32,0 | 43,0 | 32,0 | 32,0 |
| 55 | 53,5 | 56,0 | | 35,0 | 50,0 | 35,0 | 49,0 | 37,0 | 49,0 | 37,0 | 48,0 | 37,0 | 37,0 |
| 60 | 58,5 | 61,0 | | 35,0 | 50,0 | 35,0 | 54,0 | 37,0 | 54,0 | 37,0 | 53,0 | 37,0 | 37,0 |
| 65 | 63,5 | 66,0 | | 40,0 | 50,0 | 37,5 | 59,0 | 42,0 | 59,0 | 41,0 | 58,0 | 41,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | 50,0 | 37,5 | 59,0 | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | 59,0 | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | 61,0 | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | 69,0* | | 68,0* |
| 120 | 118,5 | 121,5 | | | | | | | | | 69,0* | | 68,0* |
| 130 | 128,0 | 132,0 | | | | | | | | | | | 68,0* |
| 140 | 138,0 | 142,0 | | | | | | | | | | | 68,0* |
| 150 | 148,0 | 152,0 | | | | | | | | | | | 68,0* |
| 160 | 158,0 | 162,0 | | | | | | | | | | | 68,0* |


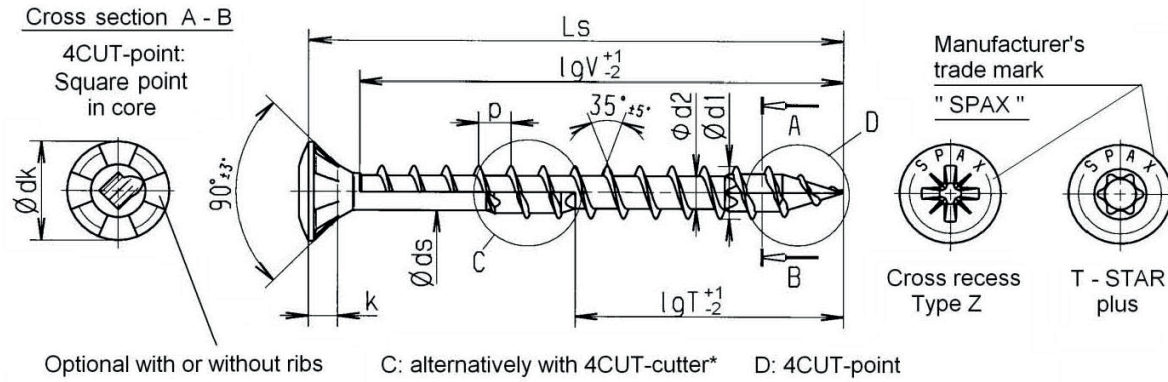
Screws of Ø6,0 mm with partial thread additionally in lengths of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm*



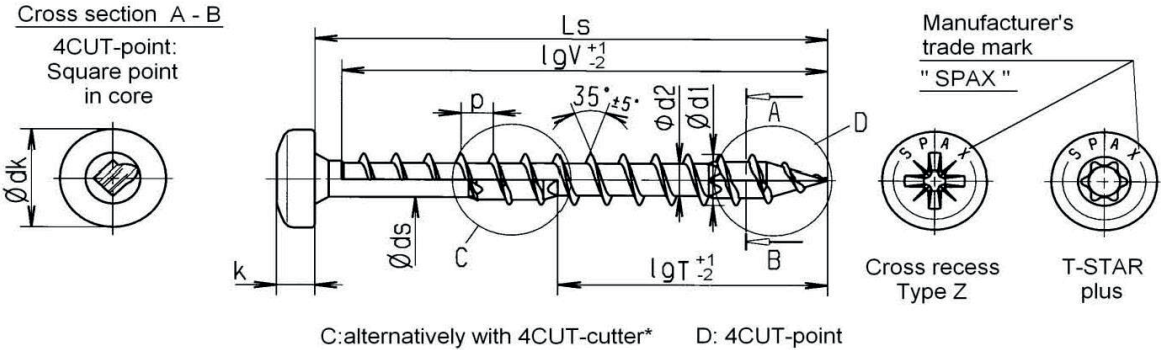
Intermediate lengths on Ls possible


Other thread lengths in the range ≥4xd1 to max. standard length permitted.

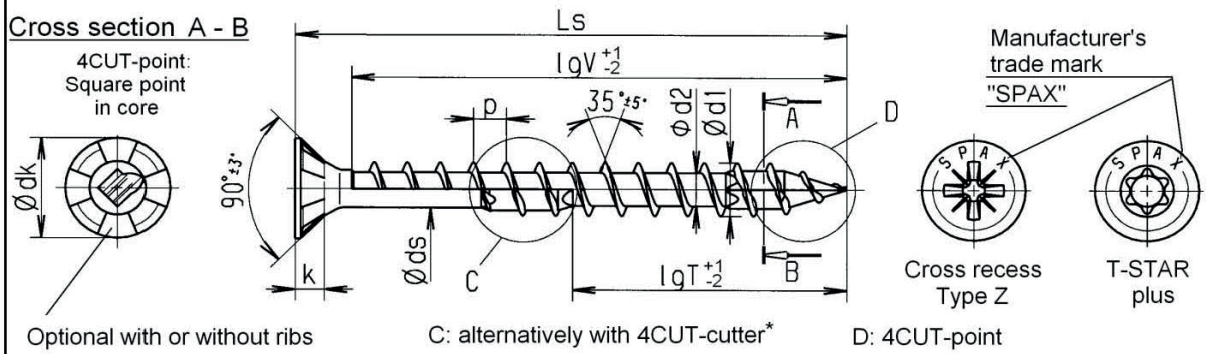
* Design C with lgT= max. 65,0 mm

| | | | | | | | | | | | | | | | | | |
|---|-----------------------|---|--|------------|--|------------|------|------------|------|------------|------|--|------|------------------------|--|----------------|--|
|  SPAX [®] Washer head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | | | | | | | |
| | | Cross section A-B 4CUT-point: square point in core | | | | | | | | | | | | | | | |
|  | |  | | | | | | | | | | Manufacturer's trade mark "SPAX" | | Cross recess Type Z | | T-STAR plus | |
| C:alternatively with 4CUT-cutter* | | D: 4CUT-point | | | | | | | | | | | | | | | |
| Nominal diameter | | | | 3,5 | | 4,0 | | 4,5 | | 5,0 | | 6,0 | | | | | |
| d1 | thread size | | | 3,5 | | 4,0 | | 4,5 | | 5,0 | | 6,0 | | | | | |
| | permissible tolerance | | | | | | | ±0,3 | | | | | | | | | |
| dk | head diameter | 8,6 | | 9,6 | | 10,6 | | 11,6 | | 13,6 | | | | | | | |
| | permissible tolerance | | | ±0,6 | | | | | | ±0,65 | | | | | | | |
| dk1 | countersink diameter | 4,9 | | 5,0 | | 5,4 | | 5,9 | | 6,9 | | | | | | | |
| | permissible tolerance | | | | | +0,20 | | | | | | | | | | | |
| d2 | core diameter | 2,25 | | 2,6 | | 2,9 | | 3,2 | | 3,9 | | | | | | | |
| | permissible tolerance | +0,1/-0,3 | | | | ±0,3 | | | | | | | | | | | |
| ds | shank diameter | 2,45 | | 2,85 | | 3,2 | | 3,55 | | 4,3 | | | | | | | |
| | permissible tolerance | | | | | ±0,10 | | | | | | | | | | | |
| k | head height max. | 1,8 | | 1,9 | | 2,0 | | 2,2 | | 3,1 | | | | | | | |
| p | thread pitch | 2,1 | | 2,4 | | 2,7 | | 3,0 | | 3,6 | | | | | | | |
| | permissible tolerance | | | | | ±0,1 x p | | | | | | | | | | | |
| T-STAR plus size | | | | T15 / T20 | | T20 | | T30 | | | | | | | | | |
| Cross recess size Type Z | | | | | | 2 | | | | | | | | | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | | | | | | |
| Nom. dim. | min | max | | | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | | | |
| 16 | 16,0 | 17,5 | | | 15,0 | | | | | | | | | | | | |
| 20 | 18,5 | 20,5 | | | 18,0 | | 18,0 | | | | | | | | | | |
| 25 | 23,5 | 25,5 | | | 23,0 | 18,0 | 23,0 | | 22,5 | | 22,0 | | | | | | |
| 30 | 28,5 | 30,5 | | | 27,0 | 18,0 | 27,5 | 18,0 | 27,5 | | 27,0 | | 27,0 | | | | |
| 35 | 33,5 | 36,0 | | | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 | 32,0 | 24,0 | | | |
| 40 | 38,5 | 41,0 | | | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 | 37,0 | 24,0 | | | |
| 45 | 43,5 | 46,0 | | | 40,0 | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 | 41,0 | 29,0 | | | |
| 50 | 48,5 | 51,0 | | | 40,0 | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 | 46,0 | 32,0 | | | |
| 55 | 53,5 | 56,0 | | | | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 | 51,0 | 37,0 | | | |
| 60 | 58,5 | 61,0 | | | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 | 56,0 | 37,0 | | | |
| 65 | 63,5 | 66,0 | | | | 40,0 | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | | | |
| 70 | 68,5 | 71,0 | | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | | | |
| 75 | 73,5 | 76,0 | | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | | | |
| 80 | 78,5 | 81,0 | | | | | | | 59,0 | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 | | | |
| 90 | 88,5 | 91,5 | | | | | | | 59,0 | 47,0 | | 61,0 | | 61,0 | | | |
| 100 | 98,5 | 101,5 | | | | | | | | | | 61,0 | | 61,0 | | | |
| 110 | 108,5 | 111,5 | | | | | | | | | | 69,0* | | 68,0* | | | |
| 120 | 118,5 | 121,5 | | | | | | | | | | 69,0* | | 68,0* | | | |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | 68,0* | | | |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | 68,0* | | | |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | 68,0* | | | |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | 68,0* | | | |
| Screws of Ø6,0 mm with partial thread additionally in lengths of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm* | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | | | | | |
| Intermediate lengths on Ls possible | | | | | * Design C with lgT= max. 65,0 mm | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|--|--|-------|--|--|--|--|--|--|--|--|--|--|
|  SPAX [®] Raised countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | | | |
| |  | | | | | | | | | | | |
| Nominal diameter | | | | | | | | | | | | |
| d1 | thread size | | | | | | | | | | | |
| | permissible tolerance | | | | | | | | | | | |
| dk | head diameter | | | | | | | | | | | |
| | permissible tolerance | | | | | | | | | | | |
| d2 | core diameter | | | | | | | | | | | |
| | permissible tolerance | | | | | | | | | | | |
| ds | shank diameter | | | | | | | | | | | |
| | permissible tolerance | | | | | | | | | | | |
| k | head height max. | | | | | | | | | | | |
| p | thread pitch | | | | | | | | | | | |
| | permissible tolerance | | | | | | | | | | | |
| T-STAR plus | size | | | | | | | | | | | |
| Cross recess size Type Z | | | | | | | | | | | | |
| Ls | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | | |
| Nom. dim. | min | max | | | | | | | | | | |
| 20 | 18,5 | 20,5 | | | | | | | | | | |
| 25 | 23,5 | 25,5 | | | | | | | | | | |
| 30 | 28,5 | 30,5 | | | | | | | | | | |
| 35 | 33,5 | 36,0 | | | | | | | | | | |
| 40 | 38,5 | 41,0 | | | | | | | | | | |
| 45 | 43,5 | 46,0 | | | | | | | | | | |
| 50 | 48,5 | 51,0 | | | | | | | | | | |
| 55 | 53,5 | 56,0 | | | | | | | | | | |
| 60 | 58,5 | 61,0 | | | | | | | | | | |
| 65 | 63,5 | 66,0 | | | | | | | | | | |
| 70 | 68,5 | 71,0 | | | | | | | | | | |
| 75 | 73,5 | 76,0 | | | | | | | | | | |
| 80 | 78,5 | 81,0 | | | | | | | | | | |
| 90 | 88,5 | 91,5 | | | | | | | | | | |
| 100 | 98,5 | 101,5 | | | | | | | | | | |
| 110 | 108,5 | 111,5 | | | | | | | | | | |
| 120 | 118,5 | 121,5 | | | | | | | | | | |
| 130 | 128,0 | 132,0 | | | | | | | | | | |
| 140 | 138,0 | 142,0 | | | | | | | | | | |
| 150 | 148,0 | 152,0 | | | | | | | | | | |
| 160 | 158,0 | 162,0 | | | | | | | | | | |
| Screws of Ø6,0 mm with partial thread additionally in lengths of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm* | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | |
| Intermediate lengths on Ls possible | | | | | | * Design C with lgT= max. 65,0 mm | | | | | | |

| | | | | | | | | | | | | | | |
|--|---|---|--|--|--|------------|------------|------------|------------|------|------|-------|------|-------|
|  |  Pan head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | | | | |
| | |  | | | | | | | | | | | | |
| Nominal diameter | | | | | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | |
| d1 | thread size | | | | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | |
| | permissible tolerance | | | | ±0,3 | | | | | | | | | |
| dk | head diameter | | | | 7,0 | 8,0 | 9,0 | 9,9 | 11,9 | | | | | |
| | permissible tolerance | | | | ±0,5 | | | | | | | | | |
| d2 | core diameter | | | | 2,25 | 2,6 | 2,9 | 3,2 | 3,9 | | | | | |
| | permissible tolerance | | | | +0,1/-0,3 | | | | | | | | | |
| ds | shank diameter | | | | 2,45 | 2,85 | 3,2 | 3,55 | 4,3 | | | | | |
| | permissible tolerance | | | | ±0,10 | | | | | | | | | |
| k | head height max. | | | | 2,7 | 2,9 | 3,1 | 3,4 | 4,0 | | | | | |
| p | thread pitch | | | | 2,1 | 2,4 | 2,7 | 3,0 | 3,6 | | | | | |
| | permissible tolerance | | | | ±0,1 x p | | | | | | | | | |
| T-STAR plus size | | | | | T15 / T20 | T20 | | | T30 | | | | | |
| Cross recess size Z | | | | | 2 | | | | 3 | | | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | | | |
| Nom. dim. | min | max | | | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT |
| 16 | 16,0 | 17,5 | | | 15,0 | | | | | | | | | |
| 20 | 18,5 | 20,5 | | | 18,0 | | 18,0 | | | | | | | |
| 25 | 23,5 | 25,5 | | | 23,0 | 18,0 | 23,0 | | 22,5 | | 22,0 | | | |
| 30 | 28,5 | 30,5 | | | 27,0 | 18,0 | 27,5 | 18,0 | 27,0 | | 27,0 | | 27,0 | |
| 35 | 33,5 | 36,0 | | | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 | 32,0 | 24,0 |
| 40 | 38,5 | 41,0 | | | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 | 37,0 | 24,0 |
| 45 | 43,5 | 46,0 | | | 40,0 | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 | 41,0 | 29,0 |
| 50 | 48,5 | 51,0 | | | 40,0 | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 | 46,0 | 32,0 |
| 55 | 53,5 | 56,0 | | | | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 | 51,0 | 37,0 |
| 60 | 58,5 | 61,0 | | | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 | 56,0 | 37,0 |
| 65 | 63,5 | 66,0 | | | | 40,0 | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | 50,0 | 37,5 | 59,0 | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | | 59,0 | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | | 61,0 | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | | 69,0* | | 68,0* |
| 120 | 118,5 | 121,5 | | | | | | | | | | 69,0* | | 68,0* |
| 130 | 128,0 | 132,0 | | | | | | | | | | | | 68,0* |
| 140 | 138,0 | 142,0 | | | | | | | | | | | | 68,0* |
| 150 | 148,0 | 152,0 | | | | | | | | | | | | 68,0* |
| 160 | 158,0 | 162,0 | | | | | | | | | | | | 68,0* |
| Screws of Ø6,0 mm with partial thread additionally in lengths of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm* | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | | | | |
| Intermediate lengths on Ls possible | | | | | * Design C with lgT= max. 65,0 mm | | | | | | | | | |
| Annex A22 | | | | | | | | | | | | | | |

| | | |
|---|---------------------------------------|--|
|  | SPAX® Flat countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws |
|---|---------------------------------------|--|



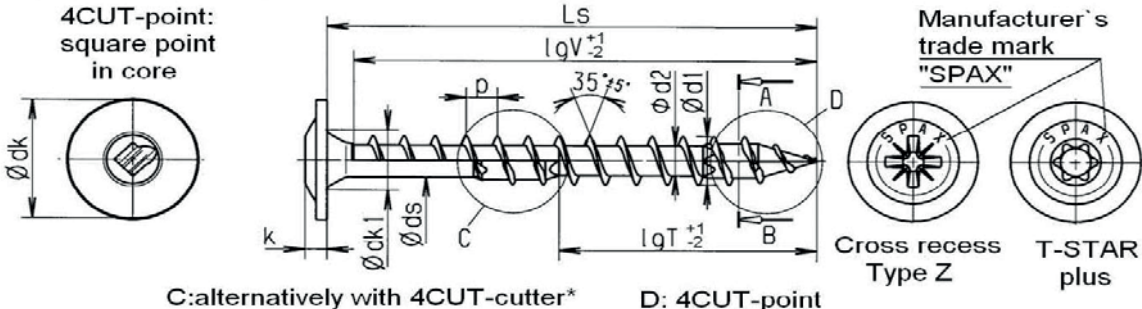




| Nominal diameter | | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | | | | |
|--------------------------|-----------------------|--|------|----------|------|------|------|------|------|-------|------|-------|-----|-----|
| d1 | thread Size | 3,5 | 4,0 | 4,5 | 5,1 | 6,1 | | | | | | | | |
| | permissible tolerance | | | ±0,3 | | | | | | | | | | |
| dk | head diameter | 7,0 | 8,0 | 8,8 | 9,7 | 11,6 | | | | | | | | |
| | permissible tolerance | | ±0,5 | | ±0,6 | | | | | | | | | |
| d2 | core diameter | 2,5 | 2,8 | 3,1 | 3,4 | 3,9 | | | | | | | | |
| | permissible tolerance | | | ±0,3 | | | | | | | | | | |
| ds | shank diameter | 2,6 | 3,0 | 3,3 | 3,75 | 4,3 | | | | | | | | |
| | permissible tolerance | | | ±0,10 | | | | | | | | | | |
| k | head height max. | 2,1 | 2,4 | 2,7 | 2,9 | 3,4 | | | | | | | | |
| p | thread pitch | 2,1 | 2,4 | 2,7 | 3,0 | 3,6 | | | | | | | | |
| | permissible tolerance | | | ±0,1 x p | | | | | | | | | | |
| T-STAR plus size | | T15 / T20 | | T20 | | T30 | | | | | | | | |
| Cross recess size Type Z | | 2 | | | | 3 | | | | | | | | |
| 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 |
| 20 | 18,5 | 20,5 | 16,0 | | 16,0 | | | | | | | | | |
| 25 | 23,5 | 25,5 | 21,0 | 18,0 | 21,0 | | 20,0 | | 20,0 | | | | | |
| 30 | 28,5 | 30,5 | 25,0 | 18,0 | 25,0 | 18,0 | 25,0 | | 25,0 | | 24,0 | | | |
| 35 | 33,5 | 36,0 | 30,0 | 23,0 | 30,0 | 23,0 | 30,0 | 25,0 | 30,0 | 25,0 | 29,0 | | | |
| 40 | 38,5 | 41,0 | 35,0 | 23,0 | 35,0 | 23,0 | 34,0 | 25,0 | 35,0 | 27,0 | 34,0 | 24,0 | | |
| 45 | 43,5 | 46,0 | 40,0 | 30,0 | 40,0 | 30,0 | 39,0 | 30,0 | 39,0 | 30,0 | 38,0 | 29,0 | | |
| 50 | 48,5 | 51,0 | 40,0 | 32,0 | 45,0 | 32,5 | 44,0 | 32,5 | 44,0 | 32,0 | 43,0 | 32,0 | | |
| 55 | 53,5 | 56,0 | | 35,0 | 50,0 | 35,0 | 49,0 | 37,0 | 49,0 | 37,0 | 48,0 | 37,0 | | |
| 60 | 58,5 | 61,0 | | 35,0 | 50,0 | 35,0 | 54,0 | 37,0 | 54,0 | 37,0 | 53,0 | 37,0 | | |
| 65 | 63,5 | 66,0 | | 40,0 | 50,0 | 37,5 | 59,0 | 42,0 | 59,0 | 41,0 | 58,0 | 41,0 | | |
| 70 | 68,5 | 71,0 | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | | |
| 75 | 73,5 | 76,0 | | | 50,0 | 37,5 | 59 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | | |
| 80 | 78,5 | 81,0 | | | 50,0 | 37,5 | 59,0 | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 | | |
| 90 | 88,5 | 91,5 | | | | | 59,0 | 47,0 | | 61,0 | | 61,0 | | |
| 100 | 98,5 | 101,5 | | | | | | | | 61,0 | | 61,0 | | |
| 110 | 108,5 | 111,5 | | | | | | | | 69,0* | | 68,0* | | |
| 120 | 118,5 | 121,5 | | | | | | | | 69,0* | | 68,0* | | |
| 130 | 128,0 | 132,0 | | | | | | | | | | 68,0* | | |
| 140 | 138,0 | 142,0 | | | | | | | | | | 68,0* | | |
| 150 | 148,0 | 152,0 | | | | | | | | | | 68,0* | | |
| 160 | 158,0 | 162,0 | | | | | | | | | | 68,0* | | |

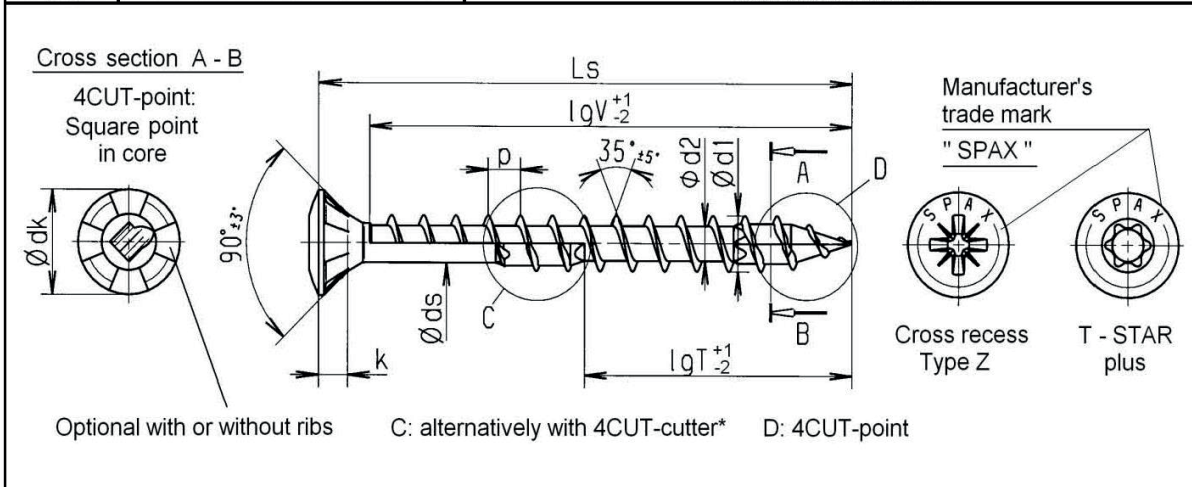
Intermediate lengths on Ls possible

Other thread lengths in the range $\geq 4 \times d1$ to max. standard length permitted.

* Design C with lgT = max. 65,0 mm

| | | | | | | | | | | | | |
|---|--|---|------------|--|------------|------------|------------|------|------|-------|------|-------|
|  |  Washer head | Self-tapping screw with full and partial thread | | | | | | | | | | |
| | | Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | | | | | |
| <p>Cross section A-B 4CUT-point: square point in core</p>  <p>C: alternatively with 4CUT-cutter* D: 4CUT-point</p> <p>Manufacturer's trade mark "SPAX"</p> <p>Cross recess Type Z T-STAR plus</p> | | | | | | | | | | | | |
| Nominal diameter | | | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | | | |
| d1 | thread size | | 3,5 | 4,0 | 4,5 | 5,1 | 6,1 | | | | | |
| | permissible tolerance | | | | ±0,3 | | | | | | | |
| dk | head diameter | | 8,6 | 9,6 | 10,6 | 11,6 | 13,6 | | | | | |
| | permissible tolerance | | | | ±0,6 | | ±0,65 | | | | | |
| dk1 | countersink diameter | | 4,9 | 5,0 | 5,4 | 5,9 | 6,9 | | | | | |
| | permissible tolerance | | | | +0,20 | | | | | | | |
| d2 | core diameter | | 2,5 | 2,8 | 3,1 | 3,4 | 3,9 | | | | | |
| | permissible tolerance | | | | ±0,3 | | | | | | | |
| ds | shank diameter | | 2,6 | 3,0 | 3,3 | 3,75 | 4,3 | | | | | |
| | permissible tolerance | | | | ±0,10 | | | | | | | |
| k | head height max. | | 1,8 | 1,9 | 2,0 | 2,2 | 3,1 | | | | | |
| p | thread pitch | | 2,1 | 2,4 | 2,7 | 3,0 | 3,6 | | | | | |
| | permissible tolerance | | | | ±0,1 x p | | | | | | | |
| T-STAR plus size | | | T15 / T20 | | T20 | | T30 | | | | | |
| Cross recess size Type Z | | | 2 | | | | | | | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | |
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT |
| 16 | 16,0 | 17,5 | 15,0 | | | | | | | | | |
| 20 | 18,5 | 20,5 | 18,0 | | 18,0 | | | | | | | |
| 25 | 23,5 | 25,5 | 23,0 | 18,0 | 23,0 | | 22,5 | | 22,0 | | | |
| 30 | 28,5 | 30,5 | 27,0 | 18,0 | 27,5 | 18,0 | 27,5 | | 27,0 | | 27,0 | |
| 35 | 33,5 | 36,0 | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 | 32,0 | 24,0 |
| 40 | 38,5 | 41,0 | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 | 37,0 | 24,0 |
| 45 | 43,5 | 46,0 | 40,0 | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 | 41,0 | 29,0 |
| 50 | 48,5 | 51,0 | 40,0 | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 | 46,0 | 32,0 |
| 55 | 53,5 | 56,0 | | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 | 51,0 | 37,0 |
| 60 | 58,5 | 61,0 | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 | 56,0 | 37,0 |
| 65 | 63,5 | 66,0 | | 40,0 | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | 59,0 | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | 59,0 | 47,0 | | 61,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | 61,0 | | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | 69,0* | | 68,0* |
| 120 | 118,5 | 121,5 | | | | | | | | 69,0* | | 68,0* |
| 130 | 128,0 | 132,0 | | | | | | | | | | 68,0* |
| 140 | 138,0 | 142,0 | | | | | | | | | | 68,0* |
| 150 | 148,0 | 152,0 | | | | | | | | | | 68,0* |
| 160 | 158,0 | 162,0 | | | | | | | | | | 68,0* |
| Intermediate lengths on Ls possible | | | | Other thread lengths in the range ≥4xdl to max. standard length permitted. | | | | | | | | |
| | | | | * Design C with lgT= max. 65,0 mm | | | | | | | | |
| Annex A24 | | | | | | | | | | | | |

| | | |
|---|--|--|
|  |  SPAX [®] Raised countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws |
|---|--|--|





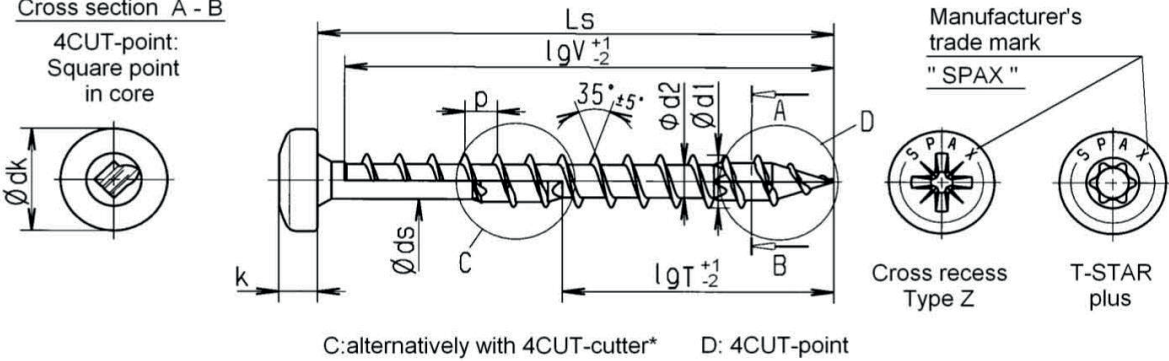
| Nominal diameter | | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 |
|--------------------------|-----------------------|-----------|-----|------|------|------|
| d1 | thread size | 3,5 | 4,0 | 4,5 | 5,1 | 6,1 |
| | permissible tolerance | | | ±0,3 | | |
| dk | head diameter | 7,0 | 8,0 | 8,8 | 9,7 | 11,6 |
| | permissible tolerance | ±0,5 | | ±0,6 | | |
| d2 | core diameter | 2,5 | 2,8 | 3,1 | 3,4 | 3,9 |
| | permissible tolerance | ±0,3 | | | | |
| ds | shank diameter | 2,6 | 3,0 | 3,3 | 3,75 | 4,3 |
| | permissible tolerance | ±0,10 | | | | |
| k | head height max. | 2,1 | 2,4 | 2,7 | 2,9 | 3,4 |
| p | thread pitch | 2,1 | 2,4 | 2,7 | 3,0 | 3,6 |
| | permissible tolerance | ±0,1 x p | | | | |
| T-STAR plus size | | T15 / T20 | | T20 | | T30 |
| Cross recess size Type Z | | 2 | | | | 3 |



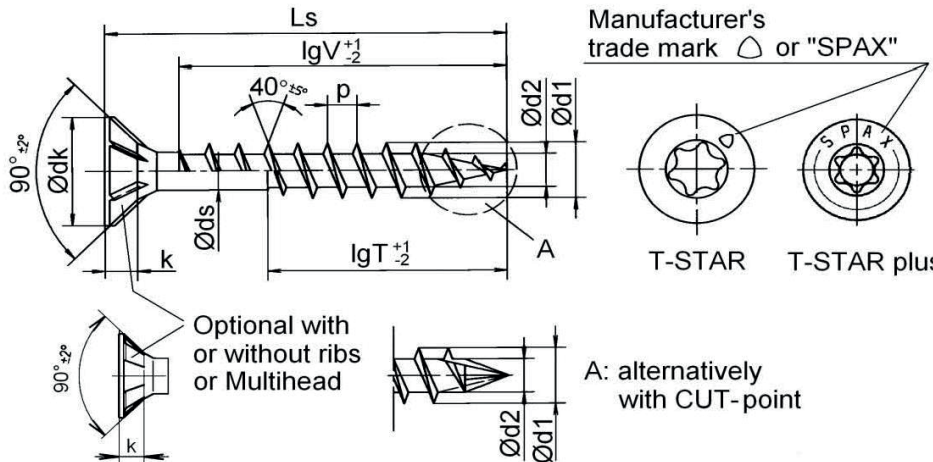

| Ls | | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | | |
|-----------|-------|-------|--|------|------|------|------|------|------|-------|------|-------|------|-----|
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT |
| 20 | 18,5 | 20,5 | 16,0 | 16,0 | | | | | | | | | | |
| 25 | 23,5 | 25,5 | 21,0 | 18,0 | 21,0 | | | 20,0 | | 20,0 | | | | |
| 30 | 28,5 | 30,5 | 25,0 | 18,0 | 25,0 | 18,0 | 25,0 | | | 25,0 | | | 24,0 | |
| 35 | 33,5 | 36,0 | 30,0 | 23,0 | 30,0 | 23,0 | 30,0 | 25,0 | 30,0 | 25,0 | 29,0 | | | |
| 40 | 38,5 | 41,0 | 35,0 | 23,0 | 35,0 | 23,0 | 34,0 | 25,0 | 35,0 | 27,0 | 34,0 | 24,0 | | |
| 45 | 43,5 | 46,0 | | 30,0 | 40,0 | 30,0 | 39,0 | 30,0 | 39,0 | 30,0 | 38,0 | 29,0 | | |
| 50 | 48,5 | 51,0 | | 32,0 | 45,0 | 32,5 | 44,0 | 32,5 | 44,0 | 32,0 | 43,0 | 32,0 | | |
| 55 | 53,5 | 56,0 | | 35,0 | 50,0 | 35,0 | 49,0 | 37,0 | 49,0 | 37,0 | 48,0 | 37,0 | | |
| 60 | 58,5 | 61,0 | | 35,0 | 50,0 | 35,0 | 54,0 | 37,0 | 54,0 | 37,0 | 53,0 | 37,0 | | |
| 65 | 63,5 | 66,0 | | 40,0 | 50,0 | 37,5 | 59,0 | 42,0 | 59,0 | 41,0 | 58,0 | 41,0 | | |
| 70 | 68,5 | 71,0 | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | | |
| 75 | 73,5 | 76,0 | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 | 61,0 | 41,0 | | |
| 80 | 78,5 | 81,0 | | | 50,0 | 37,5 | 59,0 | 47,0 | 61,0 | 46,0 | 61,0 | 46,0 | | |
| 90 | 88,5 | 91,5 | | | | | 59,0 | 47,0 | | 61,0 | | 61,0 | | |
| 100 | 98,5 | 101,5 | | | | | | | | 61,0 | | 61,0 | | |
| 110 | 108,5 | 111,5 | | | | | | | | 69,0* | | 68,0* | | |
| 120 | 118,5 | 121,5 | | | | | | | | 69,0* | | 68,0* | | |
| 130 | 128,0 | 132,0 | | | | | | | | | | 68,0* | | |
| 140 | 138,0 | 142,0 | | | | | | | | | | 68,0* | | |
| 150 | 148,0 | 152,0 | | | | | | | | | | 68,0* | | |
| 160 | 158,0 | 162,0 | | | | | | | | | | 68,0* | | |



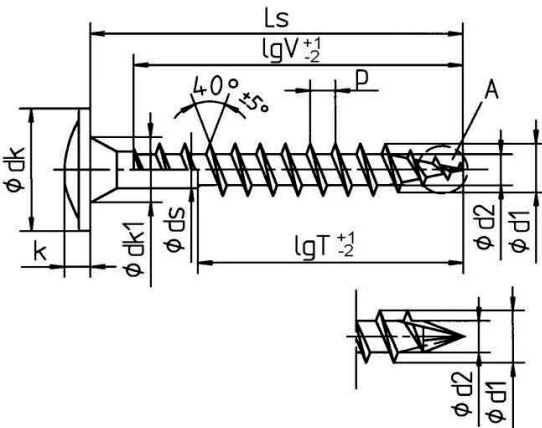
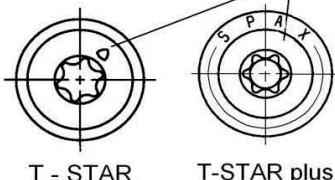
Intermediate lengths on Ls possible


Other thread lengths in the range $\geq 4 \times d1$ to max. standard length permitted.

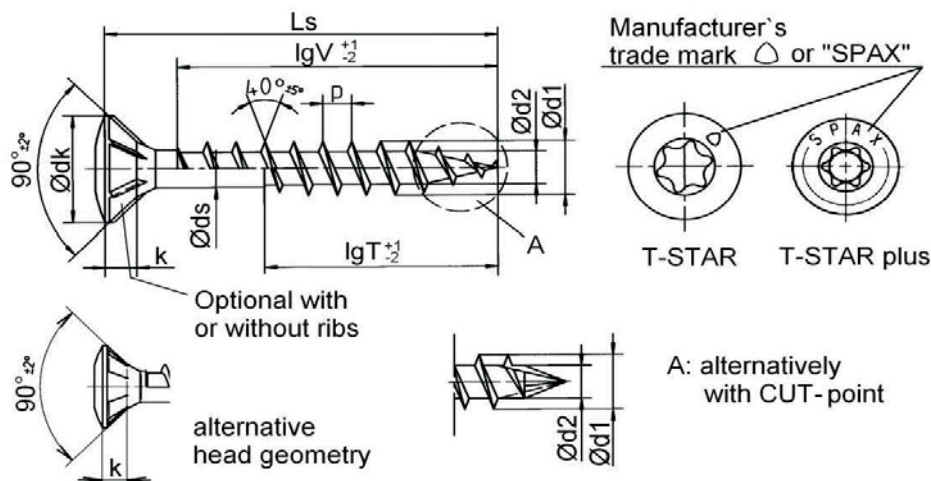
* Design C with $lgT = \text{max. } 65,0 \text{ mm}$

| | | | | | | | | | | | | |
|---|---|--|--|--|------------|--|------------|------------|------------|------|-------|-------|
|  |  Pan head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | | | | | |
| | <p>Cross section A - B</p> <p>4CUT-point: Square point in core</p>  <p style="text-align: center;">C:alternatively with 4CUT-cutter* D: 4CUT-point</p> | | | | | | | | | | | |
| Nominal diameter | | | | | 3,5 | 4,0 | 4,5 | 5,0 | 6,0 | | | |
| d1 | thread size | | | | 3,5 | 4,0 | 4,5 | 5,1 | 6,1 | | | |
| | permissible tolerance | | | | | | ±0,3 | | | | | |
| dk | head diameter | | | | 7,0 | 7,9 | 9,0 | 9,9 | 11,9 | | | |
| | permissible tolerance | | | | ±0,5 | | | ±0,6 | | | | |
| d2 | core diameter | | | | 2,5 | 2,8 | 3,1 | 3,4 | 3,9 | | | |
| | permissible tolerance | | | | | | ±0,3 | | | | | |
| ds | shank diameter | | | | 2,6 | 3,0 | 3,3 | 3,75 | 4,3 | | | |
| | permissible tolerance | | | | | | ±0,10 | | | | | |
| k | head height max. | | | | 2,7 | 2,9 | 3,1 | 3,4 | 4,0 | | | |
| p | thread pitch | | | | 2,1 | 2,4 | 2,7 | 3,0 | 3,6 | | | |
| | permissible tolerance | | | | | | ±0,1 x p | | | | | |
| T-STAR plus size | | | | | T15 / T20 | | T20 | | T30 | | | |
| Cross recess size Z | | | | | 2 | | | | 3 | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | |
| Nom. dim. | min | max | | | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT |
| 16 | 16,0 | 17,5 | | | 15,0 | | | | | | | |
| 20 | 18,5 | 20,5 | | | 18,0 | | 18,0 | | | | | |
| 25 | 23,5 | 25,5 | | | 23,0 | 18,0 | 23,0 | | 22,5 | | 22,0 | |
| 30 | 28,5 | 30,5 | | | 27,0 | 18,0 | 27,5 | 18,0 | 27,5 | | 27,0 | 27,0 |
| 35 | 33,5 | 36,0 | | | 32,0 | 23,0 | 32,5 | 23,0 | 32,5 | 25,0 | 32,0 | 25,0 |
| 40 | 38,5 | 41,0 | | | 37,0 | 23,0 | 37,5 | 23,0 | 37,0 | 25,0 | 37,0 | 27,0 |
| 45 | 43,5 | 46,0 | | | 40,0 | 30,0 | 42,5 | 30,0 | 42,0 | 30,0 | 41,0 | 30,0 |
| 50 | 48,5 | 51,0 | | | 40,0 | 32,0 | 47,5 | 32,5 | 47,0 | 32,5 | 46,0 | 32,0 |
| 55 | 53,5 | 56,0 | | | | 35,0 | 50,0 | 35,0 | 52,0 | 37,0 | 51,0 | 37,0 |
| 60 | 58,5 | 61,0 | | | | 35,0 | 50,0 | 35,0 | 57,0 | 37,0 | 56,0 | 37,0 |
| 65 | 63,5 | 66,0 | | | | 40,0 | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 |
| 70 | 68,5 | 71,0 | | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 |
| 75 | 73,5 | 76,0 | | | | | 50,0 | 37,5 | 59,0 | 42,0 | 61,0 | 41,0 |
| 80 | 78,5 | 81,0 | | | | | 50,0 | 37,5 | 59,0 | 47,0 | 61,0 | 46,0 |
| 90 | 88,5 | 91,5 | | | | | | | 59,0 | 47,0 | | 61,0 |
| 100 | 98,5 | 101,5 | | | | | | | | | 61,0 | 61,0 |
| 110 | 108,5 | 111,5 | | | | | | | | | 69,0* | 68,0* |
| 120 | 118,5 | 121,5 | | | | | | | | | 69,0* | 68,0* |
| 130 | 128,0 | 132,0 | | | | | | | | | | 68,0* |
| 140 | 138,0 | 142,0 | | | | | | | | | | 68,0* |
| 150 | 148,0 | 152,0 | | | | | | | | | | 68,0* |
| 160 | 158,0 | 162,0 | | | | | | | | | | 68,0* |
| Intermediate lengths on Ls possible | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | | | |
| | | | | | | * Design C with lgT= max. 65,0 mm | | | | | | |
| Annex A26 | | | | | | | | | | | | |

| | | | | | | | | | | | |
|--|---|--------------|---|-------------|-------------|---|-------------|--------------|--|--|--|
|  |  | | Self-tapping screw with full and partial thread | | | | | | | | |
| | Flat countersunk head | | Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel | | | | | | | | |
|  | | | Manufacturer's trade mark  or "SPAX" | | | | | | | | |
| Optional with or without ribs or Multihead | | | A: alternatively with CUT-point | | | | | | | | |
| Nominal diameter | | | 8,0 | 10,0 | 12,0 | | | | | | |
| d1 | thread size | | 8,1 | 10,0 | 12,0 | | | | | | |
| | permissible tolerance | | ±0,4 | ±0,5 | ±0,6 | | | | | | |
| dk | head diameter | | 15,1 | 18,6 | 22,6 | | | | | | |
| | permissible tolerance | | ±0,75 | ±0,9 | ±1,1 | | | | | | |
| d2 | core diameter | | 5,0 | 6,1 | 7,35 | | | | | | |
| | permissible tolerance | | ±0,3 | | ±0,35 | | | | | | |
| ds | shank diameter | | 5,7 | 6,8 | 8,5 | | | | | | |
| | permissible tolerance | | ±0,25 | | | | | | | | |
| k | head height max. | | 4,4 | 6,0 | 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 | 41,5 | 32,0 | | | | | | | | |
| 45 | 43,5 | 46,5 | 37,0 | | | | | | | | |
| 50 | 48,5 | 51,5 | 42,0 | 32,0 | 40,0 | | | | | | |
| 55 | 53,5 | 56,5 | 47,0 | 32,0 | 45,0 | | | | | | |
| 60 | 58,5 | 61,5 | 52,0 | 37,0 | 50,0 | | | 50,0 | | | |
| 65 | 63,5 | 66,5 | 57,0 | 37,0 | 55,0 | 40,0 | 55,0 | | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | 40,0 | 60,0 | | | | |
| 75 | 73,5 | 76,5 | 61,0 | 42,0 | 60,0 | 45,0 | 60,0 | | | | |
| 80 | 78,5 | 81,5 | 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 ≥4xd1 to max. standard length permitted | | | | | |
| Annex A27 | | | | | | | | | | | |

| | | | | | | | |
|---|---|-----------|--|---|--------------------|------|-------|
|  |  Washer head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel | | | | |
| |  | | | Manufacturer's trade mark \triangle or "SPAX"  T - STAR T-STAR plus A: alternatively with CUT-point | | | |
| Nominal diameter | 8,0 | | 10,0 | | 12,0 | | |
| d1 thread size | 8,1 | | 10,0 | | 12,0 | | |
| permissible tolerance | $\pm 0,4$ | | $\pm 0,5$ | | $\pm 0,6$ | | |
| dk head diameter | 18,0 | 20,0 | 22,0 | 25,0 | 29,0 | | |
| permissible tolerance | $\pm 0,9$ | $\pm 1,0$ | $\pm 1,1$ | $\pm 1,25$ | $\pm 1,45$ | | |
| dk1 countersink diameter | 9,0 | | 12,0 | | 14,0 | | |
| permissible tolerance | $+0,30$ | | $+0,30$ | | $+0,30$ | | |
| d2 core diameter | 5,0 | | 6,1 | | 7,35 | | |
| permissible tolerance | $\pm 0,3$ | | $\pm 0,3$ | | $\pm 0,35$ | | |
| ds shank diameter | 5,7 | | 6,8 | | 8,5 | | |
| permissible tolerance | $\pm 0,25$ | | $\pm 0,25$ | | $\pm 0,25$ | | |
| k head height max. | 4,0 | | 4,7 | | 5,6 | | |
| p thread pitch | 4,0 | | 5,0 | | 6,0 | | |
| permissible tolerance | $\pm 0,1 \times p$ | | $\pm 0,1 \times p$ | | $\pm 0,1 \times p$ | | |
| T - STAR size | T40 | | T50 | | T60 | | |
| Ls | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | |
| Nom.dim. | min | max | lgV | lgT | lgV | lgT | lgV |
| 40 | 38,5 | 41,5 | 37,0 | | | | |
| 45 | 43,5 | 46,5 | 42,0 | | | | |
| 50 | 48,5 | 51,5 | 46,0 | 32,0 | | | |
| 55 | 53,5 | 56,5 | 51,0 | 32,0 | 50,0 | | 50,0 |
| 60 | 58,5 | 61,5 | 56,0 | 37,0 | 55,0 | | 55,0 |
| 65 | 63,5 | 66,5 | 61,0 | 37,0 | 60,0 | 40,0 | 60,0 |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | 40,0 | 60,0 |
| 75 | 73,5 | 76,5 | 70,0 | 42,0 | 70,0 | 45,0 | 70,0 |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 50,0 | 70,0 |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 55,0 | 80,0 |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 60,0 | 80,0 |
| 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 $\geq 4 \times d1$ to max. standard length permitted | | | |
| Annex A28 | | | | | | | |


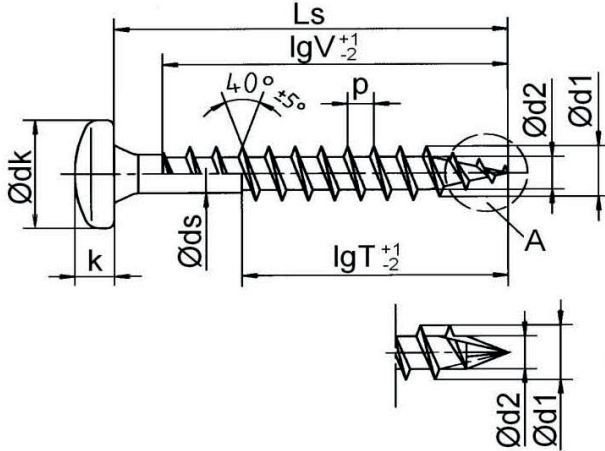
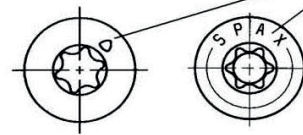
| | | |
|---|---|---|
|  | SPAX®-S Raised countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel |
| | | |



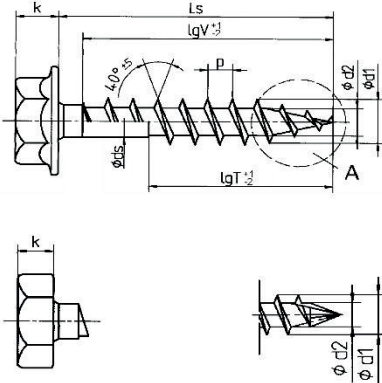
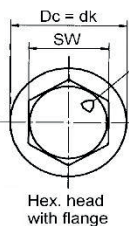
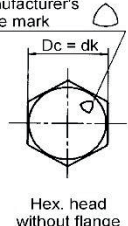




| | | | | | | | | |
|-------------------------|-----------------------|------------|-------------|-------------|--|--|--|--|
| Nominal diameter | | 8,0 | 10,0 | 12,0 | | | | |
| d1 | thread size | 8,1 | 10,0 | 12,0 | | | | |
| | permissible tolerance | ±0,4 | ±0,5 | ±0,6 | | | | |
| dk | head diameter | 15,1 | 18,6 | 22,6 | | | | |
| | permissible tolerance | ±0,75 | ±0,9 | ±1,1 | | | | |
| d2 | core diameter | 5,0 | 6,1 | 7,35 | | | | |
| | permissible tolerance | ±0,3 | | ±0,35 | | | | |
| ds | shank diameter | 5,7 | 6,8 | 8,5 | | | | |
| | permissible tolerance | ±0,25 | | | | | | |
| k | head height max. | 4,4 | 6,0 | 6,6 | | | | |
| p | thread pitch | 4,0 | 5,0 | 6,0 | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | |
| T - STAR | size | T40 | T50 | T50 | | | | |

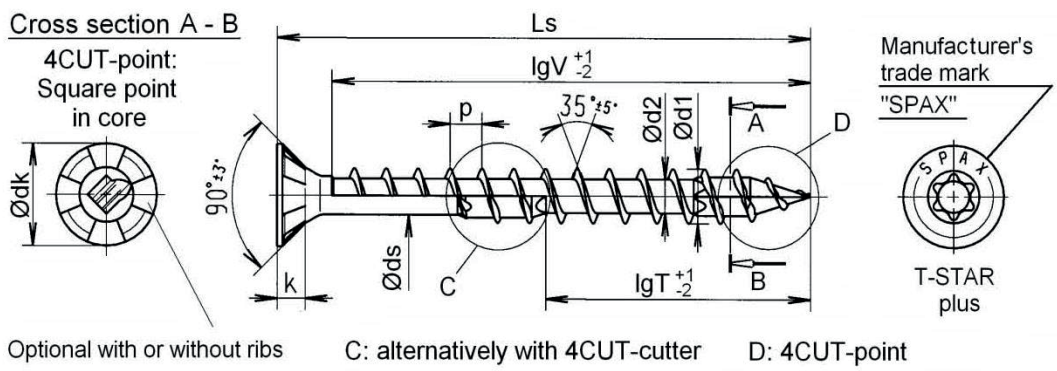
| Ls | | | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | | | | | | |
|------------|--------------|--------------|--|-------------|-------------|-------------|-------------|--------------|--|--|--|--|--|--|
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | lgV | lgT | | | | | | |
| 40 | 38,5 | 41,5 | 32,0 | | | | | | | | | | | |
| 45 | 43,5 | 46,5 | 37,0 | | | | | | | | | | | |
| 50 | 48,5 | 51,5 | 42,0 | 32,0 | 40,0 | | | | | | | | | |
| 55 | 53,5 | 56,5 | 47,0 | 32,0 | 45,0 | | | | | | | | | |
| 60 | 58,5 | 61,5 | 52,0 | 37,0 | 50,0 | | | 50,0 | | | | | | |
| 65 | 63,5 | 66,5 | 57,0 | 37,0 | 55,0 | 40,0 | 55,0 | | | | | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | 40,0 | 60,0 | | | | | | | |
| 75 | 73,5 | 76,5 | 61,0 | 42,0 | 60,0 | 45,0 | 60,0 | | | | | | | |
| 80 | 78,5 | 81,5 | 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 $\geq 4 \times d1$ to max. standard length permitted

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|--------------|---|---|--------------------|-------------|--------------------|--------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
|  | SPAX®-S Pan head | | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel | | | | | | | | | | | | | | | | | | |
| |  | | | Manufacturer's trade mark \triangle or "SPAX"  T-STAR T-STAR plus A: alternatively with CUT-point | | | | | | | | | | | | | | | | | |
| Nominal diameter | | | 8,0 | | 10,0 | | 12,0 | | | | | | | | | | | | | | |
| d1 | thread size | | 8,1 | | 10,0 | | 12,0 | | | | | | | | | | | | | | |
| | permissible tolerance | | $\pm 0,4$ | | $\pm 0,5$ | | $\pm 0,6$ | | | | | | | | | | | | | | |
| dk | head diameter | | 15,5 | | 19,0 | | 23,0 | | | | | | | | | | | | | | |
| | permissible tolerance | | $\pm 0,75$ | | $\pm 0,95$ | | $\pm 1,15$ | | | | | | | | | | | | | | |
| d2 | core diameter | | 5,0 | | 6,1 | | 7,35 | | | | | | | | | | | | | | |
| | permissible tolerance | | $\pm 0,3$ | | $\pm 0,35$ | | $\pm 0,35$ | | | | | | | | | | | | | | |
| ds | shank diameter | | 5,7 | | 6,8 | | 8,5 | | | | | | | | | | | | | | |
| | permissible tolerance | | $\pm 0,25$ | | $\pm 0,25$ | | $\pm 0,25$ | | | | | | | | | | | | | | |
| k | head height max. | | 5,7 | | 7,1 | | 8,5 | | | | | | | | | | | | | | |
| R | raised radius | | 16,0 | | 20,0 | | 24,0 | | | | | | | | | | | | | | |
| p | thread pitch | | 4,0 | | 5,0 | | 6,0 | | | | | | | | | | | | | | |
| | permissible tolerance | | $\pm 0,1 \times p$ | | $\pm 0,1 \times p$ | | $\pm 0,1 \times p$ | | | | | | | | | | | | | | |
| 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 | 38,0 | 41,5 | 37,0 | | | | | | | | | | | | | | | | | | |
| 45 | 43,0 | 46,5 | 42,0 | | | | | | | | | | | | | | | | | | |
| 50 | 48,5 | 51,5 | 46,0 | 32,0 | | | | | | | | | | | | | | | | | |
| 55 | 53,5 | 56,5 | 51,0 | 32,0 | 50,0 | | | 50,0 | | | | | | | | | | | | | |
| 60 | 58,5 | 61,5 | 56,0 | 37,0 | 55,0 | | | 55,0 | | | | | | | | | | | | | |
| 65 | 63,5 | 66,5 | 61,0 | 37,0 | 60,0 | 40,0 | 60,0 | | | | | | | | | | | | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | 40,0 | 60,0 | | | | | | | | | | | | | | |
| 75 | 73,5 | 76,5 | 70,0 | 42,0 | 70,0 | 45,0 | 70,0 | | | | | | | | | | | | | | |
| 80 | 78,5 | 81,5 | 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 $\geq 4 \times d1$ to max. standard length permitted | | | | | | | | | | | |
| Annex A30 | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|--------------|--|-------------|-------------|---|-------------|--------------|-------------|-------------|-------------|-------------|-------------|--------------|--|
|  |  | | Self-tapping screw with full and partial thread | | | | | | | | | | | | |
| | Hex. head with/without flange | | Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel | | | | | | | | | | | | |
|  | | |  | | |  | | | | | | | | | |
| | | | Hex. head with flange | | | Hex. head without flange | | | | | | | | | |
| | | | A: alternatively with CUT-point | | | | | | | | | | | | |
| | | | with flange | | | without flange | | | | | | | | | |
| Nominal diameter | | | 8,0 | | | 10,0 | | | 12,0 | | | | | | |
| d1 | thread size | | 8,1 | | | 10,0 | | | 12,0 | | | | | | |
| | permissible tolerance | | ±0,4 | | | ±0,5 | | | ±0,6 | | | | | | |
| SW | wrench size | | 10 | | | 13 | | | 16 | | | | | | |
| Dc | flange diameter | | 17,0 | | | 20,8 | | | 24,7 | | | | | | |
| | permissible tolerance | | ±0,85 | | | ±1,0 | | | ±1,2 | | | | | | |
| d2 | core diameter | | 5,0 | | | 6,1 | | | 7,35 | | | | | | |
| | permissible tolerance | | ±0,3 | | | ±0,35 | | | ±0,35 | | | | | | |
| ds | shank diameter | | 5,7 | | | 6,8 | | | 8,5 | | | | | | |
| | permissible tolerance | | ±0,25 | | | ±0,25 | | | ±0,25 | | | | | | |
| k | head height max. | | 8,5 | | | 9,7 | | | 12,1 | | | | | | |
| p | thread pitch | | 4,0 | | | 5,0 | | | 6,0 | | | | | | |
| | permissible tolerance | | ±0,1 x p | | | ±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 | 41,5 | 37,0 | | | | | | 37,0 | | | | | | |
| 45 | 43,5 | 46,5 | 42,0 | | | | | | 42,0 | | | | | | |
| 50 | 48,5 | 51,5 | 46,0 | 32,0 | 45,0 | | | | 46,0 | 32,0 | 45,0 | | | | |
| 55 | 53,5 | 56,5 | 51,0 | 32,0 | 50,0 | | 50,0 | | 51,0 | 32,0 | 50,0 | | 50,0 | | |
| 60 | 58,5 | 61,5 | 56,0 | 37,0 | 55,0 | | 55,0 | | 56,0 | 37,0 | 55,0 | | 55,0 | | |
| 65 | 63,5 | 66,5 | 61,0 | 37,0 | 60,0 | 40,0 | 60,0 | | 61,0 | 37,0 | 60,0 | 40,0 | 60,0 | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | 40,0 | 60,0 | | 61,0 | 42,0 | 60,0 | 40,0 | 60,0 | | |
| 75 | 73,5 | 76,5 | 70,0 | 42,0 | 70,0 | 45,0 | 70,0 | | 70,0 | 42,0 | 70,0 | 45,0 | 70,0 | | |
| 80 | 78,5 | 81,5 | 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 | |
| <i>to</i> | | | | | | | | | | | | | | | |
| 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 ≥4xd1 to max. standard length permitted | | | | | | | | | |
| Annex A31 | | | | | | | | | | | | | | | |



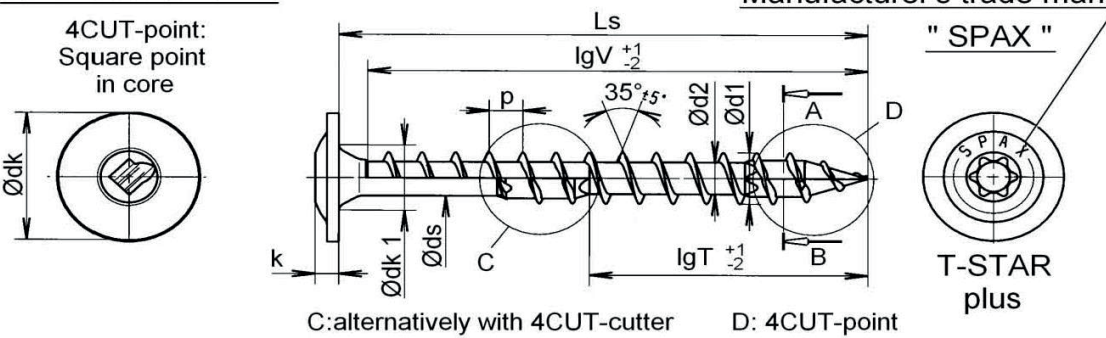

| | | |
|---|--|---|
|  |  SPAX [®] Flat countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel |
| | | |




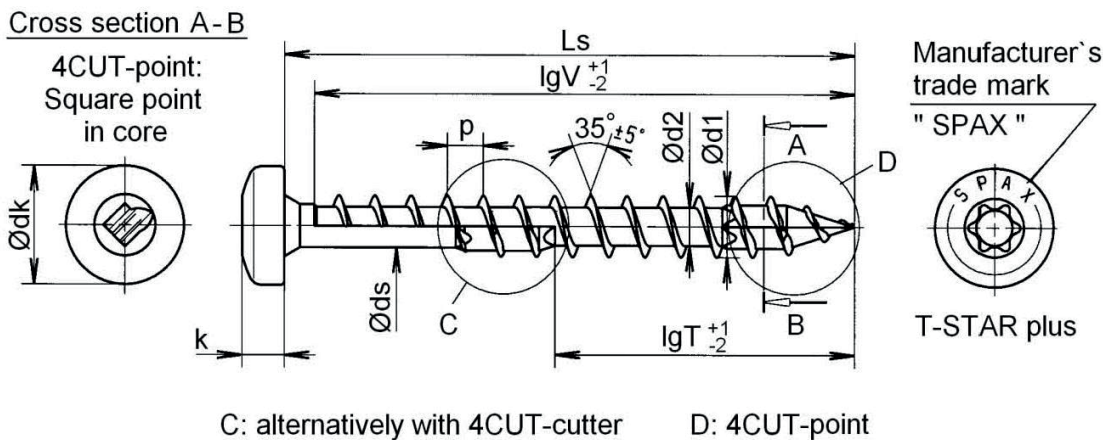
| | | | | | | | | | |
|-------------------------|-----------------------|-------------|----------|--|--|--|--|--|--|
| Nominal diameter | 8,0 | 10,0 | | | | | | | |
| d1 | thread size | 8,1 | 10,0 | | | | | | |
| | permissible tolerance | ±0,4 | ±0,5 | | | | | | |
| dk | head diameter | 15,1 | 18,6 | | | | | | |
| | permissible tolerance | ±0,75 | ±0,9 | | | | | | |
| d2 | core diameter | 5,0 | 6,1 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | |
| ds | shank diameter | 5,7 | 6,8 | | | | | | |
| | permissible tolerance | ±0,25 | ±0,25 | | | | | | |
| k | head height max. | 4,4 | 6,0 | | | | | | |
| p | thread pitch | 4,8 | 6,0 | | | | | | |
| | permissible | ±0,1 x p | ±0,1 x p | | | | | | |
| T-STAR plus size | | T40 | T50 | | | | | | |

| Ls | | | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | | | | | |
|------------|--------------|--------------|--|-------------|-------------|-------------|--|--|--|--|--|--|--|
| Nom.dim. | min | max | lgV | lgT | lgV | lgT | | | | | | | |
| 40 | 38,5 | 41,5 | 32,0 | | | | | | | | | | |
| 45 | 43,5 | 46,5 | 37,0 | | | | | | | | | | |
| 50 | 48,5 | 51,5 | 42,0 | 32,0 | 40,0 | | | | | | | | |
| 55 | 53,5 | 56,5 | 47,0 | 32,0 | 45,0 | | | | | | | | |
| 60 | 58,5 | 61,5 | 52,0 | 37,0 | 50,0 | | | | | | | | |
| 65 | 63,5 | 66,5 | 57,0 | 37,0 | 55,0 | | | | | | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | | | | | | | | |
| 75 | 73,5 | 76,5 | 61,0 | 42,0 | 60,0 | | | | | | | | |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 50,0 | | | | | | | |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 55,0 | | | | | | | |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 60,0 | | | | | | | |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | |
| 140 | 138,0 | 142,0 | | 80,0 | | 80,0 | | | | | | | |
| 150 | 148,0 | 152,0 | | 80,0 | | 80,0 | | | | | | | |
| 160 | 158,0 | 162,0 | | 80,0 | | 80,0 | | | | | | | |
| 180 | 178,0 | 182,0 | | 80,0 | | 80,0 | | | | | | | |
| 200 | 198,0 | 202,0 | | 80,0 | | 80,0 | | | | | | | |
| <i>to</i> | | | | | | | | | | | | | |
| 600 | 597,0 | 602,0 | | 80,0 | | 80,0 | | | | | | | |

Intermediate lengths on Ls possible Other thread lengths in the range ≥4xd1 to max. standard length permitted

| | | | | | | | |
|--|---|---|-------------|---|-------------|-------------|-------|
|  |  Washer head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel | | | | | |
| | <p>Cross section A - B</p> <p>4CUT-point: Square point in core</p>  <p style="text-align: right;">Manufacturer's trade mark " SPAX "</p> <p style="text-align: right;">T-STAR plus</p> <p style="text-align: center;">C: alternatively with 4CUT-cutter D: 4CUT-point</p> | | | | | | |
| Nominal diameter | 8,0 | | 10,0 | | | | |
| d1 thread size | 8,1 | | 10,0 | | | | |
| permissible tolerance | ±0,4 | | ±0,5 | | | | |
| dk head diameter | 18,0 | 20,0 | 22,0 | 24,0 | 23,0 | 25,0 | 27,0 |
| permissible tolerance | ±0,9 | ±1,0 | ±1,1 | ±1,2 | ±1,15 | ±1,25 | ±1,35 |
| dk1 countersink diameter | 9,00 | | 12,00 | | | | |
| permissible tolerance | +0,50 | | +0,5 | | | | |
| d2 core diameter | 5,0 | | 6,1 | | | | |
| permissible tolerance | ±0,3 | | ±0,3 | | | | |
| ds shank diameter | 5,7 | | 6,8 | | | | |
| permissible tolerance | ±0,25 | | ±0,25 | | | | |
| k head height max. | 4,3 | | 4,7 | | | | |
| p thread pitch | 4,8 | | 6,0 | | | | |
| permissible tolerance | ±0,1 x p | | ±0,1 x p | | | | |
| T-STAR plus size | T40 | | T50 | | | | |
| Ls | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | |
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | |
| 40 | 38,5 | 41,5 | 37,0 | | | | |
| 45 | 43,5 | 46,5 | 42,0 | | | | |
| 50 | 48,5 | 51,5 | 46,0 | 32,0 | 45,0 | | |
| 55 | 53,5 | 56,5 | 51,0 | 32,0 | 50,0 | | |
| 60 | 58,5 | 61,5 | 56,0 | 37,0 | 55,0 | | |
| 65 | 63,5 | 66,5 | 61,0 | 37,0 | 60,0 | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | | |
| 75 | 73,5 | 76,5 | 70,0 | 42,0 | 70,0 | | |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 50,0 | |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 55,0 | |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 60,0 | |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | 80,0 | |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | 80,0 | |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | 80,0 | |
| 140 | 138,0 | 142,0 | | 80,0 | | 80,0 | |
| 150 | 148,0 | 152,0 | | 80,0 | | 80,0 | |
| 160 | 158,0 | 162,0 | | 80,0 | | 80,0 | |
| 180 | 178,0 | 182,0 | | 80,0 | | 80,0 | |
| 200 | 198,0 | 202,0 | | 80,0 | | 80,0 | |
| to | | | | | | | |
| 600* | 597,0 | 602,0 | | 80,0 | | 80,0 | |
| Intermediate lengths on Ls possible | | *for d1=10,0 Ls up to 1.000 mm possible | | Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | |
|  = Preferred size | | | | | | | |



| | | |
|---|--------------------------------------|---|
|  | SPAX [®] Pan head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel |
|---|--------------------------------------|---|




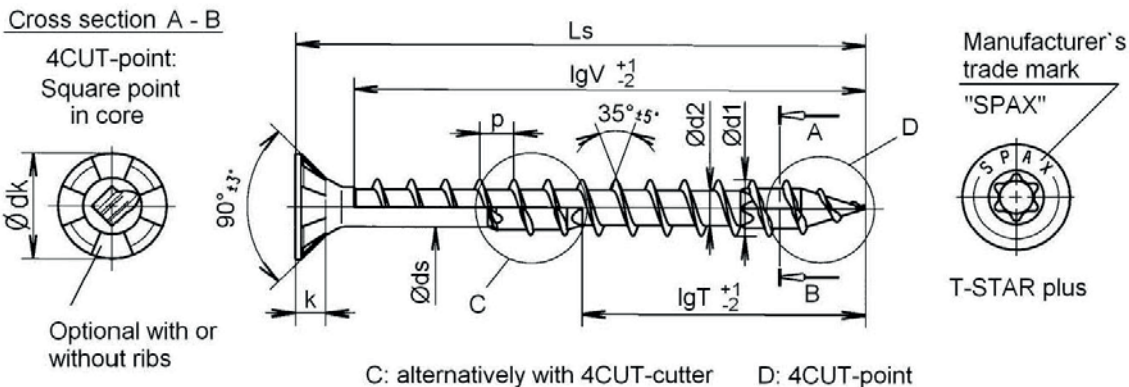
| | | | | | | | | | |
|-------------------------|-----------------------|------------|-------------|--|--|--|--|--|--|
| Nominal diameter | | 8,0 | 10,0 | | | | | | |
| d1 | thread size | 8,1 | 10,0 | | | | | | |
| | permissible tolerance | ±0,4 | ±0,5 | | | | | | |
| dk | head diameter | 15,5 | 19,0 | | | | | | |
| | permissible tolerance | ±0,75 | ±0,95 | | | | | | |
| d2 | core diameter | 5,0 | 6,1 | | | | | | |
| | permissible tolerance | ±0,30 | | | | | | | |
| ds | shank diameter | 5,7 | 6,8 | | | | | | |
| | permissible tolerance | ±0,25 | | | | | | | |
| k | head height max. | 6,0 | 7,1 | | | | | | |
| p | thread pitch | 4,8 | 6,0 | | | | | | |
| | permissible tolerance | ±0,1 x p | ±0,1 x p | | | | | | |
| T-STAR plus size | | T40 | T50 | | | | | | |

| Ls | | | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | | |
|-------------|--------------|--------------|--|-------------|-------------|-------------|--|--|--|--|
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | | | | |
| 40,0 | 38,5 | 41,5 | 37,0 | | | | | | | |
| 45,0 | 43,5 | 56,5 | 42,0 | | | | | | | |
| 50 | 48,5 | 51,5 | 46,0 | 32,0 | 40,0 | | | | | |
| 55 | 53,5 | 56,5 | 51,0 | 32,0 | 45,0 | | | | | |
| 60 | 58,5 | 61,5 | 56,0 | 37,0 | 50,0 | | | | | |
| 65 | 63,5 | 66,5 | 61,0 | 37,0 | 55,0 | | | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | | | | | |
| 75 | 73,5 | 76,5 | 70,0 | 42,0 | 60,0 | | | | | |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 50,0 | | | | |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 55,0 | | | | |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 60,0 | | | | |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | 80,0 | | | | |
| 140 | 138,0 | 142,0 | | 80,0 | | 80,0 | | | | |
| 150 | 148,0 | 152,0 | | 80,0 | | 80,0 | | | | |
| 160 | 158,0 | 162,0 | | 80,0 | | 80,0 | | | | |
| 180 | 178,0 | 182,0 | | 80,0 | | 80,0 | | | | |
| 200 | 198,0 | 202,0 | | 80,0 | | 80,0 | | | | |
| to | | | | | | | | | | |
| 600 | 597,0 | 602,0 | | 80,0 | | 80,0 | | | | |

Intermediate lengths on Ls possible Other thread lengths in the range ≥4xd1 to max. standard length permitted

|   | | Self-tapping screw with full and partial thread | | | | |
|---|-----------------------|--|---|----------------|-------------|----------------|
| | | Material: cold rolled wire according to SPAX - Factory standard Screws of high carbon steel | | | | |
| Hex. Head with/without flange | | | | | | |
| | | | | | | |
| | | with flange | | without flange | with flange | without flange |
| Nominal diameter | | 8,0 | | 8,0 | 10,0 | 10,0 |
| d1 | thread size | 8,1 | | 8,1 | 10,0 | 10,0 |
| | permissible tolerance | ±0,4 | | ±0,4 | ±0,5 | ±0,5 |
| SW | wrench size | 10 | | 10 | 13 | 13 |
| Dc | flange diameter | 16,5 | | - | 20,8 | - |
| | permissible tolerance | ±0,8 | | - | ±1,0 | - |
| d2 | core diameter | 5,0 | | 5,0 | 6,1 | 6,1 |
| | permissible tolerance | ±0,3 | | ±0,3 | ±0,3 | ±0,3 |
| ds | shank diameter | 5,7 | | 5,7 | 6,8 | 6,8 |
| | permissible tolerance | ±0,25 | | ±0,25 | ±0,25 | ±0,25 |
| k | head height max. | 4,4 | | 4,4 | 9,7 | 7,0 |
| p | thread pitch | 4,8 | | 4,8 | 6,0 | 6,0 |
| | permissible tolerance | ±0,1 x p | | ±0,1 x p | ±0,1 x p | ±0,1 x p |
| Ls | | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | |
| Nom. dim. | min | max | lgV | lgT | | |
| 40 | 38,5 | 41,5 | 32,0 | | 32,0 | |
| 45 | 43,5 | 46,5 | 37,0 | | 37,0 | |
| 50 | 48,5 | 51,5 | 42,0 | 32,0 | 42,0 | 32,0 |
| 55 | 53,5 | 56,5 | 47,0 | 32,0 | 47,0 | 32,0 |
| 60 | 58,5 | 61,5 | 52,0 | 37,0 | 52,0 | 37,0 |
| 65 | 63,5 | 66,5 | 57,0 | 37,0 | 57,0 | 37,0 |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 61,0 | 42,0 |
| 75 | 73,5 | 76,5 | 61,0 | 42,0 | 61,0 | 42,0 |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 47,0 |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 52,0 |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 57,0 |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | 70,0 |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | 70,0 |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | 70,0 |
| 140 | 138,0 | 142,0 | | 80,0 | | 80,0 |
| 150 | 148,0 | 152,0 | | 80,0 | | 80,0 |
| 160 | 158,0 | 162,0 | | 80,0 | | 80,0 |
| 180 | 178,0 | 182,0 | | 80,0 | | 80,0 |
| 200 | 198,0 | 202,0 | | 80,0 | | 80,0 |
| to | | | | | | |
| 600 | 597,0 | 602,0 | | 80,0 | | 80,0 |
| Intermediate lengths on Ls possible | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | |
| Annex A36 | | | | | | |



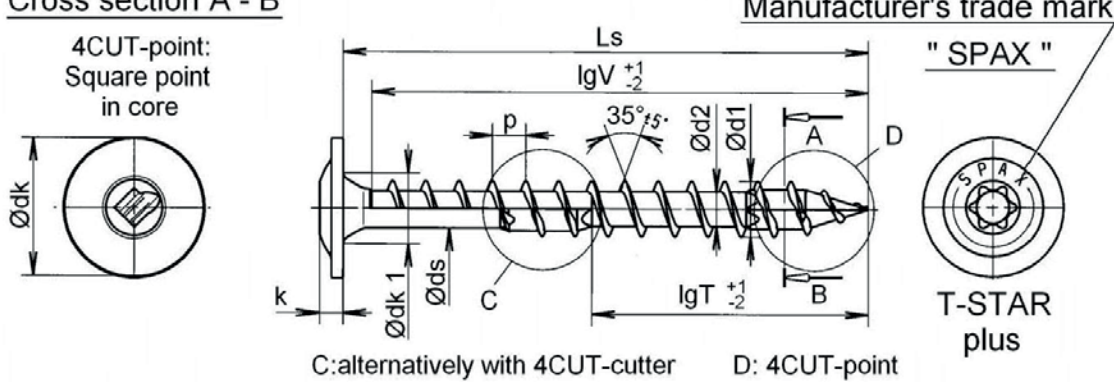

| | |
|--|--|
|  SPAX [®] Flat countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Stainless steel screws |
|--|--|



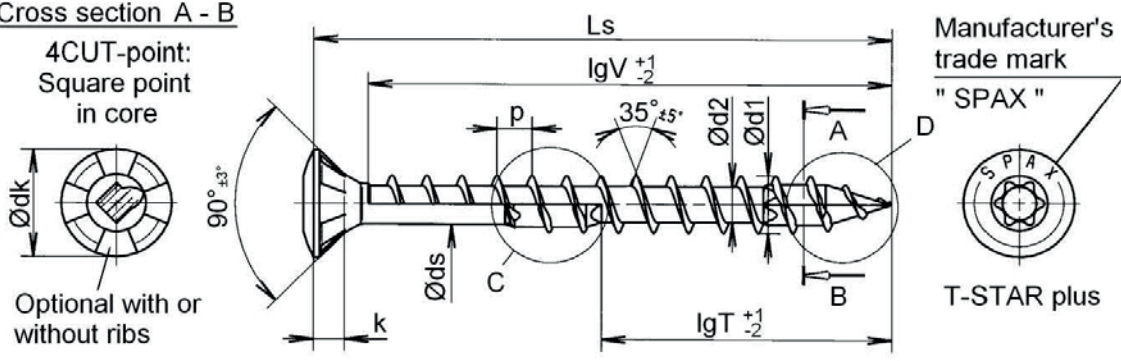




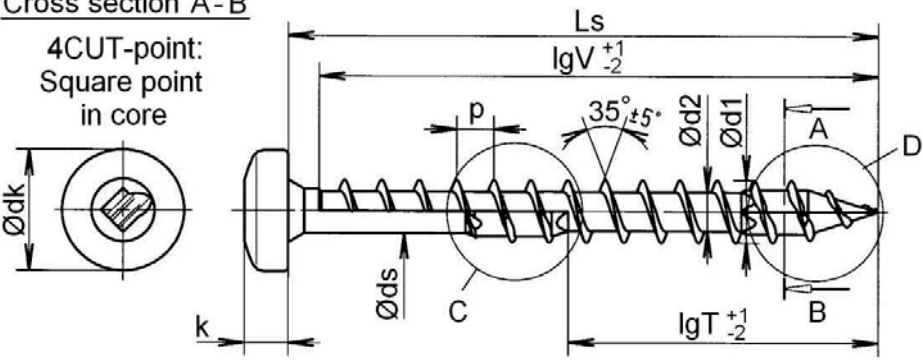

| | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|-----------------------|--|-------------|-------------|-------------|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Nominal diameter | | 8,0 | 10,0 | | | | | | | | | | | | | | | | | | |
| d1 | thread size | 8,1 | 10,0 | | | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,4 | ±0,5 | | | | | | | | | | | | | | | | | | |
| dk | head diameter | 15,1 | 18,6 | | | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,75 | ±0,93 | | | | | | | | | | | | | | | | | | |
| d2 | core diameter | 5,3 | 6,1 | | | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,30 | | | | | | | | | | | | | | | | | | | |
| ds | shank diameter | 5,70 | 6,80 | | | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,25 | | | | | | | | | | | | | | | | | | | |
| k | head height max. | 4,4 | 6,0 | | | | | | | | | | | | | | | | | | |
| p | thread pitch | 4,8 | 6,0 | | | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | | | | | | | | | | | | | |
| T-STAR plus size | | T40 | T50 | | | | | | | | | | | | | | | | | | |
| Ls | | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | | | | | | | | | | | | | | |
| Nom.dim. | min | max | lgV | lgT | lgV | lgT | | | | | | | | | | | | | | | |
| 40 | 38,5 | 41,5 | 32,0 | | | | | | | | | | | | | | | | | | |
| 45 | 43,5 | 46,5 | 37,0 | | | | | | | | | | | | | | | | | | |
| 50 | 48,5 | 51,5 | 42,0 | 32,0 | 40,0 | | | | | | | | | | | | | | | | |
| 55 | 53,5 | 56,5 | 47,0 | 32,0 | 45,0 | | | | | | | | | | | | | | | | |
| 60 | 58,5 | 61,5 | 52,0 | 37,0 | 50,0 | | | | | | | | | | | | | | | | |
| 65 | 63,5 | 66,5 | 57,0 | 37,0 | 55,0 | | | | | | | | | | | | | | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | | | | | | | | | | | | | | | | |
| 75 | 73,5 | 76,5 | 61,0 | 42,0 | 60,0 | | | | | | | | | | | | | | | | |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 50,0 | | | | | | | | | | | | | | | |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 55,0 | | | | | | | | | | | | | | | |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 60,0 | | | | | | | | | | | | | | | |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | | | | | | | | | |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | | | | | | | | | |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | | | | | | | | | |
| 140 | 138,0 | 142,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | | | |
| 150 | 148,0 | 152,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | | | |
| 160 | 158,0 | 162,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | | | |
| 180 | 178,0 | 182,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | | | |
| 200 | 197,0 | 202,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | | | |
| to | | | | | | | | | | | | | | | | | | | | | |
| 600 | 597,0 | 602,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | | | |


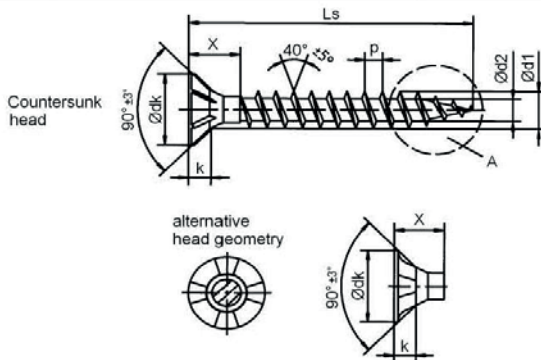

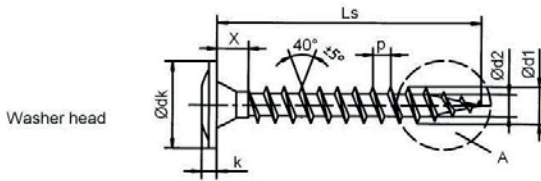
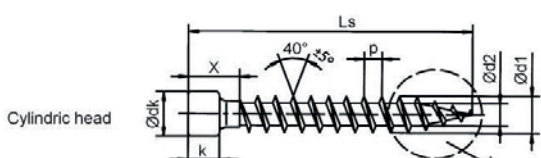

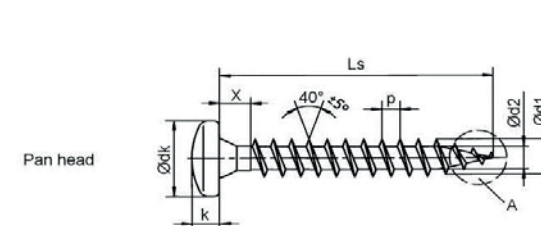


Intermediate lengths on Ls possible


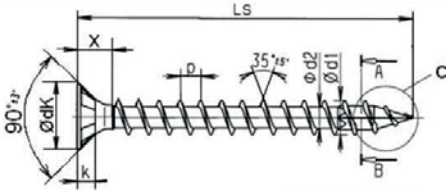


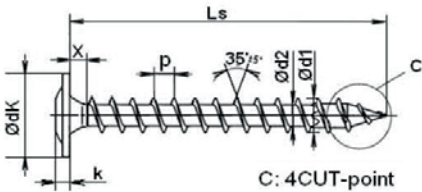

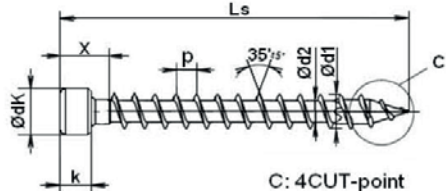

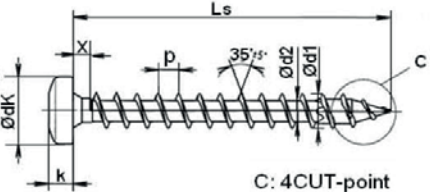


Other thread lengths in the range $\geq 4 \times d1$
to max. standard length permitted


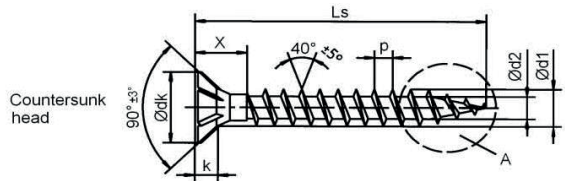
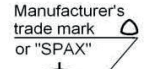

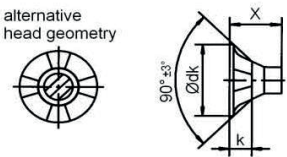
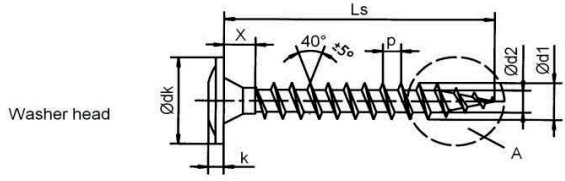


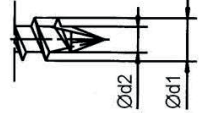
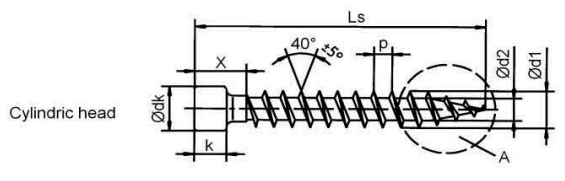
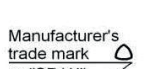

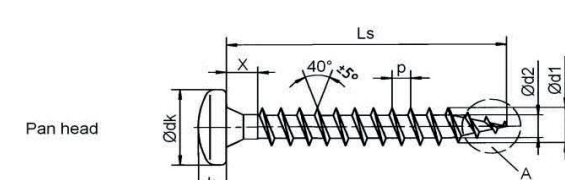


| | | | | | | | | |
|--|---|---|---|-------------|-------------|-------|-------------|-------|
|  |  Washer head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Stainless steel screws | | | | | | |
| | <p>Cross section A - B</p> <p>4CUT-point: Square point in core</p>  <p style="text-align: right;">Manufacturer's trade mark " SPAX "</p> <p style="text-align: right;">T-STAR plus</p> <p style="text-align: center;">C: alternatively with 4CUT-cutter D: 4CUT-point</p> | | | | | | | |
| Nominal diameter | 8,0 | | 10,0 | | | | | |
| d1 | thread size | 8,1 | | 10,0 | | | | |
| | permissible tolerance | ±0,4 | | ±0,5 | | | | |
| dk | head diameter | 18,0 | 20,0 | 22,0 | 24,0 | 23,0 | 25,0 | 27,0 |
| | permissible tolerance | ±0,9 | ±1,0 | ±1,1 | ±1,2 | ±1,15 | ±1,25 | ±1,35 |
| dk1 | countersink diameter | 9,00 | | 12,00 | | | | |
| | permissible tolerance | +0,50 | | +0,5 | | | | |
| d2 | core diameter | 5,3 | | 6,1 | | | | |
| | permissible tolerance | ±0,3 | | ±0,3 | | | | |
| ds | shank diameter | 5,70 | | 6,80 | | | | |
| | permissible tolerance | ±0,25 | | ±0,25 | | | | |
| k | head height max. | 4,3 | | 4,7 | | | | |
| p | thread pitch | 4,8 | | 6,0 | | | | |
| | permissible tolerance | ±0,1 x p | | ±0,1 x p | | | | |
| T-STAR plus size | | T40 | | T50 | | | | |
| Ls | | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | |
| Nom.dim. | min | max | lgV | lgT | lgV | lgT | | |
| 40 | 37,5 | 41,5 | 37,0 | | | | | |
| 45 | 43,5 | 46,5 | 42,0 | | | | | |
| 50 | 48,5 | 51,5 | 46,0 | 32,0 | 40,0 | | | |
| 55 | 53,5 | 56,5 | 51,0 | 32,0 | 45,0 | | | |
| 60 | 58,5 | 61,5 | 56,0 | 37,0 | 50,0 | | | |
| 65 | 63,5 | 66,5 | 61,0 | 37,0 | 55,0 | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | | | |
| 75 | 73,5 | 76,5 | 70,0 | 42,0 | 70,0 | | | |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | | 50,0 | |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | | 55,0 | |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | | 60,0 | |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | | 80,0 | |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | | 80,0 | |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | | 80,0 | |
| 140 | 138,0 | 142,0 | | 80,0 | | | 80,0 | |
| 150 | 148,0 | 152,0 | | 80,0 | | | 80,0 | |
| 160 | 158,0 | 162,0 | | 80,0 | | | 80,0 | |
| 180 | 178,0 | 182,0 | | 80,0 | | | 80,0 | |
| 200 | 197,0 | 202,0 | | 80,0 | | | 80,0 | |
| <i>to</i> | | | | | | | | |
| 600 | 597,0 | 602,0 | | 80,0 | | | 80,0 | |
| Intermediate lengths on Ls possible | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | | | |
|  = Preferred size | | | | | | | | |
| Annex A38 | | | | | | | | |


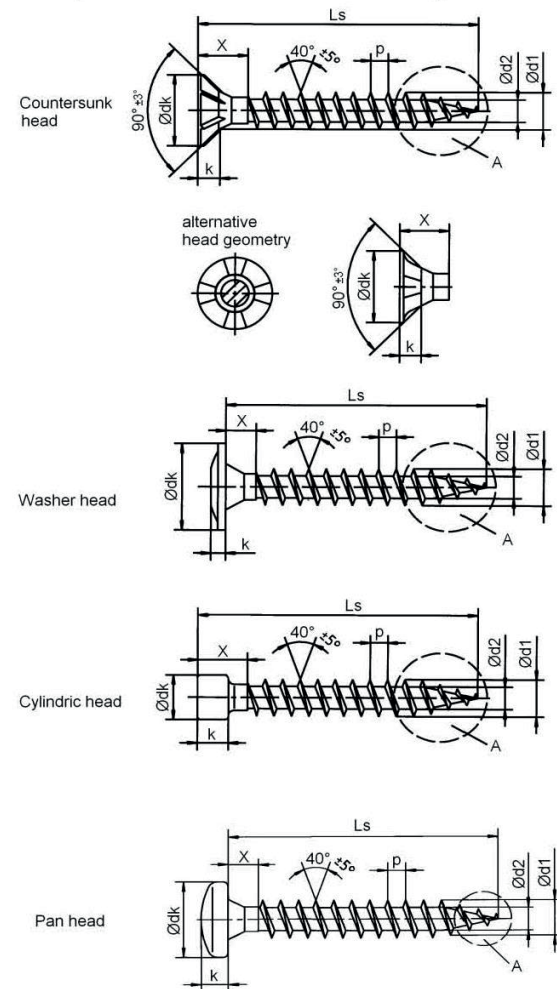

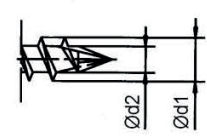

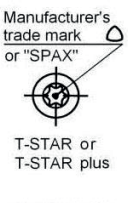
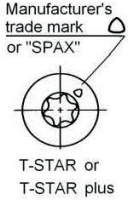

| | | | | | | | | | | | | | | | | | | | |
|---|--|--|-------------|-------------|-------------|-------------|--|--|--|---|--|--|--|--|--|--|--|--|--|
|  |  SPAX® Raised countersunk head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Stainless steel screws | | | | | | | | | | | | | | | | | |
| | <p>Cross section A - B</p> <p>4CUT-point: Square point in core</p> <p>Optional with or without ribs</p> <p>90° ±3°</p> <p>35° ±5°</p> <p>Manufacturer's trade mark " SPAX "</p> <p>T-STAR plus</p> <p>C: alternatively with 4CUT-cutter D: 4CUT-point</p>  | | | | | | | | | | | | | | | | | | |
| Nominal diameter | | 8,0 | 10,0 | | | | | | | | | | | | | | | | |
| d1 | thread size | 8,1 | 10,0 | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,4 | ±0,5 | | | | | | | | | | | | | | | | |
| dk | head diameter | 15,1 | 18,6 | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,75 | ±0,93 | | | | | | | | | | | | | | | | |
| d2 | core diameter | 5,3 | 6,1 | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,3 | ±0,3 | | | | | | | | | | | | | | | | |
| ds | shank diameter | 5,70 | 6,80 | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,25 | ±0,25 | | | | | | | | | | | | | | | | |
| k | head height max. | 4,4 | 6,0 | | | | | | | | | | | | | | | | |
| p | thread pitch | 4,8 | 6,0 | | | | | | | | | | | | | | | | |
| | permissible tolerance | ±0,1 x p | ±0,1 x p | | | | | | | | | | | | | | | | |
| T-STAR plus size | | T40 | T50 | | | | | | | | | | | | | | | | |
| Ls | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | | | | | | | | | | | | | | |
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | | | | | | | | | | | | | |
| 40 | 38,5 | 41,5 | 32,0 | | | | | | | | | | | | | | | | |
| 45 | 43,5 | 46,5 | 37,0 | | | | | | | | | | | | | | | | |
| 50 | 48,5 | 51,5 | 42,0 | 32,0 | 40,0 | | | | | | | | | | | | | | |
| 55 | 53,5 | 56,5 | 47,0 | 32,0 | 45,0 | | | | | | | | | | | | | | |
| 60 | 58,5 | 61,5 | 52,0 | 37,0 | 50,0 | | | | | | | | | | | | | | |
| 65 | 63,5 | 66,5 | 57,0 | 37,0 | 55,0 | | | | | | | | | | | | | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | | | | | | | | | | | | | | |
| 75 | 73,5 | 76,5 | 61,0 | 42,0 | 60,0 | | | | | | | | | | | | | | |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 50,0 | | | | | | | | | | | | | |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 55,0 | | | | | | | | | | | | | |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 60,0 | | | | | | | | | | | | | |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | | | | | | | |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | | | | | | | |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | 80,0 | | | | | | | | | | | | | |
| 140 | 138,0 | 142,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | |
| 150 | 148,0 | 152,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | |
| 160 | 158,0 | 162,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | |
| 180 | 178,0 | 182,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | |
| 200 | 198,0 | 202,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | |
| to | | | | | | | | | | | | | | | | | | | |
| 600 | 597,0 | 602,0 | | 80,0 | | 80,0 | | | | | | | | | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | | | | | | | |
| Annex A39 | | | | | | | | | | | | | | | | | | | |



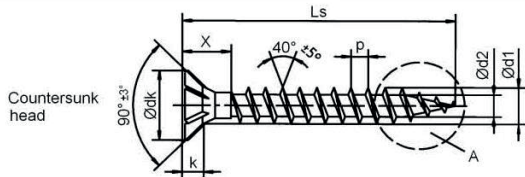

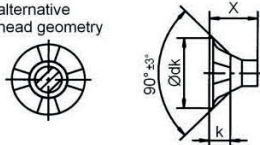

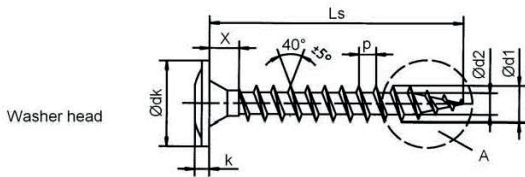

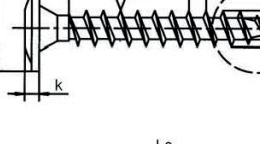

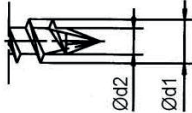
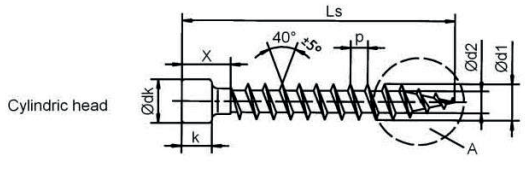

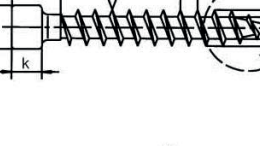

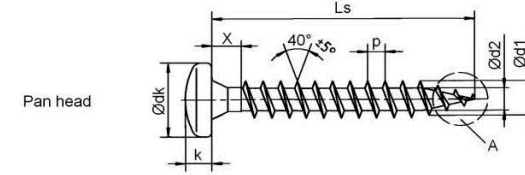

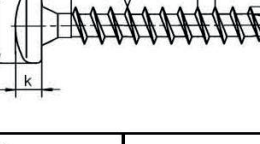
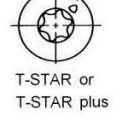

| | | | | | | | |
|---|---|--|--|---|-------------|-------------|--|
|  |  Pan head | Self-tapping screw with full and partial thread Material: cold rolled wire according to SPAX - Factory standard Stainless steel screws | | | | | |
| | Cross section A-B 4CUT-point: Square point in core | |  | | | | Manufacturer's trade mark "SPAX"  T-STAR plus |
| | | C: alternatively with 4CUT-cutter | | D: 4CUT-point | | | |
| Nominal diameter | | 8,0 | 10,0 | | | | |
| d1 | thread size | 8,1 | 10,0 | | | | |
| | permissible tolerance | ±0,4 | ±0,5 | | | | |
| dk | head diameter | 15,5 | 19,0 | | | | |
| | permissible tolerance | ±0,77 | ±0,95 | | | | |
| d2 | core diameter | 5,3 | 6,1 | | | | |
| | permissible tolerance | ±0,3 | ±0,3 | | | | |
| ds | shank diameter | 5,70 | 6,80 | | | | |
| | permissible tolerance | ±0,25 | ±0,25 | | | | |
| k | head height max. | 6,0 | 7,1 | | | | |
| p | thread pitch | 4,8 | 6,0 | | | | |
| | permissible tolerance | ±0,1 x p | ±0,1 x p | | | | |
| T-STAR plus size | | T40 | T50 | | | | |
| Ls | | Standard thread lengths (full thread=lgV / partial thread = lgT) | | | | | |
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | |
| 40 | 38,5 | 41,5 | 37,0 | | | | |
| 45 | 43,5 | 46,5 | 42,0 | | | | |
| 50 | 48,5 | 51,5 | 46,0 | 32,0 | 40,0 | | |
| 55 | 53,5 | 56,5 | 51,0 | 32,0 | 45,0 | | |
| 60 | 58,5 | 61,5 | 56,0 | 37,0 | 50,0 | | |
| 65 | 63,5 | 66,5 | 61,0 | 37,0 | 55,0 | | |
| 70 | 68,5 | 71,5 | 61,0 | 42,0 | 60,0 | | |
| 75 | 73,5 | 76,5 | 70,0 | 42,0 | 60,0 | | |
| 80 | 78,5 | 81,5 | 70,0 | 47,0 | 70,0 | 50,0 | |
| 90 | 88,5 | 91,5 | 80,0 | 52,0 | 80,0 | 55,0 | |
| 100 | 98,5 | 101,5 | 80,0 | 57,0 | 80,0 | 60,0 | |
| 110 | 108,5 | 111,5 | 80,0 | 70,0 | 80,0 | 80,0 | |
| 120 | 118,5 | 121,5 | 80,0 | 70,0 | 80,0 | 80,0 | |
| 130 | 128,0 | 132,0 | 80,0 | 70,0 | 80,0 | 80,0 | |
| 140 | 138,0 | 142,0 | | 80,0 | | 80,0 | |
| 150 | 148,0 | 152,0 | | 80,0 | | 80,0 | |
| 160 | 158,0 | 162,0 | | 80,0 | | 80,0 | |
| 180 | 178,0 | 182,0 | | 80,0 | | 80,0 | |
| 200 | 198,0 | 202,0 | | 80,0 | | 80,0 | |
| to | | | | | | | |
| 600 | 597,0 | 202,0 | | 80,0 | | 80,0 | |
| Intermediate lengths on Ls possible | | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | |
| Annex A40 | | | | | | | |


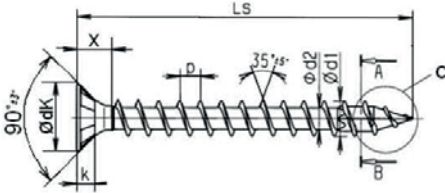
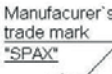


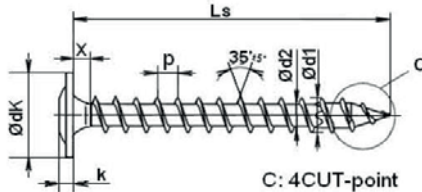
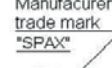

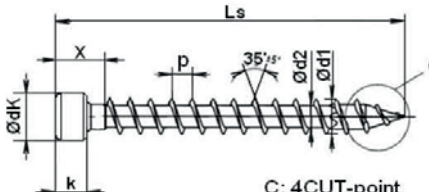


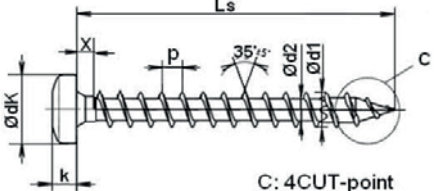
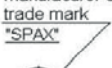


|  SPAX®-S | | Self-tapping screw with full- thread | | | | | | |
|--|-----------------------|---|------|---|------|-----------------------|-----------------|------|
| | | Material: Cold rolled wire according to SPAX - Factory Standard Screws of high-carbon steel | | | | | | |
|  <p>Countersunk head</p> <p>alternative head geometry</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> <p>T-STAR or T-STAR plus</p> | |  <p>Washer head</p> <p>A: alternatively with CUT-point</p> | | | | |
|  <p>Cylindric head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> <p>T-STAR or T-STAR plus</p> | | | | | | |
|  <p>Pan head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> <p>T-STAR or T-STAR plus</p> | | | | | | |
| <p>Nominal diameter</p> | | 6,0 | | | | | | |
| Type of Head | | Countersunk head | | Washer head | | Cylindric head | Pan head | |
| d1 | thread size | 6,0 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | |
| dk | head diameter | 9,7 | 11,6 | 13,0 | 15,0 | 8,4 | 9,9 | 11,9 |
| | permissible tolerance | ±0,6 | | ±0,65 | | ±0,75 | | ±0,6 |
| d2 | core diameter | 3,8 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | |
| k | head height max. | 2,9 | 3,8 | 2,2 | 2,4 | 6,0 | 3,4 | 4 |
| p | thread pitch | 3,0 | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | |
| T-STAR size | | T20 | | T30 | | | T20 T30 | |
| Thread-free length X | Ls 60-200 | max. 15 mm | | | | | | |
| permissible tolerance of screw length | Ls 60-99 | Ls ±2 mm | | | | | | |
| | Ls 100-200 | Ls ±5 mm | | | | | | |
|  =Preferred Version | | | | | | | | |
| Annex A41 | | | | | | | | |



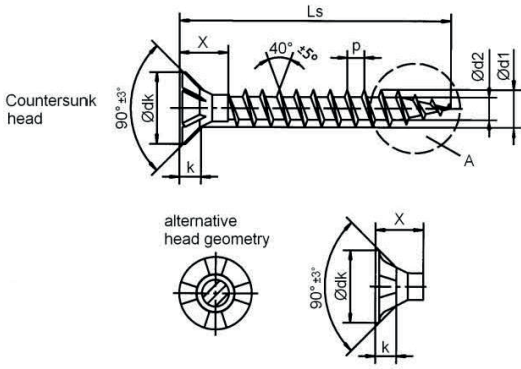

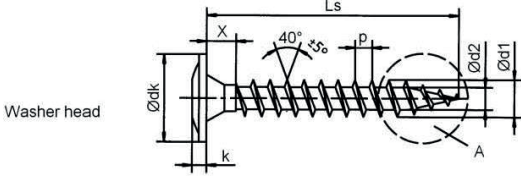

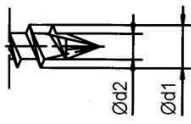
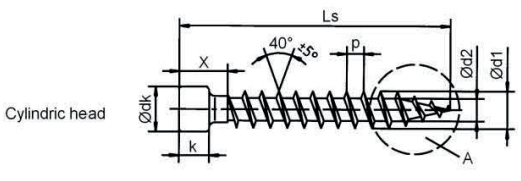

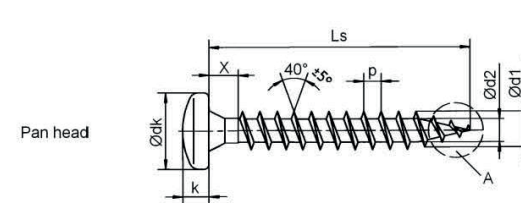


|  | | Self-tapping screw with full- thread | | | | | | |
|--|-----------------------|--|------|--|-------|-----------------------|-----------------|------|
| | | Material: Cold rolled wire according to SPAX - Factory Standard Screws of high-carbon steel | | | | | | |
|  <p>C: 4CUT-point</p> | |  | | <p>Cross sektion A-B</p>  <p>4CUT-point: Square point in core</p> | | | | |
|  <p>C: 4CUT-point</p> | |  | | | | | | |
|  <p>C: 4CUT-point</p> | |  | | | | | | |
|  <p>C: 4CUT-point</p> | |  | | | | | | |
| Nominal diameter | | 6,0 | | | | | | |
| Type of Head | | Countersunk head | | Washer head | | Cylindric head | Pan head | |
| d1 | thread size | 6,0 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | |
| dk | head diameter | 9,7 | 11,6 | 13,0 | 15,0 | 8,4 | 9,9 | 11,9 |
| | permissible tolerance | ±0,6 | | ±0,65 | ±0,75 | | ±0,6 | |
| d2 | core diameter | 3,9 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | |
| k | head height max. | 2,9 | 3,8 | 2,2 | 2,4 | 6,0 | 3,4 | 4 |
| p | thread pitch | 3,6 | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | |
| T-STAR plus size | | T20 | | T30 | | | T20 T30 | |
| Thread-free length X | | Ls 60-200 | | max. 15 mm | | | | |
| permissible tolerance of screw length | | Ls 60-99 | | Ls ±2 mm | | | | |
| | | Ls 100-200 | | Ls ±5 mm | | | | |
|  =Preferred Version | | | | | | | | |
| | | Annex A42 | | | | | | |


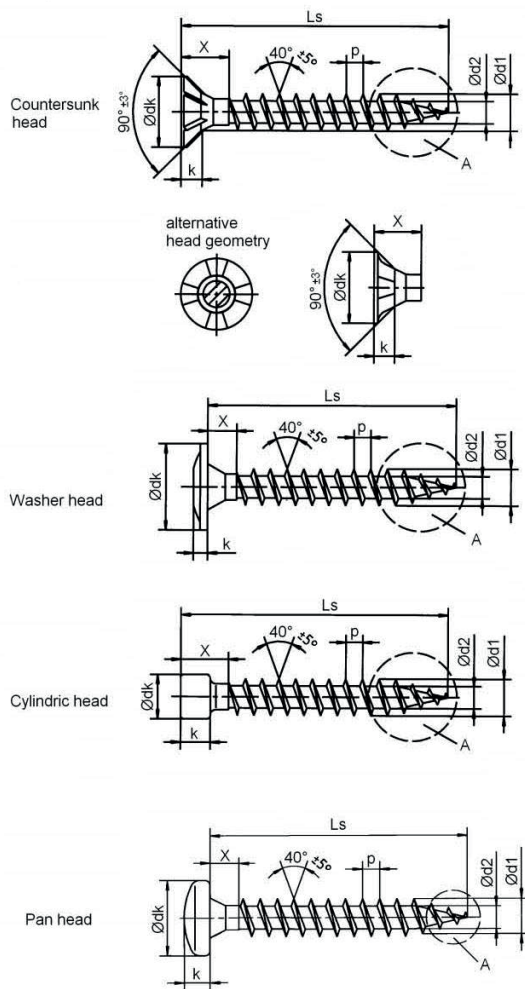

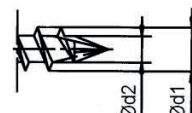

|  SPAX®-S | | Self-tapping screw with full- thread | | | | | | | | |
|--|-----------------------|---|-------|---|------|--|------|-----------------|-------|------|
| | | Material: Cold rolled wire according to SPAX - Factory Standard Screws of high-carbon steel | | | | | | | | |
|  <p>Countersunk head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | |  <p>T-STAR or T-STAR plus</p> | | | | | | |
|  <p>alternative head geometry</p> | | | | | | | | | | |
|  <p>Washer head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | |  <p>T-STAR or T-STAR plus</p> | |  <p>A: alternatively with CUT-point</p> | | | | |
|  <p>Cylindric head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | |  <p>T-STAR or T-STAR plus</p> | | | | | | |
|  <p>Pan head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | |  <p>T-STAR or T-STAR plus</p> | | | | | | |
| Nominal diameter | | 8,0 | | | | | | | | |
| Type of Head | | Countersunk head | | Washer head | | Cylindric head | | Pan head | | |
| d1 | thread size | 8,1 | | | | | | | | |
| | permissible tolerance | ±0,4 | | | | | | | | |
| dk | head diameter | 11,6 | 15,1 | 18,0 | 20,0 | 22,0 | 24,0 | 10,0 | 15,5 | 11,9 |
| | permissible tolerance | ±0,6 | ±0,75 | ±0,9 | ±1,0 | ±1,1 | ±1,2 | ±0,6 | ±0,75 | ±0,6 |
| d2 | core diameter | 5,0 | | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | | |
| k | head height max. | 3,0 | 4,8 | 4,5 | | 8,0 | 5,8 | 4,0 | | |
| p | thread pitch | 4,0 | | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | | |
| T - STAR size | | T40 | | | | | | T30 | | |
| Thread-free length X | Ls 60-200 | max. 15 mm | | | | | | | | |
| | Ls > 200 | max. 25mm | | | | | | | | |
| permissible tolerance of screw length | Ls 60-99 | Ls ±2 mm | | | | | | | | |
| | Ls 100-200 | Ls ±5 mm | | | | | | | | |
| | Ls > 200 | Ls ±15 mm | | | | | | | | |
| Screw lengths Ls up to 600 mm (Lengths > 400 mm with CUT-point) =Preferred size | | | | | | | | | | |
| Annex A43 | | | | | | | | | | |

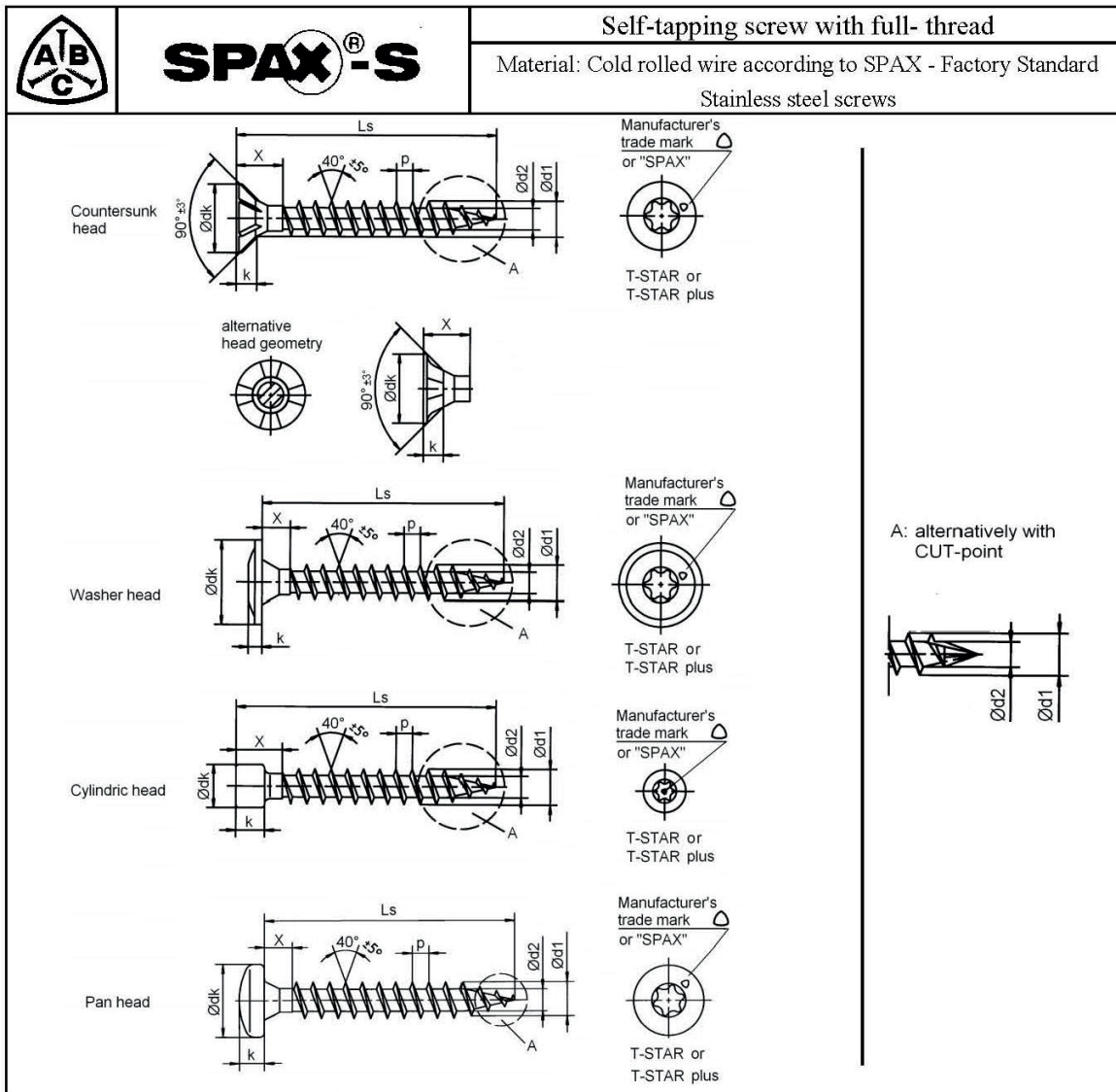
|  SPAX[®]-S | | Self-tapping screw with full-thread | | | | | | |
|--|-----------------------|--|-------|--|-----------------------|-----------------|-------|-------|
| | | Material: Cold rolled wire according to SPAX - Factory Standard Screws of high-carbon steel | | | | | | |
|  | |  T-STAR or T-STAR plus | |  A: alternatively with CUT-point | | | | |
|  T-STAR or T-STAR plus | | | | | | | | |
|  T-STAR or T-STAR plus | | | | | | | | |
|  T-STAR or T-STAR plus | | | | | | | | |
| Nominal diameter | | 10,0 | | | | | | |
| Type of Head | | Countersunk head | | Washer head | Cylindric head | Pan head | | |
| d1 | thread size | 10,0 | | | | | | |
| | permissible tolerance | ±0,5 | | | | | | |
| dk | head diameter | 15,1 | 18,6 | 20,0 | 25,0 | 12,0 | 19,0 | 15,5 |
| | permissible tolerance | ±0,75 | ±0,93 | ±1,0 | ±1,25 | ±0,6 | ±0,95 | ±0,75 |
| d2 | core diameter | 6,1 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | |
| k | head height max. | 4,2 | 6,0 | 5,0 | 5,0 | 10,0 | 7,1 | 5,8 |
| p | thread pitch | 5,0 | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | |
| T - STAR | size | T50 | | T40 | | T50 | T40 | |
| Thread-free length X | Ls 60-200 | max. 15 mm | | | | | | |
| | Ls > 200 | max. 25 mm | | | | | | |
| permissible tolerance of screw length | Ls 60-99 | Ls ±2 mm | | | | | | |
| | Ls 100-200 | Ls ±5 mm | | | | | | |
| | Ls > 200 | Ls ±15 mm | | | | | | |
| Screw lengths Ls to 800 mm possible | |  = Preferred size | | | | | | |
| Annex A44 | | | | | | | | |

|   | | Self-tapping screw with full- thread | | | | | | |
|---|-----------------------|--|-------|--|-------|-----------------------|-----------------|-------|
| | | Material: Cold rolled wire according to SPAX - Factory Standard Screws of high-carbon steel | | | | | | |
|  <p>Countersunk head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | | | | | | |
|  <p>alternative head geometry</p> | |  <p>T-STAR or T-STAR plus</p> | | | | | | |
|  <p>Washer head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | | | | | | |
|  <p>alternative head geometry</p> | |  <p>T-STAR or T-STAR plus</p> | |  <p>A: alternatively with CUT-point</p> | | | | |
|  <p>Cylindric head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | | | | | | |
|  <p>alternative head geometry</p> | |  <p>T-STAR or T-STAR plus</p> | | | | | | |
|  <p>Pan head</p> | |  <p>Manufacturer's trade mark or "SPAX"</p> | | | | | | |
|  <p>alternative head geometry</p> | |  <p>T-STAR or T-STAR plus</p> | | | | | | |
| Nominal diameter | | 12,0 | | | | | | |
| Type of Head | | Countersunk head | | Washer head | | Cylindric head | Pan head | |
| d1 | thread size | 12,0 | | | | | | |
| | permissible tolerance | ±0,6 | | | | | | |
| dk | head diameter | 18,6 | 22,6 | 25,0 | 29,0 | 14,0 | 23,0 | 19,0 |
| | permissible tolerance | ±0,93 | ±1,13 | ±1,25 | ±1,45 | ±0,7 | ±1,13 | ±0,95 |
| d2 | core diameter | 7,35 | | | | | | |
| | permissible tolerance | ±0,35 | | | | | | |
| k | head height max. | 5,2 | 7,1 | 6,0 | 12,0 | 8,5 | 7,1 | |
| p | thread pitch | 6,0 | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | |
| T - STAR | size | T50 | | | | | | |
| Thread-free length X | Ls 60-99 | max. 15 mm | | | | | | |
| | Ls 100-200 | max. 20 mm | | | | | | |
| | Ls > 200 | max. 25 mm | | | | | | |
| permissible tolerance of screw length | Ls 60-99 | Ls ±2 mm | | | | | | |
| | Ls 100-200 | Ls ±10 mm | | | | | | |
| | Ls > 200 | Ls ±15 mm | | | | | | |
| Screw lengths Ls to 600 mm possible | |  =Preferred size | | | | | | |
| Annex A45 | | | | | | | | |

|  | | Self-tapping screw with full- thread | | | | | | |
|--|-----------------------|---|------|--|-------|-----------------------|-----------------|-----|
| | | Material: Cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | |
|  <p>C: 4CUT-point</p> | |  Manufacturer's trade mark "SPAX"  T-STAR plus | | <p>Cross section A-B</p>  <p>4CUT-point: Square point in core</p> | | | | |
|  <p>C: 4CUT-point</p> | |  Manufacturer's trade mark "SPAX"  T-STAR plus | | | | | | |
|  <p>C: 4CUT-point</p> | |  Manufacturer's trade mark "SPAX"  T-STAR plus | | | | | | |
|  <p>C: 4CUT-point</p> | |  Manufacturer's trade mark "SPAX"  T-STAR plus | | | | | | |
| Nominal diameter | | 6,0 | | | | | | |
| Type of Head | | Countersunk head | | Washer head | | Cylindric head | Pan head | |
| d1 | thread size | 6,1 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | |
| dk | head diameter | 9,7 | 11,6 | 13,0 | 15,0 | 8,4 | 11,9 | 9,9 |
| | permissible tolerance | ±0,6 | | ±0,65 | ±0,75 | | ±0,6 | |
| d2 | core diameter | 4,0 | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | |
| k | head height max. | 2,9 | 3,8 | 2,2 | 2,4 | 6,0 | 4,0 | 3,4 |
| p | thread pitch | 3,6 | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | |
| T-STAR plus size | | T30 | | | | | T20 | |
| Thread-free length X Ls 60-200 | | max. 15 mm | | | | | | |
| permissible tolerance of screw length | | Ls 60-99 | | Ls ±2 mm | | | | |
| | | Ls 100-200 | | Ls ±5 mm | | | | |
|  =Preferred Version | | | | | | | | |
| | | Annex A46 | | | | | | |


|   | | Self-tapping screw with full- thread | | | | | | | | |
|---|-----------------------|---|-------|--------------------|--|------|------|---|-----------------|------|
| | | Material: Cold rolled wire according to SPAX Factory - Standard Stainless steel screws | | | | | | | | |
|  | |  Manufacturer's trade mark or "SPAX" T-STAR or T-STAR plus | | | | | | | | |
|  | |  Manufacturer's trade mark or "SPAX" T-STAR or T-STAR plus | | | A: alternatively with CUT-point  | | | | | |
|  | |  Manufacturer's trade mark or "SPAX" T-STAR or T-STAR plus | | | | | | | | |
|  | |  Manufacturer's trade mark or "SPAX" T-STAR or T-STAR plus | | | | | | | | |
| Nominal diameter | | 8,0 | | | | | | | | |
| Type of Head | | Countersunk head | | Washer head | | | | Cylindric head | Pan head | |
| d1 | thread size | 8,1 | | | | | | | | |
| | permissible tolerance | ±0,4 | | | | | | | | |
| dk | head diameter | 11,6 | 15,1 | 18,0 | 20,0 | 22,0 | 24,0 | 10,0 | 15,5 | 11,9 |
| | permissible tolerance | ±0,6 | ±0,75 | ±0,9 | ±1,0 | ±1,1 | ±1,2 | ±0,6 | ±0,75 | ±0,6 |
| d2 | core diameter | 5,0 | | | | | | | | |
| | permissible tolerance | ±0,3 | | | | | | | | |
| k | head height max. | 3,0 | 4,8 | 4,5 | | | | 8,0 | 5,8 | 4,0 |
| p | thread pitch | 4,0 | | | | | | | | |
| | permissible tolerance | ±0,1 x p | | | | | | | | |
| T - STAR size | | T40 | | | | | | | T30 | |
| Thread-free length X | Ls 60-200 | max. 15 mm | | | | | | | | |
| | Ls > 200 | max. 25 mm | | | | | | | | |
| permissible tolerance of screw length | Ls 60-99 | Ls ±2 mm | | | | | | | | |
| | Ls 100-200 | Ls ±5 mm | | | | | | | | |
| | Ls > 200 | Ls ±15 mm | | | | | | | | |
| Screw lengths Ls up to 600 mm (Lengths > 400 mm with CUT-point) | | | | | | | |  =Preferred size | | |
| Annex A47 | | | | | | | | | | |

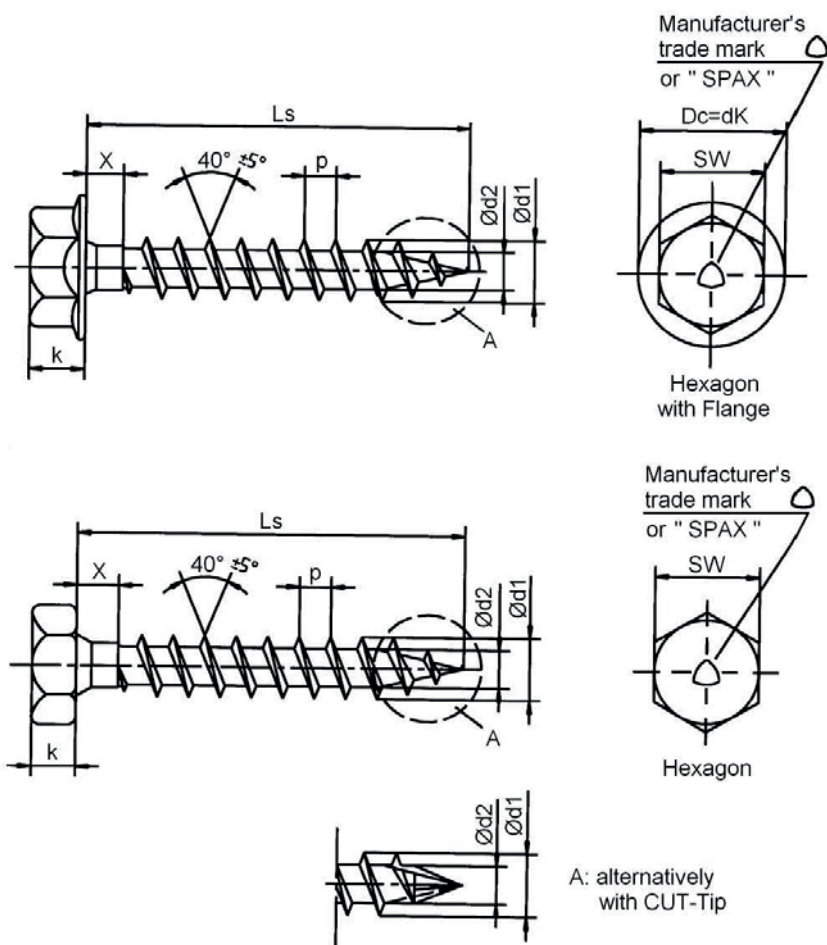
|  SPAX®-S | | Self-tapping screw with full- thread | | | | | | |
|--|--|--|--------------------|--|-----------------------|-----------------|--------------|---------------|
| | | Material: Cold rolled wire according to SPAX - Factory Standard Stainless steel screws | | | | | | |
|  | |  | | <p>A: alternatively with CUT-point</p>  | | | | |
| Nominal diameter | | 10,0 | | | | | | |
| Type of Head | | Countersunk head | Washer head | | Cylindric head | Pan head | | |
| d1 | thread size permissible tolerance | 10,0 ±0,5 | | | | | | |
| dk | head diameter permissible tolerance | 15,1 ±0,75 | 18,6 ±0,93 | | 20,0 ±1,0 | 25,0 ±1,25 | 12,0 ±0,6 | 19,0 ±0,95 |
| d2 | core diameter permissible tolerance | 6,1 ±0,3 | | | | | | |
| k | head height max. | 4,2 | 6,0 | 5,0 | 5,0 | 10,0 | 7,1 | 5,8 |
| p | thread pitch permissible tolerance | 5,0 ±0,1 x p | | | | | | |
| T - STAR | size | T50 | | T40 | | T50 | | T40 |
| Thread-free length X | Ls 60-200 | max. 15 mm | | | | | | |
| | Ls > 200 | max. 25 mm | | | | | | |
| permissible tolerance of screw length | Ls 60-99 | Ls ±2 mm | | | | | | |
| | Ls 100-200 | Ls ±5 mm | | | | | | |
| | Ls > 200 | Ls ±15 mm | | | | | | |
| Screw lengths Ls to 800 mm possible | |  = Preferred size | | | | | | |
| Annex A48 | | | | | | | | |



| Nominal diameter | | 12,0 | | | | | | |
|---------------------------------------|--|------------------|---------------|----------------|---------------|--------------|---------------|---------------|
| Type of Head | | Countersunk head | Washer head | Cylindric head | Pan head | | | |
| d1 | thread size permissible tolerance | 12,0 ±0,6 | | | | | | |
| dk | head diameter permissible tolerance | 18,6 ±0,75 | 22,6 ±0,93 | 25,0 ±1,25 | 29,0 ±1,45 | 14,0 ±0,7 | 23,0 ±1,15 | 19,0 ±0,95 |
| d2 | core diameter permissible tolerance | 7,35 ±0,35 | | | | | | |
| k | head height max. | 5,2 | 7,1 | 6,0 | 12,0 | 8,5 | 7,1 | |
| p | thread pitch permissible tolerance | 6,0 ±0,1 x p | | | | | | |
| T - STAR | size | T50 | | | | | | |
| Thread-free length X | Ls 60-99 | max. 15 mm | | | | | | |
| | Ls 100-200 | max. 20 mm | | | | | | |
| | Ls > 200 | max. 25 mm | | | | | | |
| permissible tolerance of screw length | Ls 60-99 | Ls ±2 mm | | | | | | |
| | Ls 100-200 | Ls ±10 mm | | | | | | |
| | Ls > 200 | Ls ±15 mm | | | | | | |


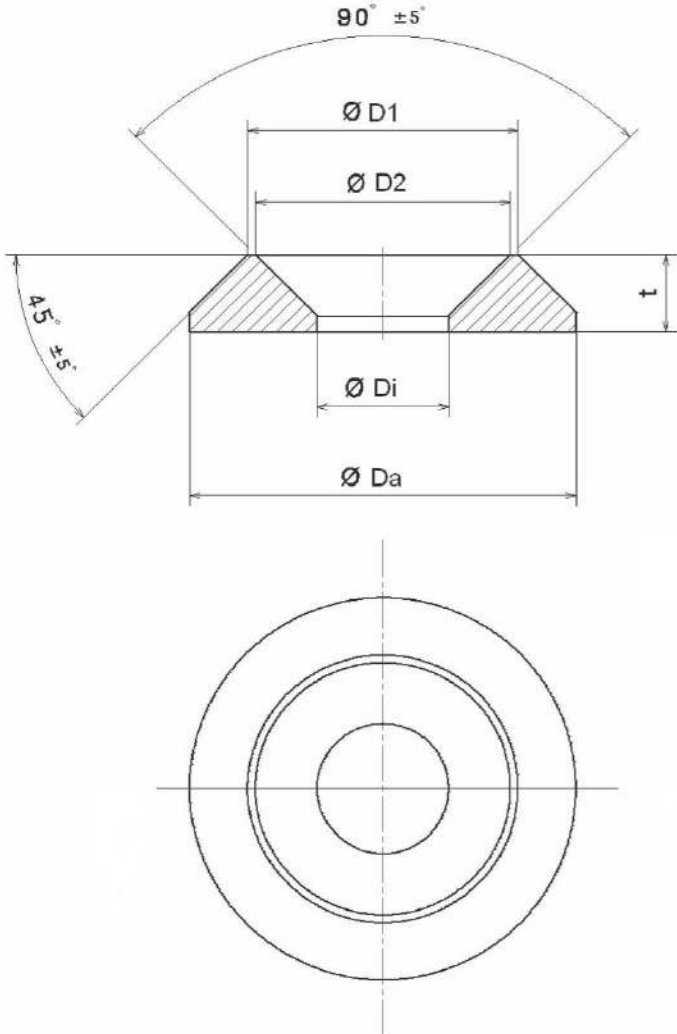
Screw lengths Ls to 600 mm possible =Preferred size

| | | |
|---|---|---|
|  | SPAX®-S Hex. head with/without flange | Self-tapping screw with full- thread Material: Cold rolled wire according to SPAX - Factory Standard Screws of high-carbon steel |
| | | |



| Nominal diameter | 8,0 | | 10,0 | | 12,0 | |
|---------------------------------------|----------------|-------------|----------------|-------------|----------------|-------------|
| Type of Head | without flange | with flange | without flange | with flange | without flange | with flange |
| SW wrench size | 10 | | 13 | | 16 | |
| k head height max. | 6,00 | 8,5 | 7,00 | 9,7 | 8,00 | 12,1 |
| Dc diameter of flange | 15,5 | | 19,5 | | 22,5 | |
| permissible tolerance | ±0,77 | | ±0,97 | | ±1,12 | |
| d1 thread diameter | 8,1 | | 10,0 | | 12,0 | |
| permissible tolerance | ±0,4 | | ±0,5 | | ±0,6 | |
| d2 core diameter | 5,0 | | 6,1 | | 7,35 | |
| permissible tolerance | ±0,3 | | | | ±0,35 | |
| p thread pitch | 4,0 | | 5,0 | | 6,0 | |
| permissible tolerance | | | ±0,1 x p | | | |
| thread-free length X | Ls 60-99 | | Ls 60-99 | | Ls 60-99 | |
| | max. 15 mm | | max. 15 mm | | max. 15 mm | |
| | Ls 100-200 | | Ls 100-200 | | Ls 100-200 | |
| | max. 20 mm | | max. 20 mm | | max. 20 mm | |
| | Ls > 200 | | Ls > 200 | | Ls > 200 | |
| | max. 25 mm | | max. 25 mm | | max. 25 mm | |
| permissible tolerance of screw length | Ls 60-99 | | Ls 60-99 | | Ls 60-99 | |
| | Ls ±2 mm | | Ls ±2 mm | | Ls ±2 mm | |
| | Ls 100-200 | | Ls 100-200 | | Ls 100-200 | |
| | Ls ±5 mm | | Ls ±5 mm | | Ls ±10 mm | |
| | Ls > 200 | | Ls > 200 | | Ls > 200 | |
| | Ls ±15 mm | | Ls ±15 mm | | Ls ±15 mm | |

Screw lengths Ls up to 600 mm possible (at a nominal diameter of 8,0 mm lengths > 400 mm with CUT-point)

| | | | | | | |
|---|------------------------------------|--|-------------|-------------|------------------|--|
|  | SPAX [®] Washer | Washer for screws with countersunk and raised countersunk head | | | | |
| | | Material: machining steel | | | | |
| Dimensions in mm | | | | | | |
|  | | | | | | |
| Thread size | 6,0 | 8,0 | 10,0 | 12,0 | Tolerance | |
| ØDa | 18,0 | 25,0 | 32,0 | 40,0 | ± 0,3 | |
| ØDi | 6,5 | 8,5 | 11,0 | 13,0 | | |
| ØD1 | 13,5 | 17,5 | 22,5 | 27,0 | | |
| ØD2 | 12,5 | 16,5 | 21,5 | 26,0 | | |
| t | 3,5 | 5,0 | 5,6 | 7,0 | | |
| Annex A51 | | | | | | |

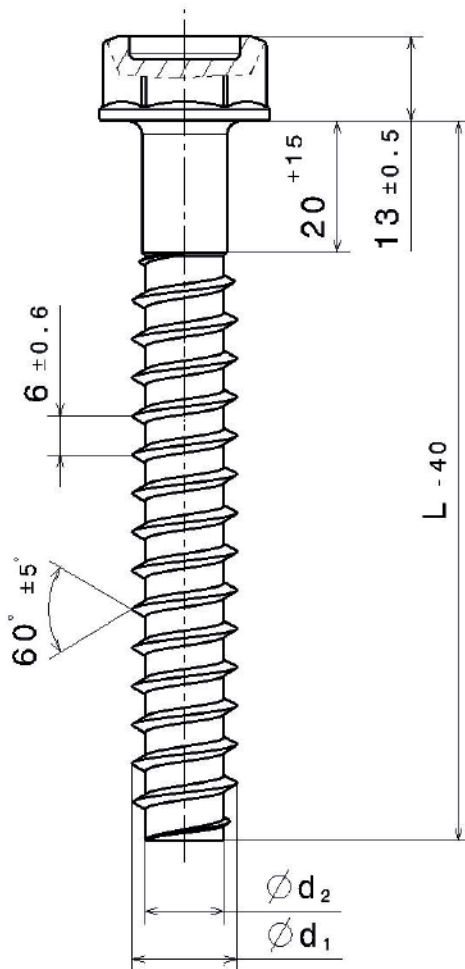


SPAX[®]

Threaded rod with full thread

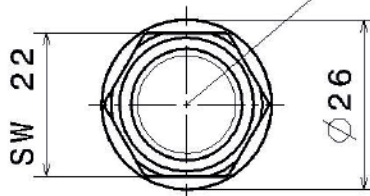
Material: Steel or Stainless steel

Design with hexagon head



| L |
|------|
| 800 |
| 1000 |
| 1200 |
| 1400 |
| 1600 |
| 1800 |
| 2000 |
| 2200 |

Manufacturer's trade mark:
ABC or SPAX



| | | |
|-----------------|------------------|------------------|
| stainless steel | 16 ± 0.8 | 12 ± 0.6 |
| Steel | 16 ± 0.8 | 12 ± 0.6 |
| Execution | Ø d ₁ | Ø d ₂ |

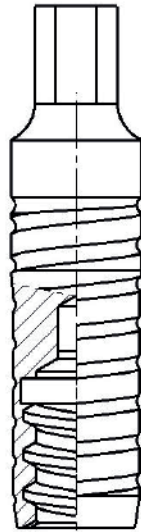
- Other lengths 100 - 3000 mm possible
- Length can be changed by cutting the threaded part



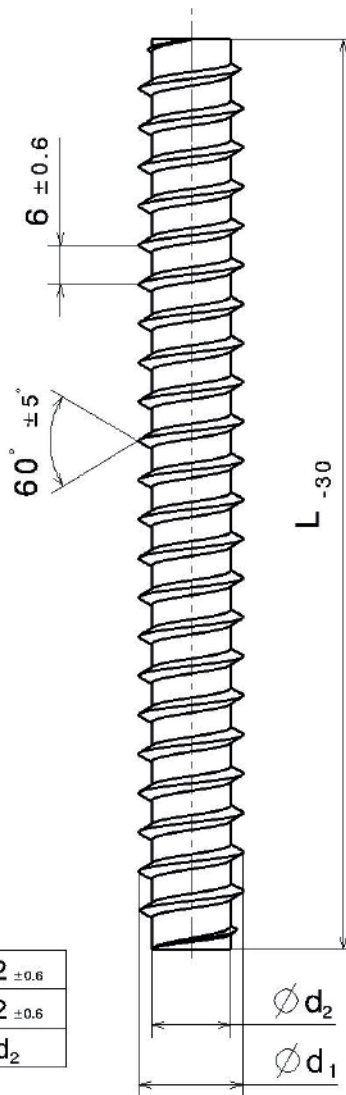
SPAX®

Threaded rod with full thread

Material: steel or stainless steel



Version without head



Screw adapter available as accessory

| |
|------|
| L |
| 3000 |

| | | |
|-----------------|------------------|------------------|
| stainless steel | 16 ±0.8 | 12 ±0.6 |
| Steel | 16 ±0.8 | 12 ±0.6 |
| Execution | Ø d ₁ | Ø d ₂ |

- Other lengths 100 - 3000 mm possible
- Length can be changed by cutting the threaded part



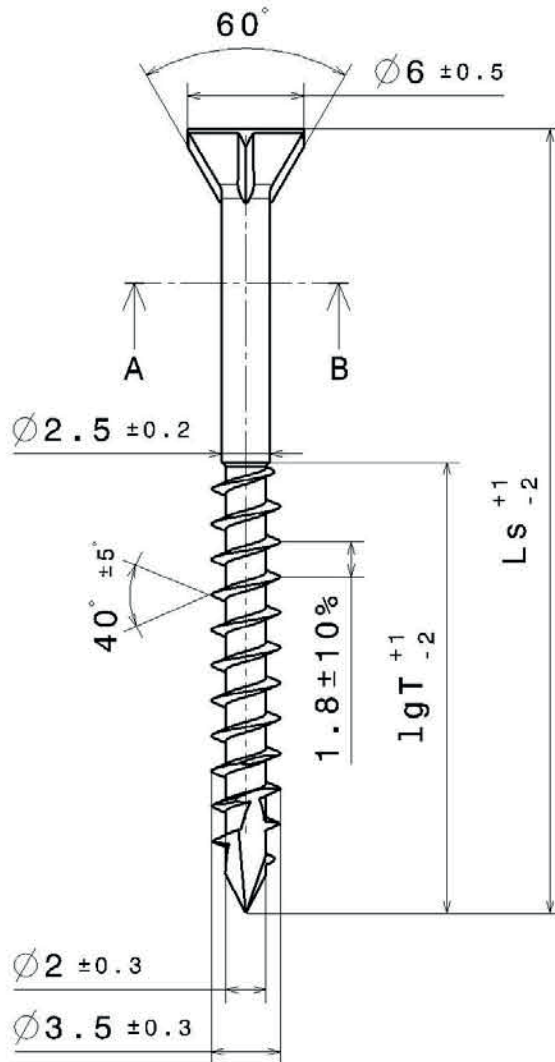
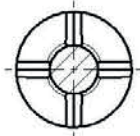
SPAX®

Self-tapping screw with CUT-point

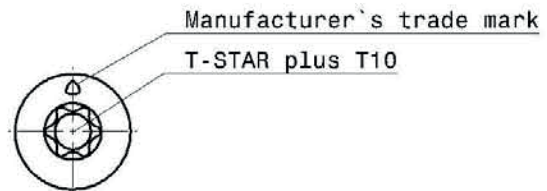
Material: cold rolled wire according to SPAX - Factory Standard
Screws of high carbon steel

Screw with CUT-point

Cross section A-B



| | |
|----|------|
| 55 | 35 |
| 45 | 28 |
| 35 | 20 |
| Ls | lgT* |



*other thread lengths (lgT)
are acceptable if
lgT > 4 x 3,5



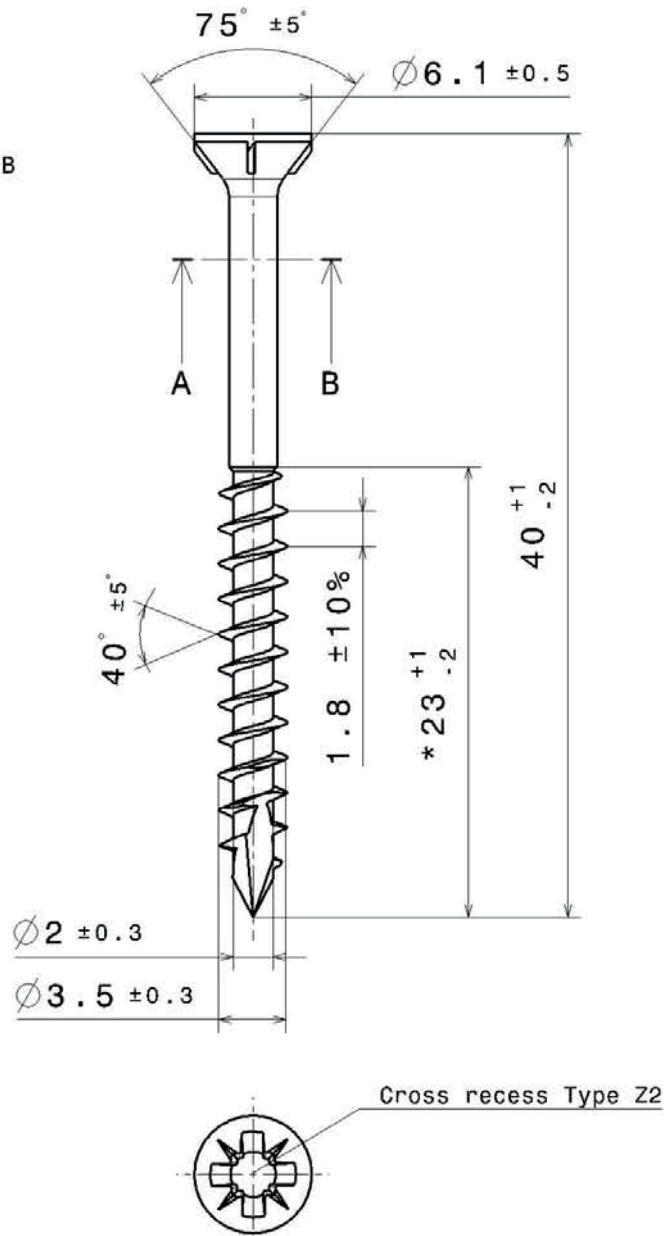
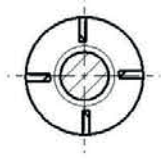
SPAX®

Self-tapping flat countersunk head screw with CUT-point

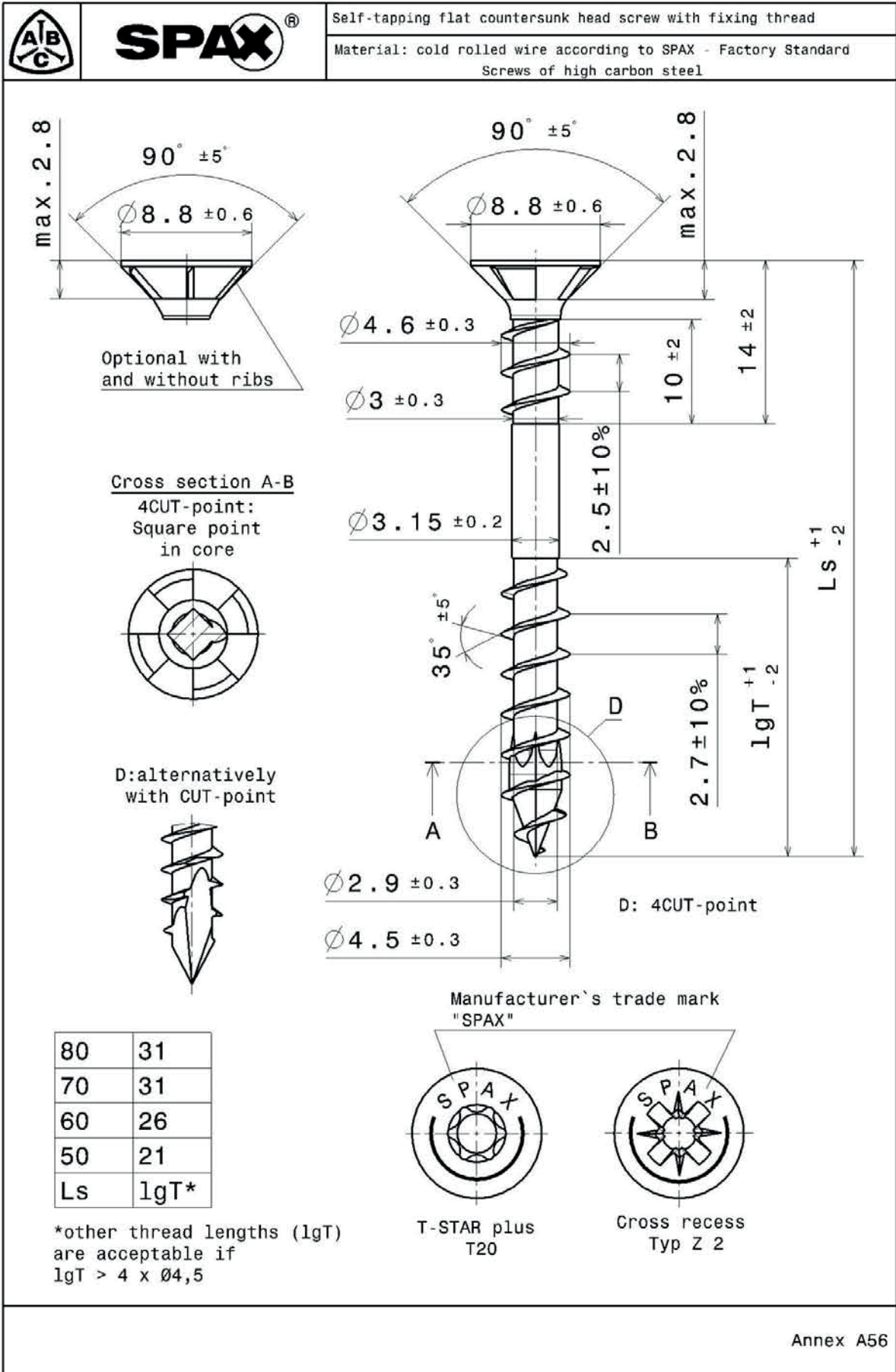
Material: cold rolled wire according to SPAX - Factory Standard
Screws of high carbon steel

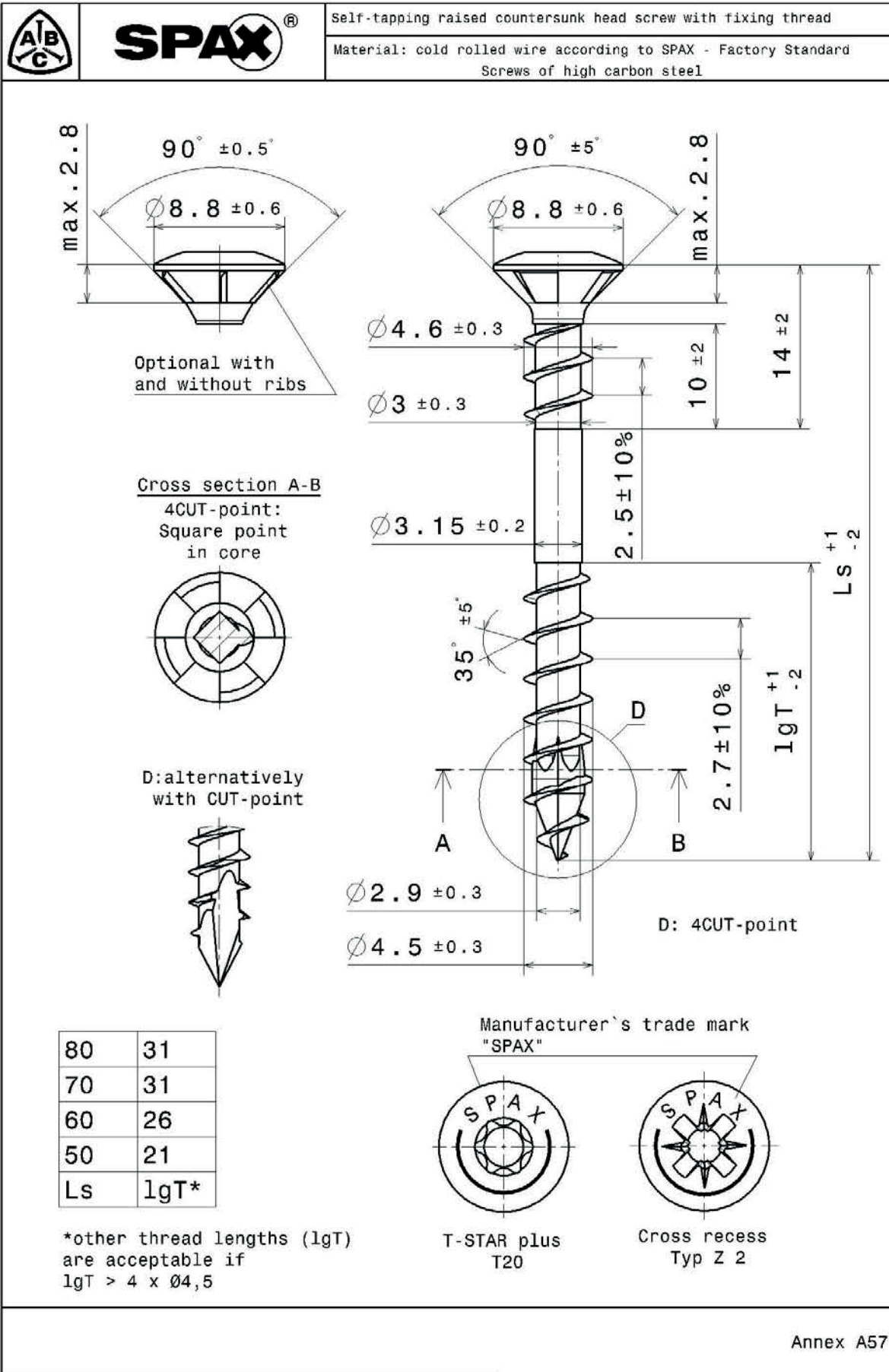
Screw with CUT-point

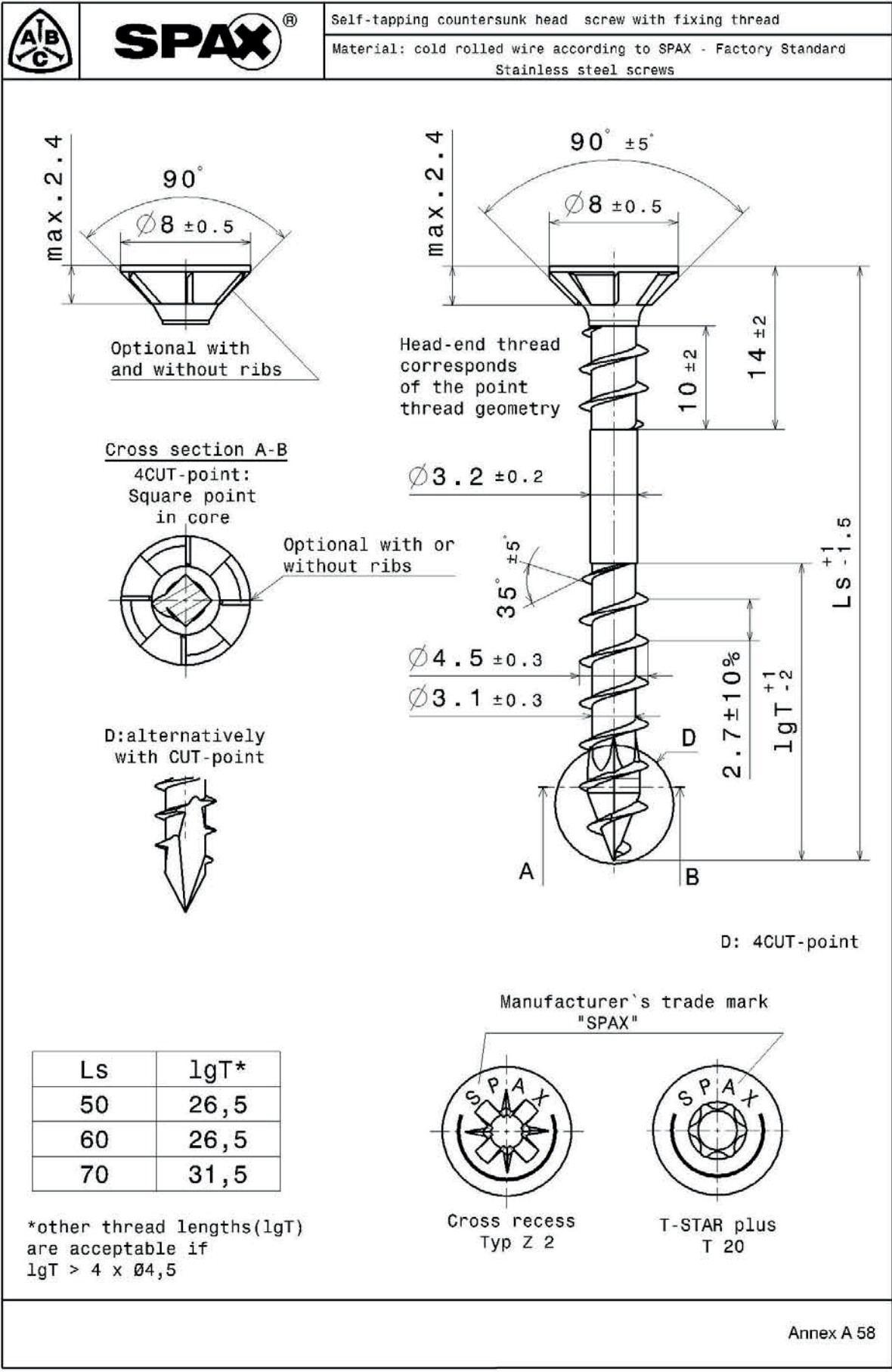
Cross section A-B

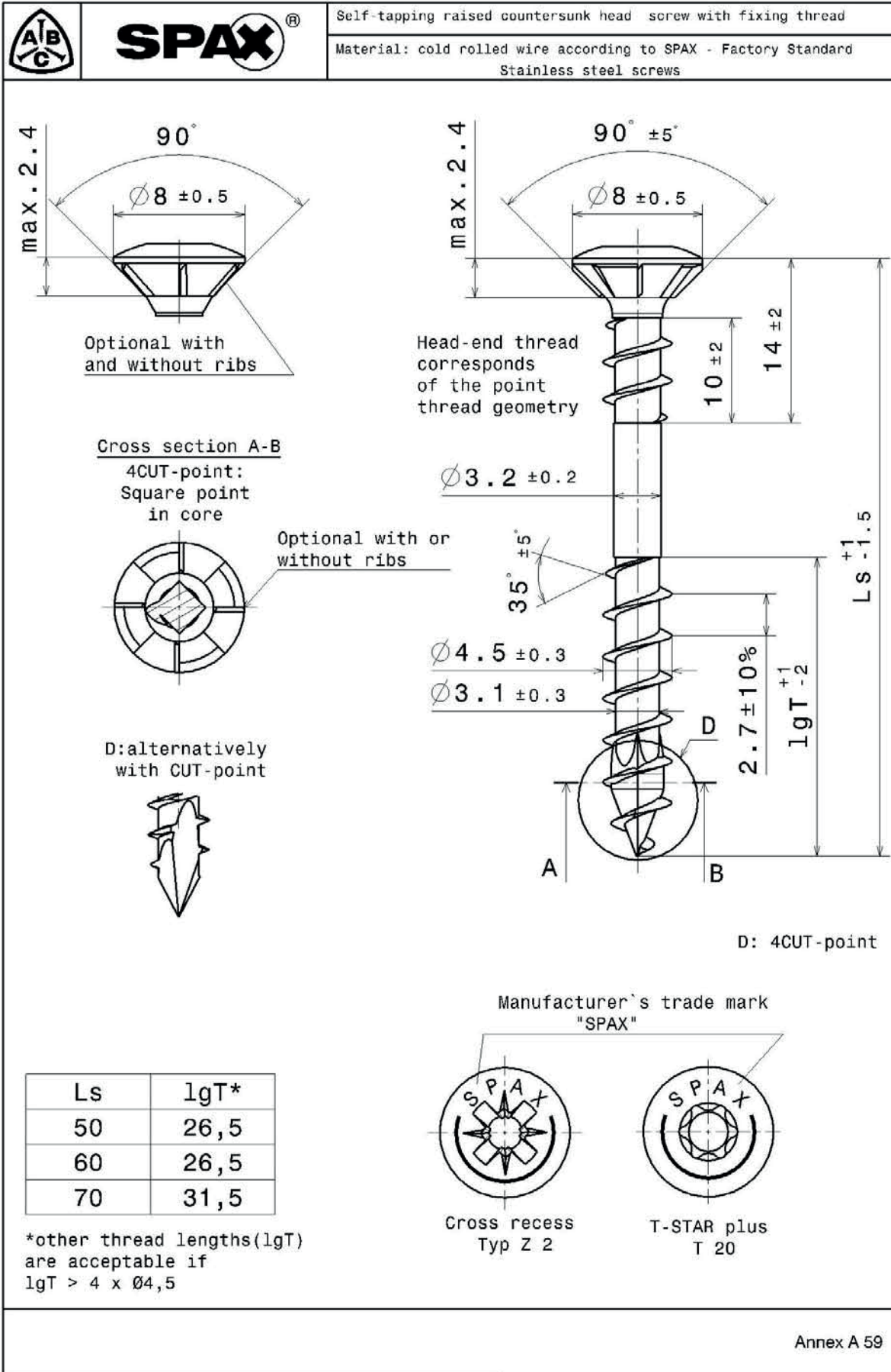


*other thread lengths (lgT)
are acceptable if
 $lgT > 4 \times 3,5$

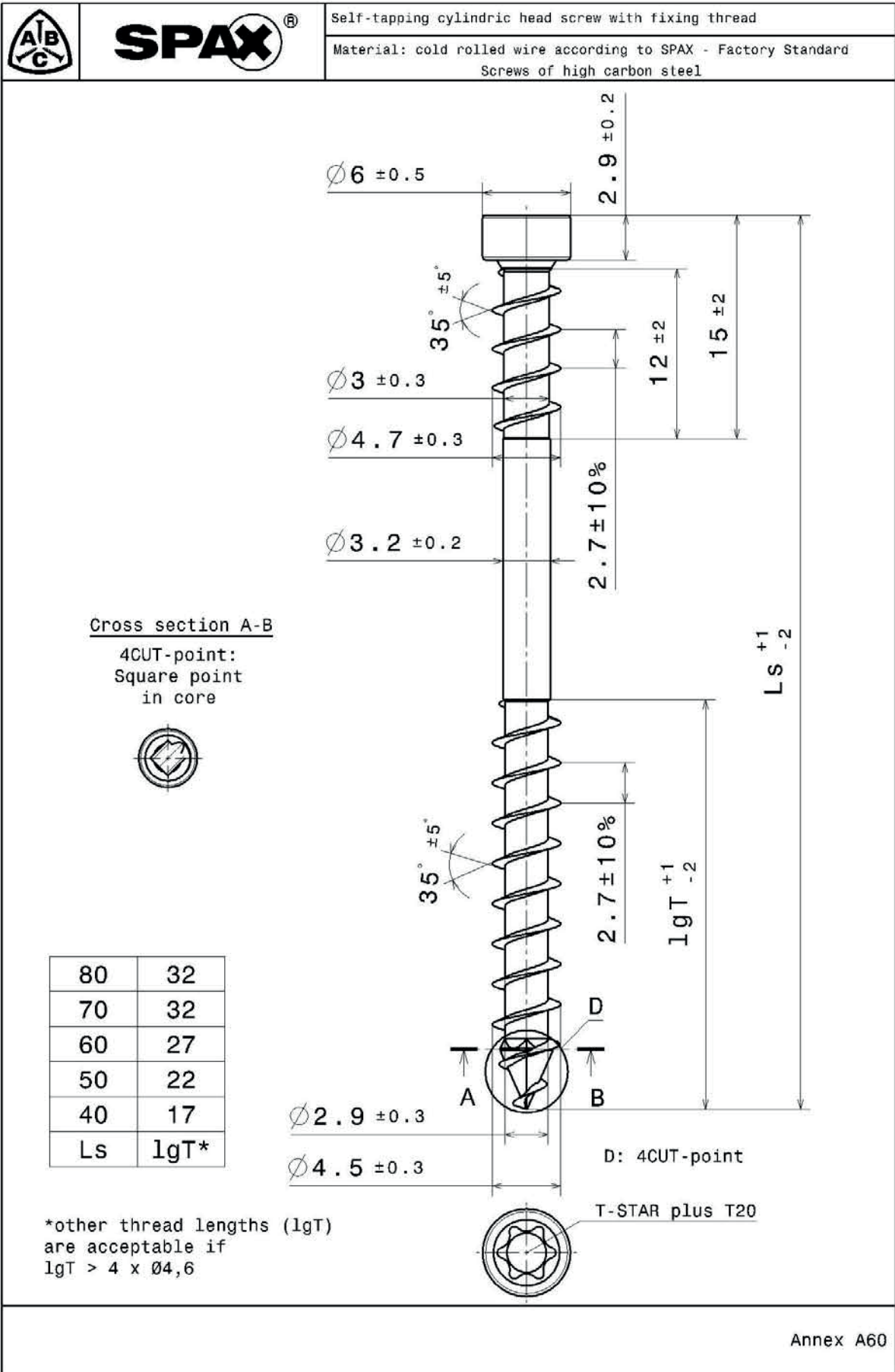








Annex A 59



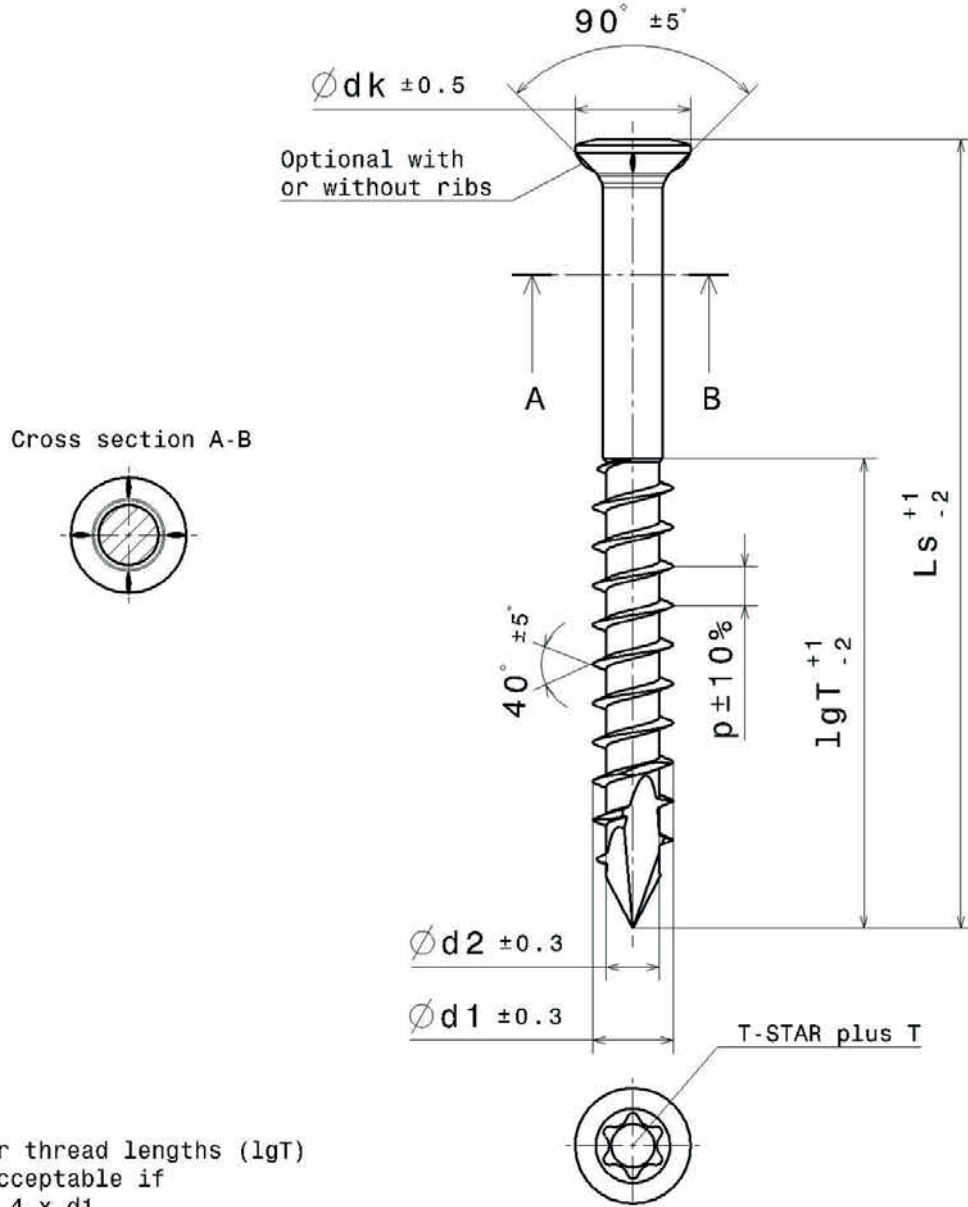


SPAX®

Self-tapping raised countersunk head screw with CUT-point

Material: cold rolled wire according to SPAX - Factory Standard
Stainless steel screws

Screws with CUT-point



*other thread lengths (lgT) are acceptable if lgT > 4 x d1

| | | | | | | |
|-----|-----|----|-----|-----|------|-----|
| 5,0 | 3,3 | 8 | T20 | 100 | 61 | 2,5 |
| 4,5 | 3 | 7 | T15 | 70 | 42 | 2,2 |
| 4,0 | 2,7 | 6 | T15 | 45 | 29 | 2 |
| 4,0 | 2,7 | 6 | T15 | 40 | 24 | 2 |
| d1 | d2 | dk | T | Ls | lgT* | p |

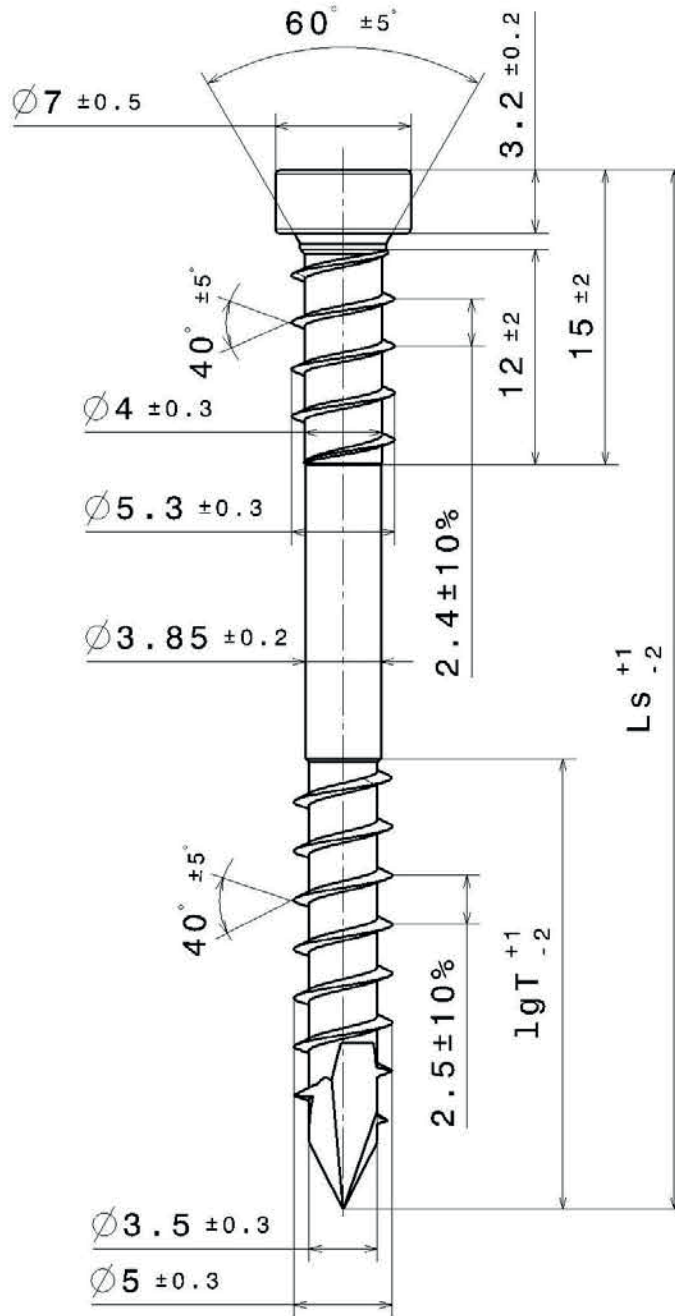


SPAX®

Self-tapping cylindric head screw with fixing thread

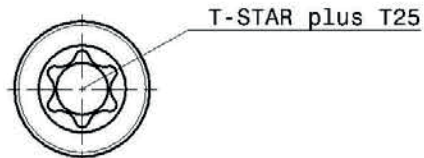
Material: cold rolled wire according to SPAX - Factory Standard
Stainless steel screw

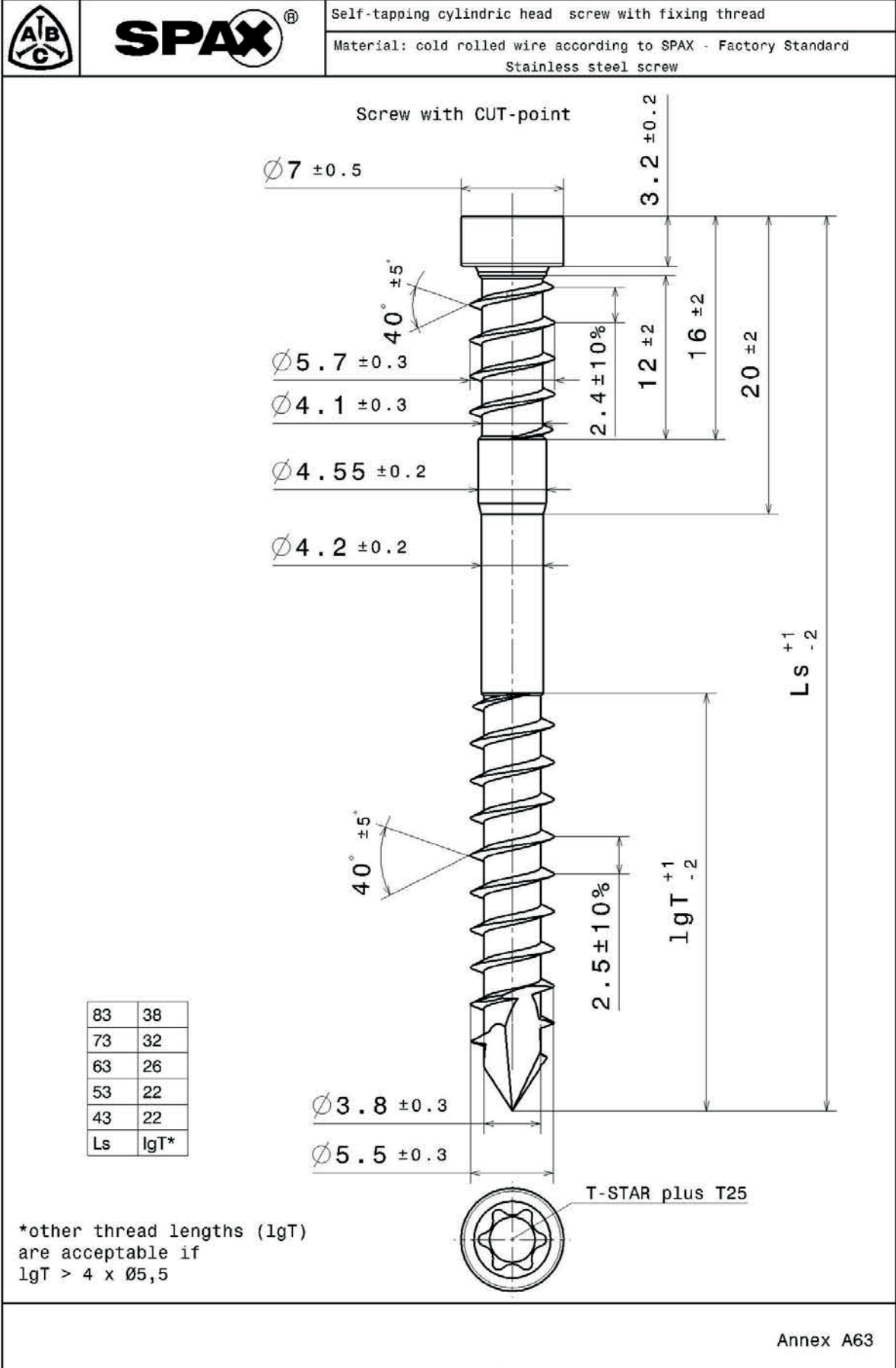
Screw with CUT-point

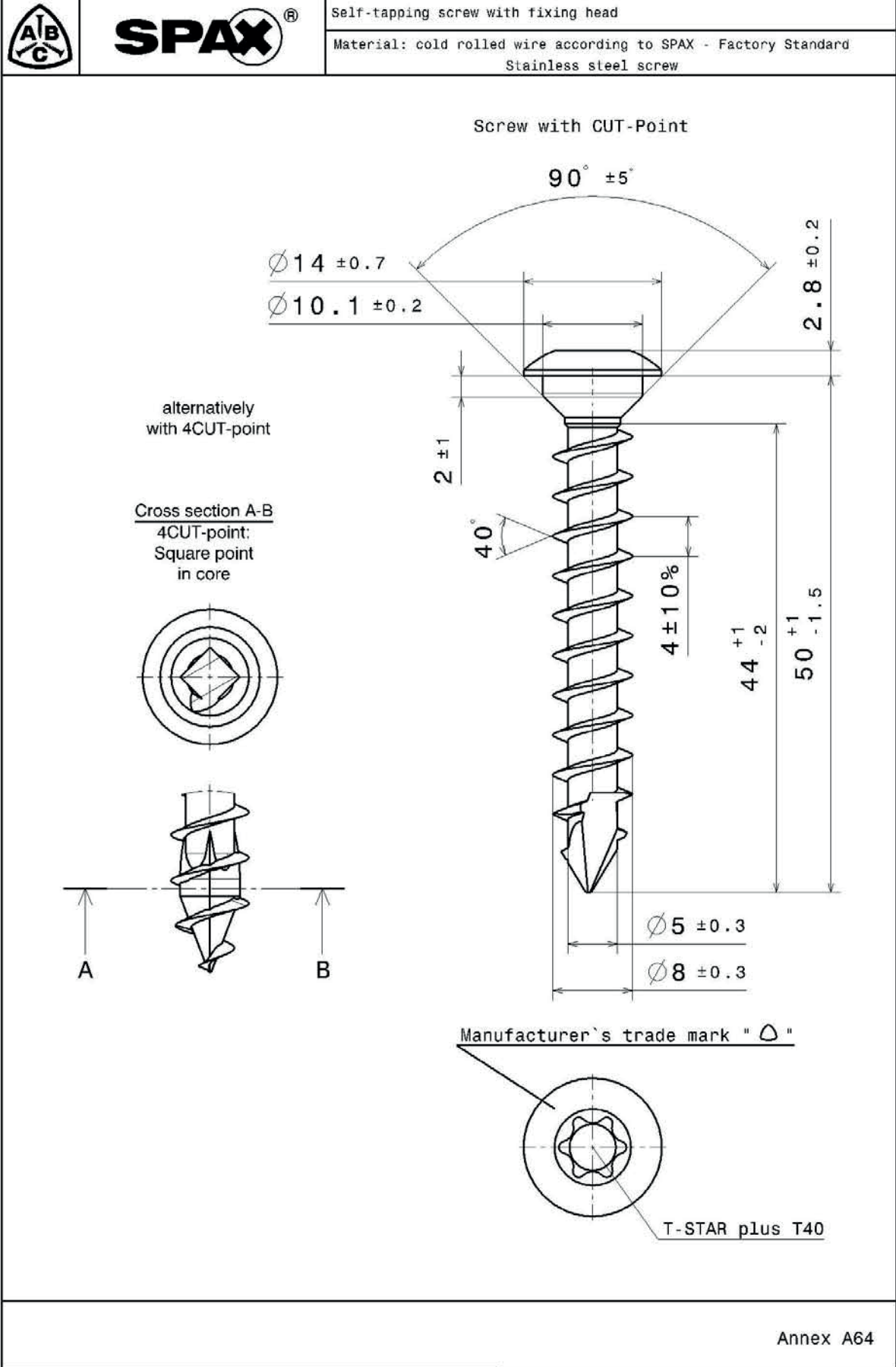


| | |
|----|------|
| 83 | 36 |
| 73 | 31 |
| 63 | 26 |
| 53 | 21 |
| 43 | 21 |
| Ls | lgT* |

*other thread lengths (lgT) are acceptable if $lgT > 4 \times \varnothing 5,0$





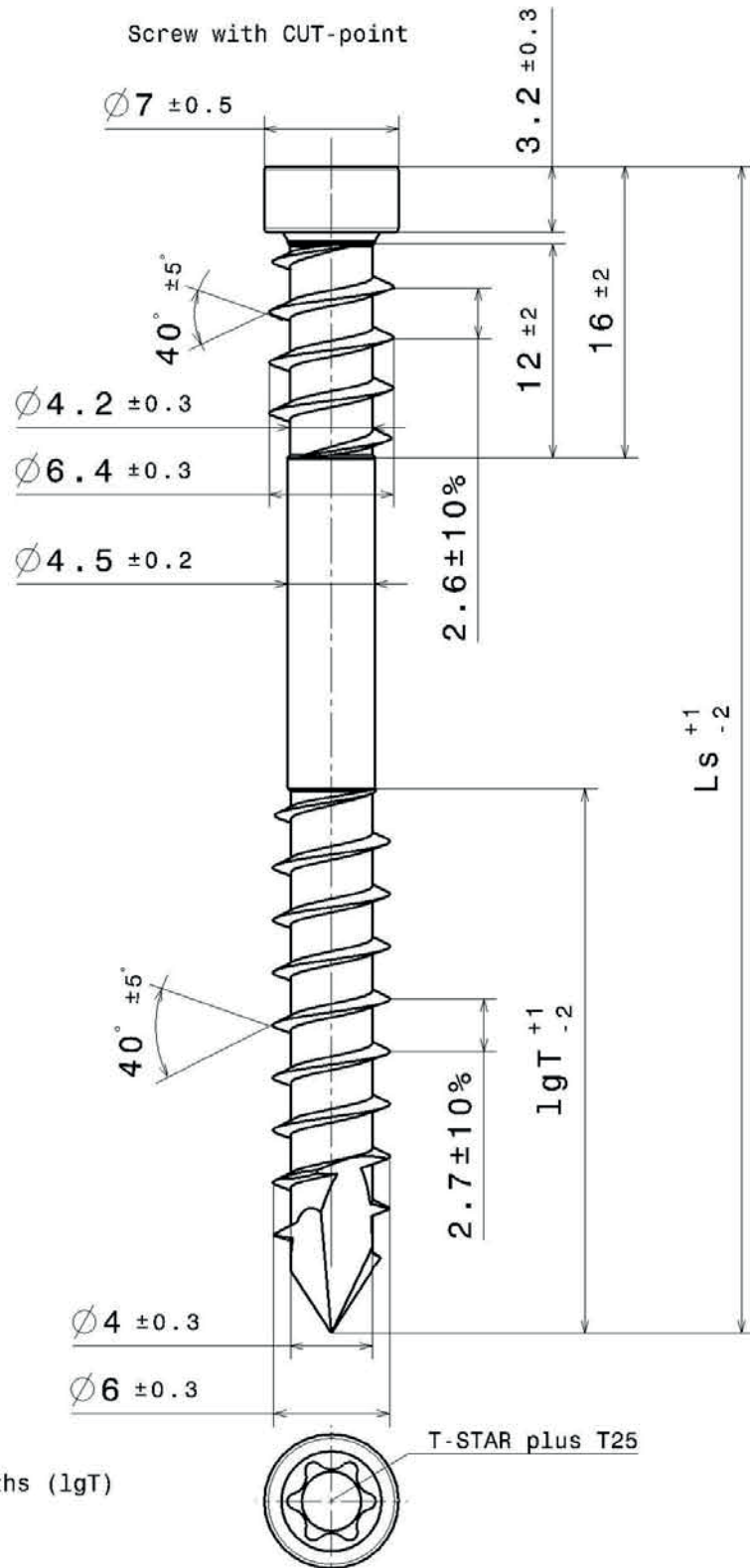




SPAX®

Self-tapping cylindric head screw with fixing thread

Material: cold rolled wire according to SPAX - Factory Standard
Stainless steel screw



*other thread lengths (lgT) are acceptable if $lgT > 4 \times \varnothing 6,0$

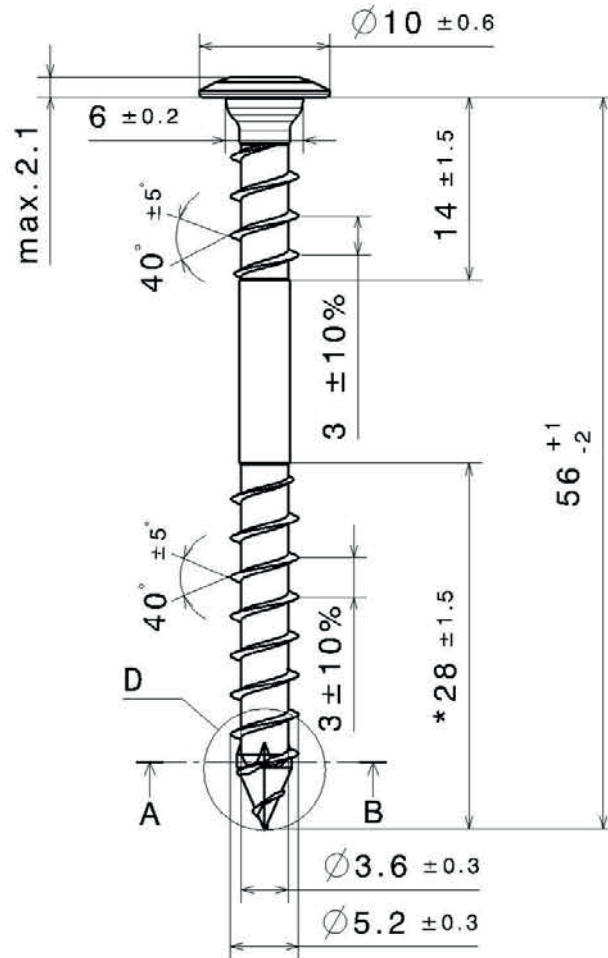
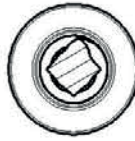


SPAX®

Self-tapping special washer head screw with fixing thread

Material: cold rolled wire according to SPAX - Factory Standard
Stainless steel screw

Cross section A-B
4CUT-point:
square point
in core



D: alternatively
with CUT-point


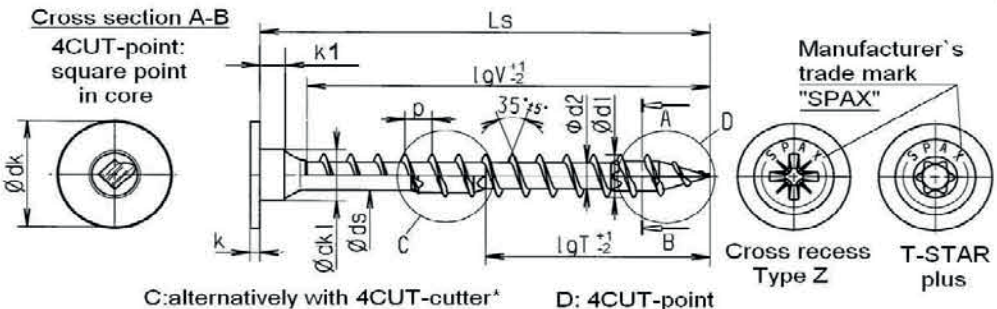




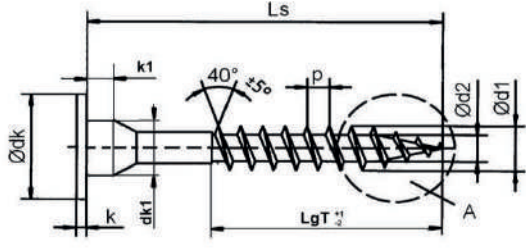

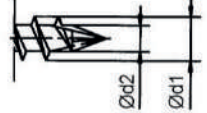
D: 4CUT point


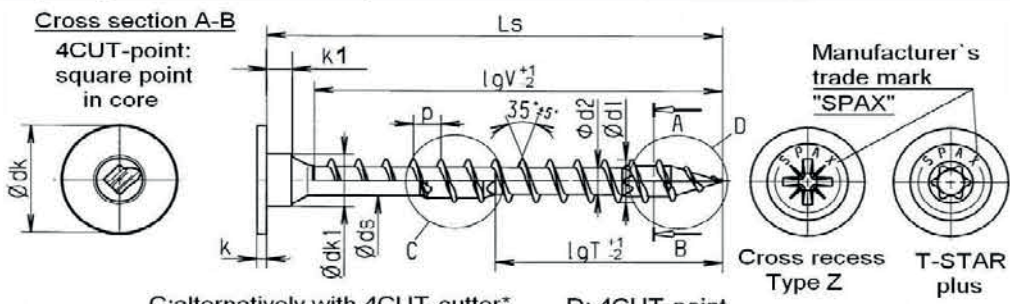
T-STAR plus T20
Manufacturer's
trade mark "SPAX"



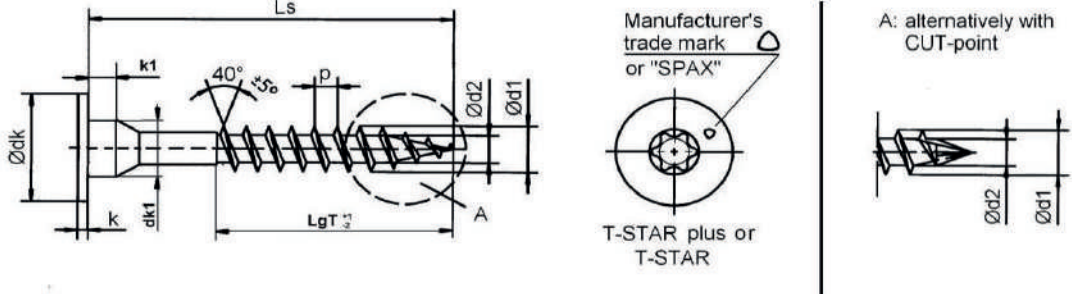


* other thread lengths (lgT)
are acceptable if
lgT > 4 x Ø5,0

|  SPAX® Special Washer head | | Self-tapping screw with full and partial thread | | | | | | | | | | | | | | | | | | | |
|--|-----------------------|--|--|-------|------|-----------------------------------|-------|-------|-----|-------|------|------|-----|------|-----|-------|-----|-------|------|------|--|
| | | Material: cold rolled wire according to SPAX - Factory Standard Screws of high carbon steel | | | | | | | | | | | | | | | | | | | |
|  <p>C: alternatively with 4CUT-cutter* D: 4CUT-point</p> | | | | | | | | | | | | | | | | | | | | | |
| Nominal diameter | | | | 4,5 | | 5,0 | | 6,0 | | 8,0 | | 10,0 | | | | | | | | | |
| d1 | thread size | | | 4,5 | | 5,0 | | 6,0 | | 8,1 | | 10,0 | | | | | | | | | |
| | permissible tolerance | | | | | ±0,3 | | | | ±0,4 | | ±0,5 | | | | | | | | | |
| dk | head diameter | 10,6 | | 8,8 | | 11,6 | | 9,7 | | 13,6 | | 11,6 | | 20,0 | | 15,1 | | 25,0 | | 18,6 | |
| | permissible tolerance | | | | | ±0,5 | | | | ±0,65 | | ±0,5 | | ±1,0 | | ±0,75 | | ±1,25 | | ±0,9 | |
| dk1 | diameter | 6,3 | | 6,3 | | 7,5 | | 8,8 | | 13,5 | | | | | | | | | | | |
| | permissible tolerance | | | ±0,3 | | | | ±0,4 | | | | | | | | | | | | | |
| d2 | core diameter | 2,9 | | 3,2 | | 3,9 | | 5,0 | | 6,1 | | | | | | | | | | | |
| | permissible tolerance | | | | | ±0,3 | | | | | | | | | | | | | | | |
| ds | shank diameter | 3,20 | | 3,55 | | 4,30 | | 5,70 | | 6,80 | | | | | | | | | | | |
| | permissible tolerance | | | ±0,10 | | | | ±0,25 | | | | | | | | | | | | | |
| k | head height max. | 1,5 | | 1,5 | | 2,0 | | 2,5 | | 3,0 | | | | | | | | | | | |
| k1 | head height | 1,5 | | 1,5 | | 1,8 | | 2,0 | | 2,5 | | | | | | | | | | | |
| | permissible tolerance | | | ±0,3 | | | | ±0,5 | | | | | | | | | | | | | |
| p | thread pitch | 2,7 | | 3,0 | | 3,6 | | 4,8 | | 6,0 | | | | | | | | | | | |
| | permissible tolerance | | | | | ±0,1 x p | | | | | | | | | | | | | | | |
| T-STAR plus size | | | | T20 | | T30 | | T40 | | T50 | | | | | | | | | | | |
| Cross recess size Type Z | | | | 2 | | 3 | | | | | | | | | | | | | | | |
| 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 | lgV | lgT | lgV | lgT | lgV | lgT | |
| 25 | 23,5 | 25,5 | 20,0 | | 20,0 | | | | | | | | | | | | | | | | |
| 30 | 28,5 | 30,5 | 25,0 | | 25,0 | | 24,0 | | | | | | | | | | | | | | |
| 35 | 33,5 | 36,0 | 30,0 | | 30,0 | | 29,0 | | | | | | | | | | | | | | |
| 40 | 38,5 | 41,0 | 34,0 | 20,0 | 35,0 | 20,0 | 34,0 | | | | 32,0 | | | | | | | | | | |
| 45 | 43,5 | 46,0 | 39,0 | 22,5 | 39,0 | 22,0 | 38,0 | | | | 37,0 | | | | | | | | | | |
| 50 | 48,5 | 51,0 | 44,0 | 25,0 | 44,0 | 25,0 | 43,0 | 24,0 | | | 42,0 | | | | | | | | 40,0 | | |
| 55 | 53,5 | 56,0 | 49,0 | 27,5 | 49,0 | 27,0 | 48,0 | 27,0 | | | 47,0 | | | | | | | | 45,0 | | |
| 60 | 58,5 | 61,0 | 54,0 | 30,0 | 54,0 | 30,0 | 53,0 | 29,0 | | | 52,0 | | | | | | | | 50,0 | | |
| 65 | 63,5 | 66,0 | 59,0 | 32,5 | 59,0 | 32,0 | 58,0 | 32,0 | | | 57,0 | 32,0 | | | | | | | 55,0 | | |
| 70 | 68,5 | 71,0 | 59,0 | 34,0 | 61,0 | 35,0 | 61,0 | 34,0 | | | 61,0 | 32,0 | | | | | | | 60,0 | | |
| 75 | 73,5 | 76,0 | 59,0 | 37,0 | 61,0 | 37,0 | 61,0 | 37,0 | | | 61,0 | 37,0 | | | | | | | 60,0 | | |
| 80 | 78,5 | 81,0 | 59,0 | 39,0 | 61,0 | 39,0 | 61,0 | 38,0 | | | 70,0 | 39,0 | | | | | | | 70,0 | | |
| 90 | 88,5 | 91,5 | 59,0 | 44,0 | | 44,0 | 61,0 | 43,0 | | | 80,0 | 39,0 | | | | | | | 80,0 | | |
| 100 | 98,5 | 101,5 | | 49,0 | | 49,0 | 61,0 | 48,0 | | | 80,0 | 47,0 | | | | | | | 80,0 | 50,0 | |
| 110 | 108,5 | 111,5 | | 54,0 | | 54,0 | 68,0* | 53,0 | | | 80,0 | 47,0 | | | | | | | 80,0 | 50,0 | |
| 120 | 118,5 | 121,5 | | | | 59,0 | 68,0* | 56,0 | | | 80,0 | 57,0 | | | | | | | 80,0 | 60,0 | |
| 130 | 128,0 | 132,0 | | | | | 68,0* | 61,0 | | | 80,0 | 61,0 | | | | | | | 80,0 | 60,0 | |
| 140 | 138,0 | 142,0 | | | | | | 68,0* | | | 70,0 | | | | | | | | 70,0 | | |
| 150 | 148,0 | 152,0 | | | | | | 68,0* | | | 70,0 | | | | | | | | 70,0 | | |
| to | | | | | | | | | | | | | | | | | | | | | |
| 160 | 158,0 | 162,0 | | | | | | 68,0* | | | 80,0 | | | | | | | | 80,0 | | |
| 600 | 597,0 | 602,0 | | | | | | | | | 80,0 | | | | | | | | 80,0 | | |
| Screws of Ø6,0mm with partial thread additionally in lengths of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm* | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | * Design C with lgT= max. 65,0 mm | | | | | | | | | | | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | | | | | | | | | | | | |
| -Preferred size | | | | | | | | | | | | | | | | | | | | | |

| | | | | |
|--|---|---|---|-------|
|  |  Special Washer Head | Self-tapping screw with partial thread Material: Cold rolled wire according to SPAX - Factory Standard Screws of high-carbon steel | | |
| |  | | Manufacturer's trade mark or "SPAX"  T-STAR plus or T-STAR | |
| | | A: alternatively with CUT-point  | | |
| Nominal diameter | | 12,0 | | |
| Type of Head | | Special Washer head | | |
| d1 | thread size | 12,0 | | |
| | permissible tolerance | ±0,30 | | |
| dk | head diameter | 18,6 | 25,0 | 29,0 |
| | permissible tolerance | ±0,93 | ±1,25 | ±1,45 |
| dk1 | diameter | 13,5 | | |
| | permissible tolerance | ±0,6 | | |
| d2 | core diameter | 7,35 | | |
| | permissible tolerance | ±0,35 | | |
| k | head height max. | 4,0 | | |
| k1 | head height | 2,5 | | |
| | permissible tolerance | ±0,5 | | |
| p | thread pitch | 6,0 | | |
| | permissible tolerance | ±0,1 x p | | |
| T - STAR plus size | | T50 | | |
| Ls | | Standard thread lengths partial thread = lgT) | | |
| Nom. dim. | min | max | | |
| 80 | 78,5 | 81,5 | lgT | |
| 90 | 88,5 | 91,5 | 50,0 | |
| 100 | 98,5 | 101,5 | 55,0 | |
| 110 | 108,5 | 111,5 | 60,0 | |
| 120 | 118,5 | 121,5 | 80,0 | |
| 130 | 128,0 | 132,0 | 80,0 | |
| 140 | 138,0 | 142,0 | 100,0 | |
| 150 | 148,0 | 152,0 | 100,0 | |
| 160 | 158,0 | 162,0 | 100,0 | |
| 180 | 178,0 | 182,0 | 100,0 | |
| 200 | 198,0 | 202,0 | 100,0 | |
| <i>to</i> | | | | |
| 600 | 597,0 | 602,0 | 100,0 | |
| Screw lengths Ls to 600 mm possible Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | | |
| Annex A68 | | | | |

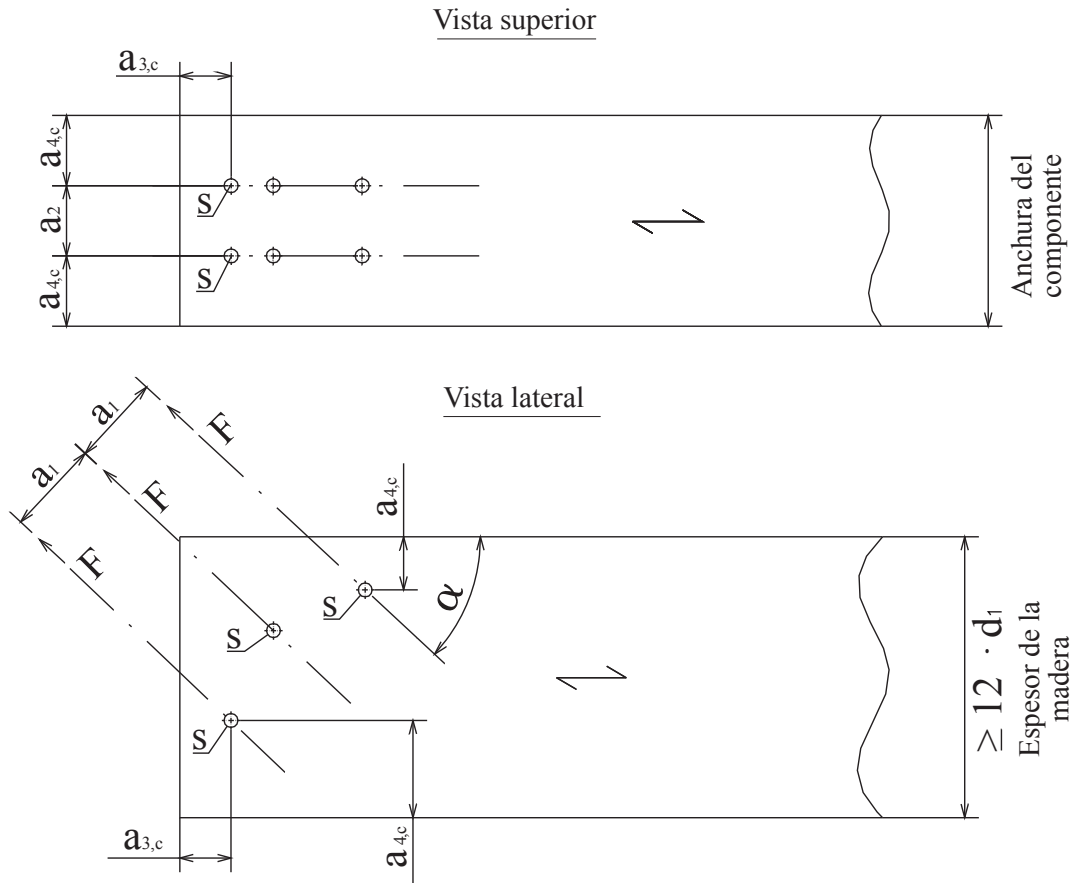
|  SPAX® Special Washer head | | Self-tapping screw with full and partial thread | | | | | | | | | | |
|---|-----------------------|--|--|-------------|------------|---|-----------------------------------|-------|------|------|------|------|
| | | Material: cold rolled wire according to SPAX - Factory Standard Stainless steel screw | | | | | | | | | | |
|  <p>C: alternatively with 4CUT-cutter* D: 4CUT-point</p> | | | | | | | | | | | | |
| Nominal diameter | | | 4,5 | 5,0 | 6,0 | 8,0 10,0 | | | | | | |
| d1 | thread size | | 4,5 | 5,0 | 6,0 | 8,1 10,0 | | | | | | |
| | permissible tolerance | | | ±0,3 | | ±0,4 ±0,5 | | | | | | |
| dk | head diameter | | 10,6 | 8,8 11,6 | 9,7 | 13,6 11,6 20,0 15,1 25,0 18,6 | | | | | | |
| | permissible tolerance | | | ±0,6 | | ±0,65 ±0,6 ±1,0 ±0,75 ±1,25 ±0,9 | | | | | | |
| dk1 | diameter | | 6,3 | 6,3 | 7,5 | 8,8 13,5 | | | | | | |
| | permissible tolerance | | | ±0,5 | | ±0,6 | | | | | | |
| d2 | core diameter | | 3,1 | 3,4 | 3,9 | 5,3 6,1 | | | | | | |
| | permissible tolerance | | | | ±0,3 | | | | | | | |
| ds | shank diameter | | 3,30 | 3,75 | 4,30 | 5,70 6,80 | | | | | | |
| | permissible tolerance | | | ±0,3 | | ±0,3 | | | | | | |
| k | head height max. | | 1,5 | 1,5 | 2,0 | 2,5 3,0 | | | | | | |
| k1 | head height | | 1,5 | 1,5 | 1,8 | 2,0 2,5 | | | | | | |
| | permissible tolerance | | | ±0,3 | | ±0,5 | | | | | | |
| p | thread pitch | | 2,7 | 3,0 | 3,6 | 4,8 6,0 | | | | | | |
| | permissible tolerance | | | | ±0,1 x p | | | | | | | |
| T-STAR plus size | | | | T20 | T30 | T40 T50 | | | | | | |
| Cross recess size Type Z | | | | 2 | 3 | | | | | | | |
| Ls | | Standard thread lengths (full thread = lgV / partial thread = lgT) | | | | | | | | | | |
| Nom. dim. | min | max | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT | lgV | lgT |
| 25 | 23,5 | 25,5 | 20,0 | | 20,0 | | | | | | | |
| 30 | 28,5 | 30,5 | 25,0 | | 25,0 | | 24,0 | | | | | |
| 35 | 33,5 | 36,0 | 30,0 | | 30,0 | | 29,0 | | | | | |
| 40 | 38,5 | 41,0 | 34,0 | 20,0 | 35,0 | 20,0 | 34,0 | | 32,0 | | | |
| 45 | 43,5 | 46,0 | 39,0 | 22,5 | 39,0 | 22,0 | 38,0 | | 37,0 | | | |
| 50 | 48,5 | 51,0 | 44,0 | 25,0 | 44,0 | 25,0 | 43,0 | 24,0 | 42,0 | | 40,0 | |
| 55 | 53,5 | 56,0 | 49,0 | 27,5 | 49,0 | 27,0 | 48,0 | 27,0 | 47,0 | | 45,0 | |
| 60 | 58,5 | 61,0 | 54,0 | 30,0 | 54,0 | 30,0 | 53,0 | 29,0 | 52,0 | | 50,0 | |
| 65 | 63,5 | 66,0 | 59,0 | 32,5 | 59,0 | 32,0 | 58,0 | 32,0 | 57,0 | 32,0 | 55,0 | |
| 70 | 68,5 | 71,0 | 59,0 | 34,0 | 61,0 | 35,0 | 61,0 | 34,0 | 61,0 | 32,0 | 60,0 | |
| 75 | 73,5 | 76,0 | 59,0 | 37,0 | 61,0 | 37,0 | 61,0 | 37,0 | 61,0 | 37,0 | 60,0 | |
| 80 | 78,5 | 81,0 | 59,0 | 39,0 | 61,0 | 39,0 | 61,0 | 38,0 | 70,0 | 39,0 | 70,0 | |
| 90 | 88,5 | 91,5 | 59,0 | 44,0 | | 44,0 | 61,0 | 43,0 | 80,0 | 39,0 | 80,0 | |
| 100 | 98,5 | 101,5 | | 49,0 | | 49,0 | 61,0 | 48,0 | 80,0 | 47,0 | 80,0 | 50,0 |
| 110 | 108,5 | 111,5 | | 54,0 | | 54,0 | 68,0* | 53,0 | 80,0 | 47,0 | 80,0 | 50,0 |
| 120 | 118,5 | 121,5 | | | | 59,0 | 68,0* | 56,0 | 80,0 | 57,0 | 80,0 | 60,0 |
| 130 | 128,0 | 132,0 | | | | | 68,0* | 61,0 | 80,0 | 61,0 | 80,0 | 60,0 |
| 140 | 138,0 | 142,0 | | | | | | 68,0* | | 70,0 | | 70,0 |
| 150 | 148,0 | 152,0 | | | | | | 68,0* | | 70,0 | | 70,0 |
| to | | | | | | | | | | | | |
| 160 | 158,0 | 162,0 | | | | | | 68,0* | | 80,0 | | 80,0 |
| 600 | 597,0 | 602,0 | | | | | | | | 80,0 | | 80,0 |
| Screws of Ø6,0mm with partial thread additionally in lengths of 180 to 300 mm, in steps of 20 mm, LgT= 68,0 mm* | | | Other thread lengths in the range ≥4xd1 to max. standard length permitted. | | | | * Design C with lgT= max. 65,0 mm | | | | | |
| Intermediate lengths on Ls possible | | | | | | | | | | | | |
| = Preferred size | | | | | | | | | | | | |

| | | | |
|---|--|---|--------------|
|  |  Special Washer Head | Self-tapping screw with partial thread Material: Cold rolled wire according to SPAX - Factory Standard Stainless steel screw | |
| |  | | |
| Nominal diameter | | 12,0 | |
| Type of Head | | Special Washer head | |
| d1 | thread size | 12,0 | |
| | permissible tolerance | ±0,60 | |
| dk | head diameter | 18,6 | 25,0 |
| | permissible tolerance | ±0,93 | ±1,25 |
| dk1 | diameter | 29,0 | |
| | permissible tolerance | ±1,45 | |
| d2 | core diameter | 13,5 | |
| | permissible tolerance | ±0,6 | |
| k | head height max. | 7,35 | |
| | permissible tolerance | ±0,35 | |
| k1 | head height | 4,0 | |
| | permissible tolerance | ±0,5 | |
| p | thread pitch | 2,5 | |
| | permissible tolerance | ±0,5 | |
| T - STAR plus size | | 6,0 | |
| T - STAR plus size | | ±0,1 x p | |
| Ls | | T50 | |
| Ls | | Standard thread lengths partial thread = lgT) | |
| Nom. dim. | min | max | lgT |
| 80 | 78,5 | 81,5 | 50,0 |
| 90 | 88,5 | 91,5 | 55,0 |
| 100 | 98,5 | 101,5 | 60,0 |
| 110 | 108,5 | 111,5 | 80,0 |
| 120 | 118,5 | 121,5 | 80,0 |
| 130 | 128,0 | 132,0 | 80,0 |
| 140 | 138,0 | 142,0 | 80,0 |
| 150 | 148,0 | 152,0 | 100,0 |
| 160 | 158,0 | 162,0 | 100,0 |
| 180 | 178,0 | 182,0 | 100,0 |
| 200 | 198,0 | 202,0 | 100,0 |
| <i>to</i> | | | |
| 600 | 597,0 | 602,0 | 100,0 |
| Screw lengths Ls to 600 mm possible | | | |
| Other thread lengths in the range ≥4xd1 to max. standard length permitted | | | |
| Annex A70 | | | |

Anexo B Separaciones y distancias mínimas

Separaciones y distancias mínimas para tornillos SPAX con carga exclusivamente axial con punta CUT o 4CUT o con $d \leq 8$ mm en agujeros no perforados previamente en elementos de madera maciza, madera laminada encolada o productos encolados similares

Configuración simple



- Dirección de la fibra
- Eje del tornillo
- S** Centro de gravedad de la parte del tornillo dentro de la madera
- $15^\circ \leq \alpha \leq 90^\circ$

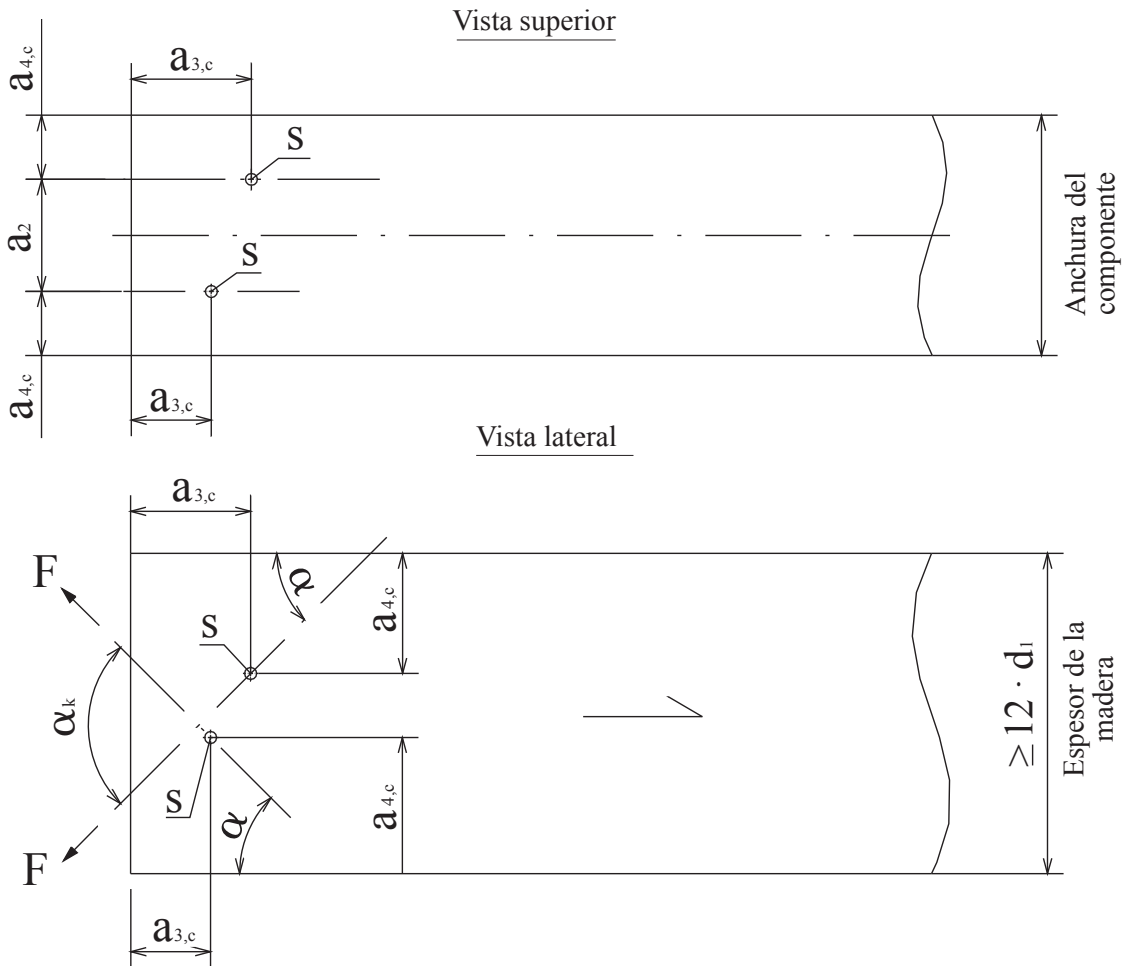
$$\begin{aligned}
 a_1 &\geq 5 \cdot d \\
 a_2 &\geq 2,5 \cdot d \\
 a_{3,c} &\geq 5 \cdot d \\
 a_{4,c} &\geq 4 \cdot d \\
 &\geq 3 \cdot d \quad \text{para tornillos con punta CUT o 4CUT} \\
 a_1 \cdot a_2 &\geq 25 \cdot d^2
 \end{aligned}$$

Para las separaciones y distancias mínimas, ver también el apartado 3.11

Espesor mínimo de la madera $t = 12 \cdot d$ para madera maciza o madera laminada encolada y $t = 6 \cdot d$ para madera laminada enchapada, ver también 3.11

Separaciones y distancias mínimas para tornillos SPAX con carga exclusivamente axial con punta CUT o 4CUT o con $d \leq 8$ mm en agujeros no perforados previamente en elementos de madera maciza, madera laminada encolada o productos encolados similares

Configuración en cruz



- \longleftarrow Dirección de la fibra
- - - Eje del tornillo
- S Centro de gravedad de la parte del tornillo dentro de la madera
- $15^\circ \leq \alpha \leq 90^\circ$

$$\begin{aligned}
 a_1 &\geq 5 \cdot d \\
 a_2 &\geq 1,5 \cdot d && \text{para } 70^\circ < \alpha_k \leq 90^\circ \\
 &\geq 2,5 \cdot d \cdot (1 - \alpha_k / 180^\circ) && \text{para } 30^\circ \leq \alpha_k \leq 70^\circ \\
 a_{3,c} &\geq 5 \cdot d \\
 a_{4,c} &\geq 4 \cdot d \\
 &\geq 3 \cdot d && \text{para tornillos con punta CUT o 4CUT} \\
 a_1 \cdot a_2 &\geq 25 \cdot d^2
 \end{aligned}$$

Para las separaciones y distancias mínimas, ver también el apartado 3.11

Espesor mínimo de la madera $t = 12 \cdot d$ para madera maciza o madera laminada encolada y $t = 6 \cdot d$ para madera laminada enchapada, ver también 3.11

Vigas unidas mecánicamente

Tornillos SPAX con una rosca completa o varillas roscadas pueden utilizarse para uniones en elementos estructurales compuestos de varias partes en vigas o columnas unidas mecánicamente.

El módulo de deslizamiento axial K_{ser} de un tornillo o una varilla roscada con rosca completa para el estado límite de servicio en la dirección del tornillo debería considerarse, independientemente del ángulo α respecto a la fibra como:

$$C = K_{ser} = 25 \cdot d \cdot \ell_{ef} \text{ [N/mm]} \text{ para tornillos o varillas roscadas en madera blanda}$$

$$C = K_{ser} = 30 \cdot d \cdot \ell_{ef} \text{ [N/mm]} \text{ para tornillos en madera dura con perforación previa}$$

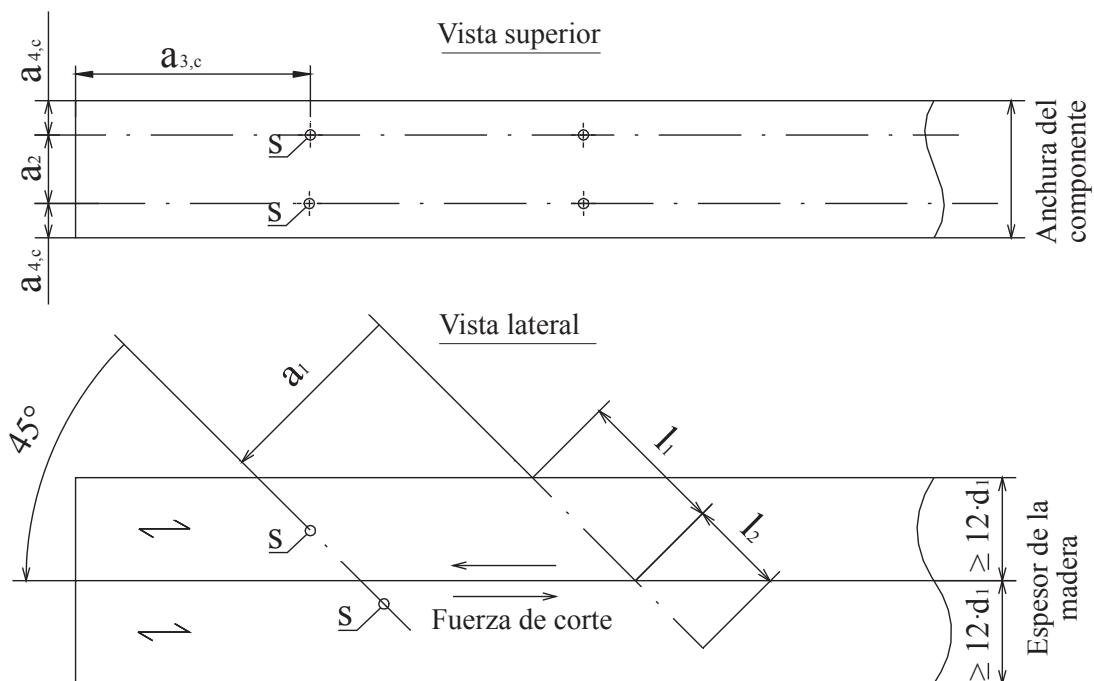
siendo,

d Diámetro exterior de la rosca [mm]

ℓ_{ef} Longitud de penetración en el elemento estructural correspondiente [mm], $\ell_{ef} = \ell_1$ o ℓ_2

Varillas roscadas o tornillos SPAX con carga axial en madera maciza, madera laminada encolada o madera laminada enchapada

Configuración simple



- \leftarrow Dirección de la fibra
- - - Eje del tornillo
- S Centro de gravedad de la parte del tornillo dentro de la madera

$$a_1 \geq 5 \cdot d$$

$$a_2 \geq 2,5 \cdot d$$

$$a_{3,c} \geq 5 \cdot d$$

$$a_{4,c} \geq 4 \cdot d$$

$$\geq 3 \cdot d \quad \text{para tornillos con punta CUT o 4CUT}$$

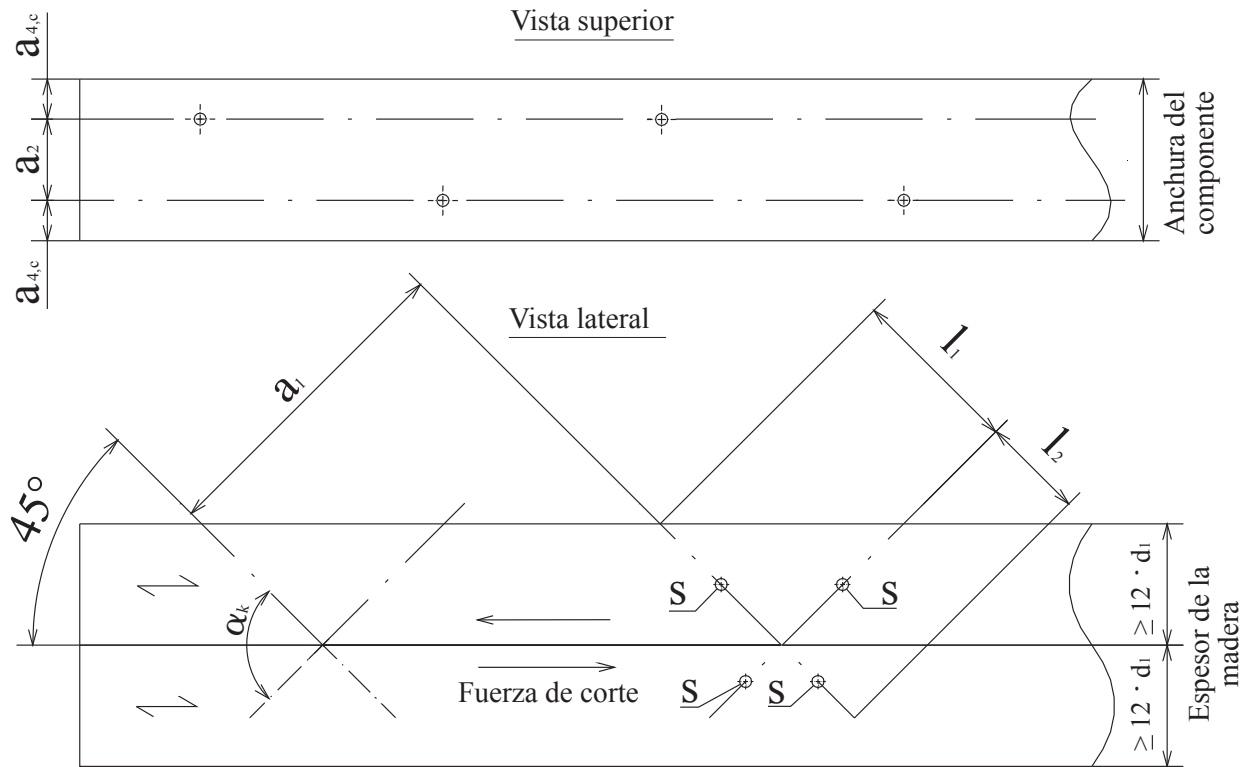
$$a_1 \cdot a_2 \geq 25 \cdot d^2$$

Para las separaciones y distancias mínimas, ver también el apartado 3.11

Espesor mínimo de la madera $t = 12 \cdot d$ para madera maciza o madera laminada encolada y $t = 6 \cdot d$ para madera laminada enchapada, ver también 3.11

Varillas roscadas o tornillos SPAX con carga axial en madera maciza, madera laminada encolada o madera laminada enchapada

Configuración en cruz



- \leftarrow Dirección de la fibra
- - - Eje del tornillo
- S Centro de gravedad de la parte del tornillo dentro de la madera

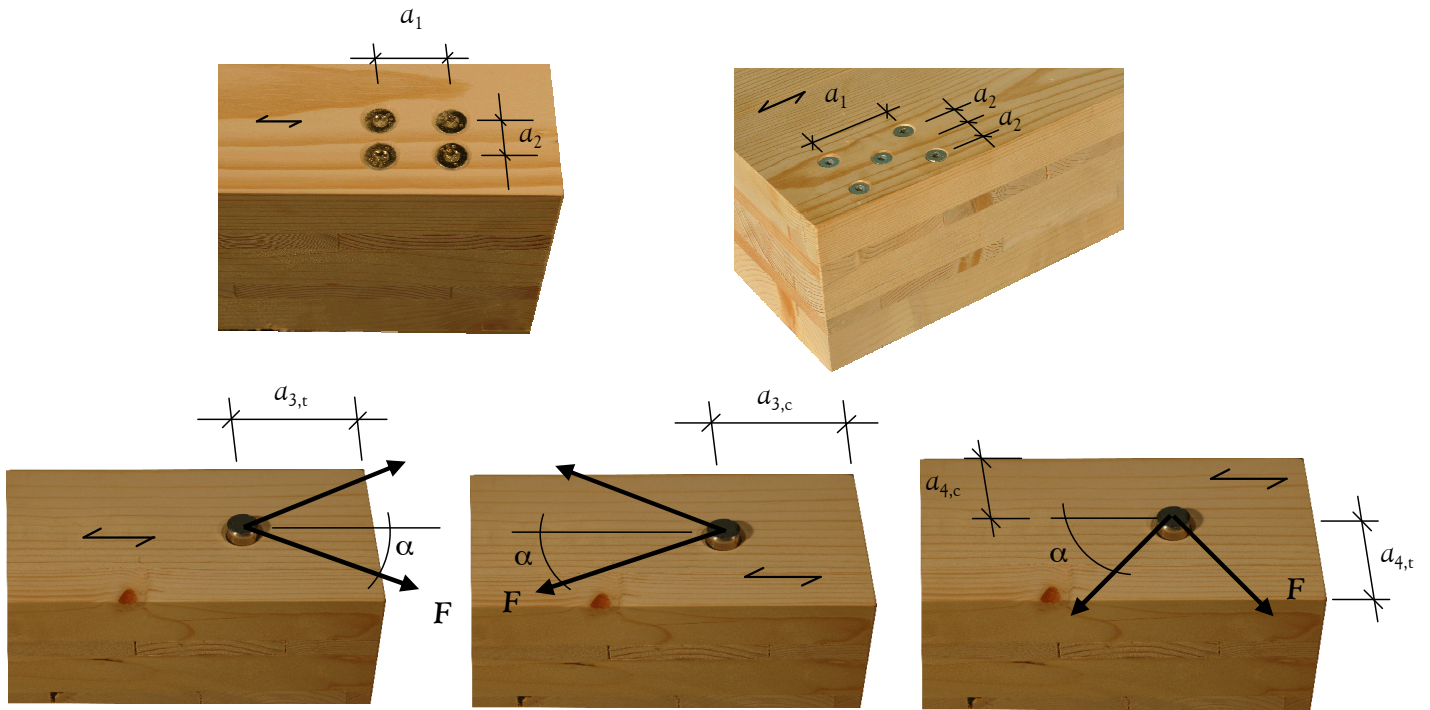
$$\begin{aligned}
 a_1 &\geq 5 \cdot d \\
 a_2 &\geq 2,5 \cdot d \quad (a_2 \geq 1,5 \cdot d \text{ entre los tornillos cruzados de un par de tornillos}) \\
 a_{3,c} &\geq 5 \cdot d \\
 a_{4,c} &\geq 4 \cdot d \\
 &\geq 3 \cdot d \quad \text{para tornillos con punta CUT o 4CUT} \\
 a_1 \cdot a_2 &\geq 25 \cdot d^2
 \end{aligned}$$

Para las separaciones y distancias mínimas, ver también el apartado 3.11

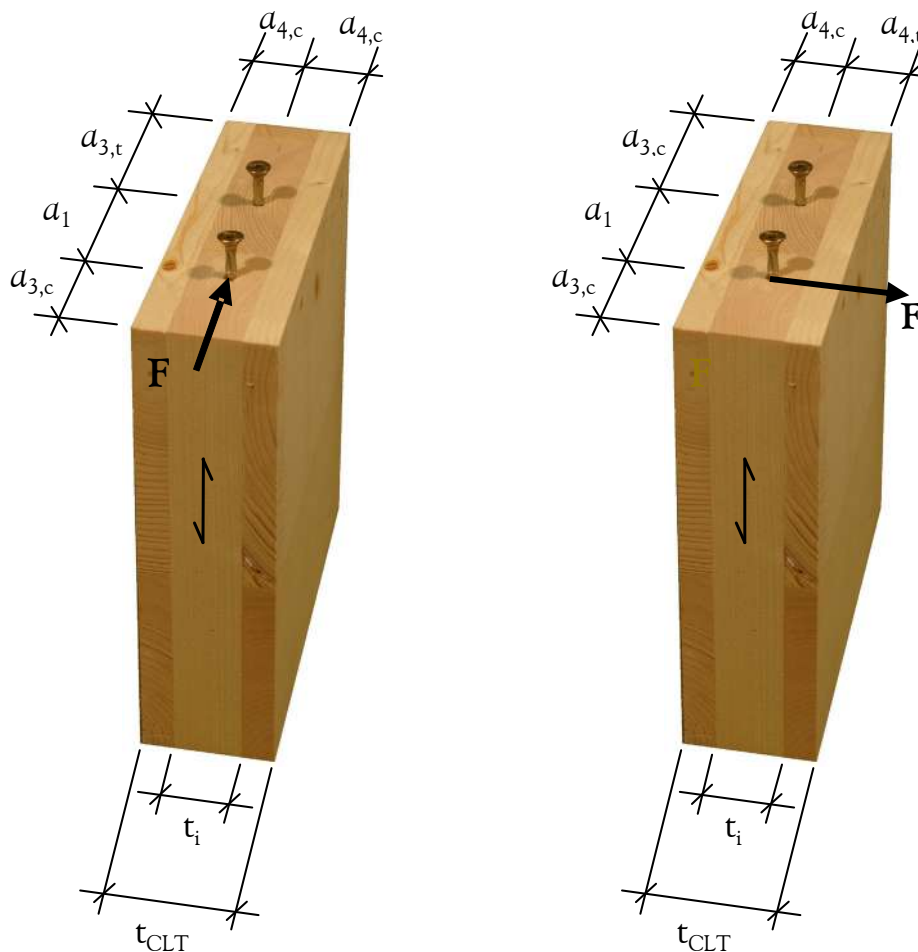
Espesor mínimo de la madera $t = 12 \cdot d$ para madera maciza o madera laminada encolada y $t = 6 \cdot d$ para madera laminada enchapada, ver también 3.11

Tornillos con carga axial o lateral en la superficie plana o del canto de madera contralaminada

Definición de separación, distancias al extremo y al canto en la superficie plana a menos que se indique lo contrario en la especificación técnica (ETA o hEN) para la madera contralaminada:



Definición de separación, distancias al extremo y al canto en la superficie del borde a menos que se indique lo contrario en la especificación técnica (ETA o hEN) para la madera contralaminada:



Anexo C Refuerzo a la compresión

Los tornillos SPAX o varillas roscadas con rosca completa pueden utilizarse para reforzar los elementos de madera con esfuerzos de compresión en un ángulo respecto a la fibra de $45^\circ \leq \alpha \leq 90^\circ$. La fuerza de compresión debe estar distribuida uniformemente sobre todos los tornillos. Debe instalarse una placa de acero como placa intermedia entre el elemento de madera y el soporte. Los tornillos deben insertarse en el elemento de madera al mismo nivel que la superficie para que haya contacto directo con la placa de acero y entre la placa de acero y la madera.

La capacidad de carga característica para un área de contacto con tornillos con rosca completa en un ángulo α respecto a la fibra de $45^\circ \leq \alpha \leq 90^\circ$ debe calcularse a partir de:

$$F_{90,Rd} = \min \left\{ \begin{array}{l} k_{c,90} \cdot B \cdot \ell_{ef,1} \cdot f_{c,90,d} + n \cdot F_{ax,Rd} \\ B \cdot \ell_{ef,2} \cdot f_{c,90,d} \end{array} \right. \quad (C.1)$$

siendo,

- $F_{90,Rd}$ Capacidad de carga de diseño del área de contacto reforzada [N]
- $k_{c,90}$ Factor para compresión perpendicular respecto a la fibra conforme a EN 1995-1-1
- B Anchura del apoyo [mm]
- $\ell_{ef,1}$ Longitud efectiva del área de contacto conforme a EN 1995-1-1 [mm]
- $f_{c,90,d}$ Longitud de compresión de diseño perpendicular respecto a la fibra [N/mm²]
- n Número de tornillos de refuerzo, $n = n_0 \cdot n_{90}$
- n_0 Número de tornillos de refuerzo dispuestos en una fila en paralelo a la fibra
- n_{90} Número de tornillos de refuerzo dispuestos en una fila en perpendicular a la fibra
- $F_{ax,Rd}$ Capacidad de compresión de diseño [N], ver página 7
- $\ell_{ef,2}$ Longitud de distribución efectiva en el plano de las puntas del tornillo [mm]
- $\ell_{ef,2} = \ell_{ef} + (n_0 - 1) \cdot a_1 + \min(\ell_{ef}, a_{3,c})$ para apoyos del extremo [mm]
- $\ell_{ef,2} = 2 \cdot \ell_{ef} + (n_0 - 1) \cdot a_1$ para apoyos centrales [mm]
- ℓ_{ef} Longitud de penetración de la punta [mm]
- a_1 Separación en paralelo a la fibra [mm]
- $a_{3,c}$ Distancia al extremo [mm]

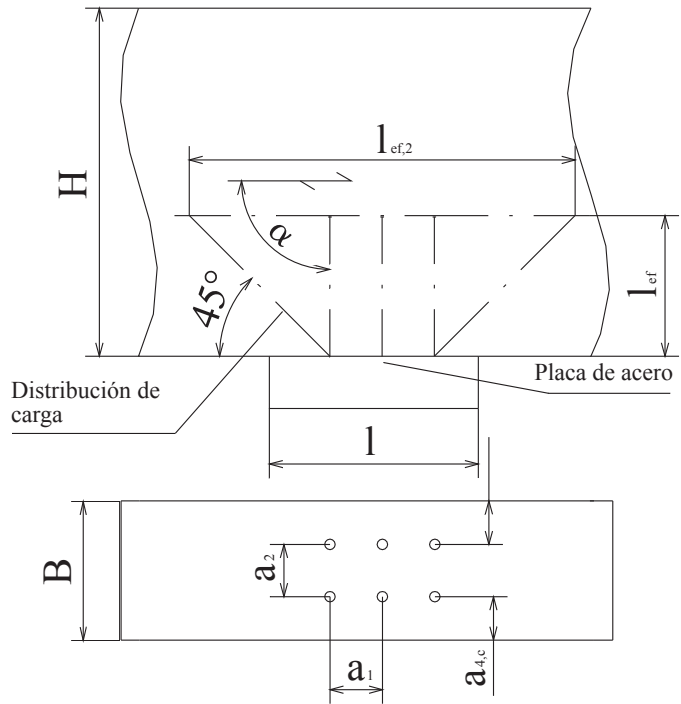
Si los tornillos se insertan en el elemento desde la parte superior e inferior y los tornillos se solapan al menos $10 \cdot d$, es decir, $\ell_{ef,top} + \ell_{ef,bottom} \geq H + 10 \cdot d$, puede descartarse la segunda condición de la ecuación (C.1).

Esta Evaluación Técnica Europea no hace referencia a tornillos de refuerzo o varillas roscadas para paneles a base de madera.

Apoyo central reforzado

- H Altura del componente [mm]
 B Anchura del apoyo [mm]
 ℓ_{ef} Longitud de penetración de la punta [mm]
 $\ell_{ef,2}$ Longitud de distribución efectiva en el plano de las puntas del tornillo [mm]
 $= 2 \cdot \ell_{ef} + (n_0 - 1) \cdot a_1$ para apoyos centrales

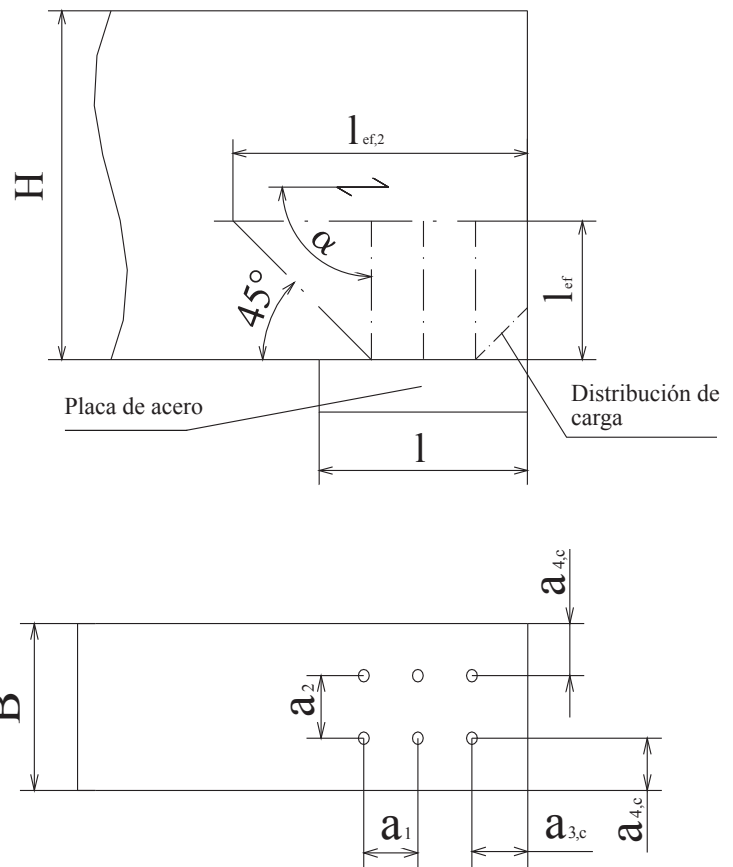
↔ Dirección de la fibra
 - - - Eje del tornillo
 $45^\circ \leq \alpha \leq 90^\circ$



Apoyo del extremo reforzado

- H Altura del componente [mm]
 B Anchura del apoyo [mm]
 ℓ_{ef} Longitud de penetración de la punta [mm]
 $\ell_{ef,2}$ Longitud de distribución efectiva en el plano de las puntas del tornillo [mm]
 $= \ell_{ef} + (n_0 - 1) \cdot a_1 + \min(\ell_{ef}; a_{3,c})$ para apoyos del extremo

↔ Dirección de la fibra
 - - - Eje del tornillo
 $45^\circ \leq \alpha \leq 90^\circ$



- $a_1 \geq 5 \cdot d$
 $a_2 \geq 2,5 \cdot d$
 $a_{3,c} \geq 5 \cdot d$
 $a_{4,c} \geq 4 \cdot d$
 $\geq 3 \cdot d$ para tornillos con punta CUT o 4CUT
 $a_1 \cdot a_2 \geq 25 \cdot d^2$

Las cabezas de los tornillos deben estar al mismo nivel que la superficie del elemento estructural de madera.

Anexo D Refuerzo a la tracción perpendicular a la fibra

A menos que se especifique de otro modo en disposiciones nacionales vigentes en el lugar de la instalación, la capacidad axial de un refuerzo de un elemento de madera cargado por una fuerza de unión perpendicular a la fibra debe cumplir la siguiente condición:

$$\frac{[1 - 3 \cdot \alpha^2 + 2 \cdot \alpha^3] \cdot F_{90,d}}{F_{ax,Rd}} \leq 1$$

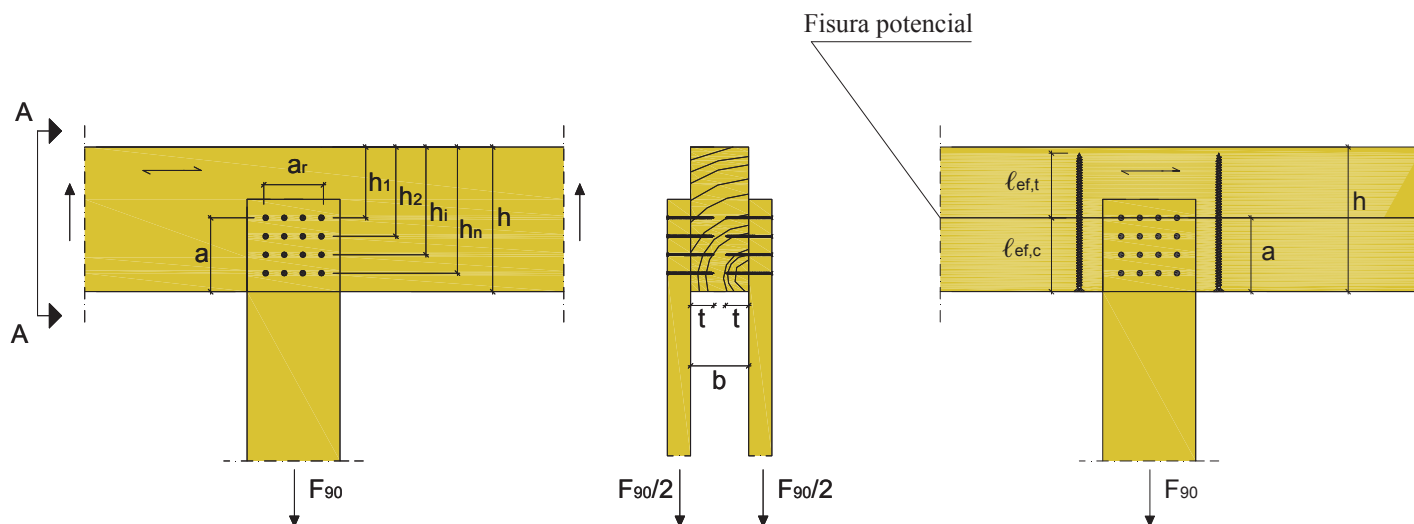
siendo,

$F_{90,d}$ Valor de diseño del componente de fuerza perpendicular respecto a la fibra [N],

$\alpha = a/h$

h = profundidad del elemento [mm]

$F_{ax,Rd}$ Mínimo de los valores de diseño de la capacidad de arranque y la capacidad de tracción de los tornillos de refuerzo o las varillas roscadas, donde ℓ_{ef} es el valor más bajo de la profundidad de penetración por debajo o por encima de la fisura potencial [N]



A menos que se especifique de otro modo en las disposiciones nacionales vigentes en el lugar de la instalación, la capacidad axial de un refuerzo de un soporte de viga entallada debe cumplir la siguiente condición:

$$\frac{1,3 \cdot V_d \cdot [3 \cdot (1 - \alpha)^2 - 2 \cdot (1 - \alpha)^3]}{F_{ax,Rd}} \leq 1$$

siendo,

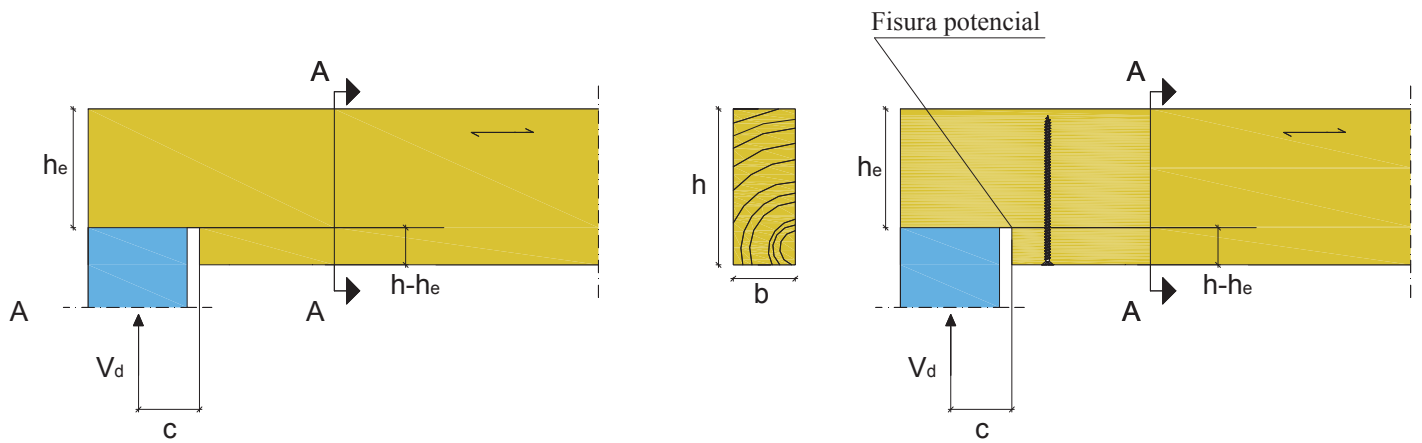
V_d Valor de diseño de la fuerza de corte [N],

$\alpha = h_e/h$

h = profundidad del elemento [mm]

$F_{ax,Rd}$ Mínimo de los valores de diseño de la capacidad de arranque y la capacidad de tracción de los tornillos de refuerzo o las varillas roscadas, donde ℓ_{ef} es el valor más bajo de la profundidad de penetración por debajo o por encima de la fisura potencial [N]

La separación mínima a_2 de las varillas roscadas utilizadas como refuerzo de un soporte de viga entallada es $a_2 = 3 \cdot d$, la distancia mínima al extremo o al canto es $a_{3,c} = 2,5 \cdot d$ o $a_{4,c} = 2,5 \cdot d$.



A menos que se especifique de otro modo en las disposiciones nacionales vigentes en el lugar de la instalación, la capacidad axial de un refuerzo de un agujero en una viga entallada debe cumplir la siguiente condición:

$$\frac{F_{t,V,d} + F_{t,M,d}}{F_{ax,Rd}} \leq 1$$

siendo,

$F_{t,V,d}$ Valor de diseño de la fuerza perpendicular respecto a la fibra debido a la fuerza de corte [N]:

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

V_d Valor de diseño de la fuerza de corte del elemento en el extremo del agujero [N],

h = profundidad del elemento [mm]

h_d = Profundidad de agujero para agujeros rectangulares [mm]

h_d = 70 % del diámetro de agujero para agujeros circulares [mm]

$F_{t,M,d}$ Valor de diseño de la fuerza perpendicular respecto a la fibra debido al momento de flexión [N]:

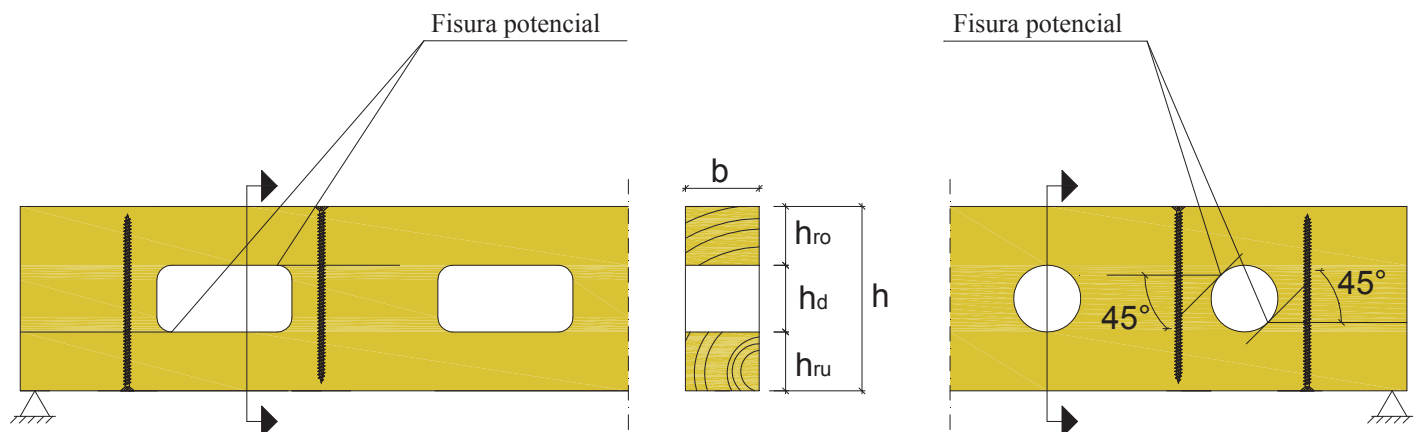
$$F_{t,M,d} = 0,008 \cdot \frac{M_d}{h_r}$$

M_d Valor de diseño del momento de flexión del elemento en el extremo del agujero [Nmm],

h_r = $\min(h_{ro}; h_{ru})$ para agujeros rectangulares [mm]

h_r = $\min(h_{ro}; h_{ru}) + 0,15 \cdot h_d$ para agujeros circulares [mm]

$F_{ax,Rd}$ Mínimo de los valores de diseño de la capacidad de arranque y la capacidad de tracción de los tornillos de refuerzo o las varillas roscadas, donde ℓ_{ef} es el valor más bajo de la profundidad de penetración por debajo o por encima de la fisura potencial [N].



Además del refuerzo con tornillos, es necesario verificar la fuerza de corte del elemento de madera alrededor del agujero.

Anexo E Refuerzo a cortante

A menos que se especifique de otro modo en las disposiciones nacionales vigentes en el lugar de la instalación, el esfuerzo de corte en áreas reforzadas de elementos de madera con un componente de esfuerzo paralelo a la fibra, debe cumplir la siguiente condición:

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

Dabei ist:

τ_d es el esfuerzo de corte de diseño sin tener en cuenta el refuerzo [N/mm²];

$f_{v,d}$ es la fuerza de corte de diseño [N/mm²];

$k_\tau = 1 - 0,46 \cdot \sigma_{90,d} - 0,052 \cdot \sigma_{90,d}^2$

$\sigma_{90,d}$ es el esfuerzo de diseño perpendicular a la fibra (valor negativo para compresión) [N/mm²];

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

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

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

V_d es la fuerza de corte de diseño [N];

G es el módulo de corte del elemento de madera, $G = 650$ [N/mm²],

b es la anchura del elemento de madera [mm],

d es el diámetro exterior de la rosca [mm] (d_1 en los dibujos del anexo),

h es la profundidad del elemento de madera [mm],

k_{ax} es la rigidez de unión entre la varilla o el tornillo y el elemento de madera [N/mm³],

$k_{ax} = 5$ N/mm³ para varillas roscadas $d = 16$ mm, $k_{ax} = 12,5$ N/mm³ para tornillos autorroscantes $d = 8$ mm,

a_1 es la separación paralela a la fibra de las varillas o tornillos dispuestos en una fila [mm], para n filas paralelas puede utilizarse una separación efectiva de $a_{1,ef} = a_1/n$,

EA_s es la rigidez axial de una varilla o tornillo [N],

$$EA_s = \frac{E \cdot \pi \cdot d_2^2}{4} = 165.000 d_2^2,$$

d_2 es el diámetro interior de la rosca de la varilla o tornillo [mm]

$d_2 = 12$ mm para varillas roscadas $d = 16$ mm, $d_2 = 5$ mm para tornillos $d = 8$ mm.

La capacidad axial de una varilla roscada o tornillo debe cumplir la siguiente condición:

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

Donde: $F_{ax,Rd}$ Mínimo de los valores de diseño de la capacidad de arranque y capacidad de tracción de las varillas o tornillos de refuerzo. La longitud de penetración efectiva es 50 % de la longitud roscada [N].

Fuera de las áreas reforzadas (área sombreada en la figura E.1), el diseño de corte debe cumplir las condiciones para elementos no reforzados.

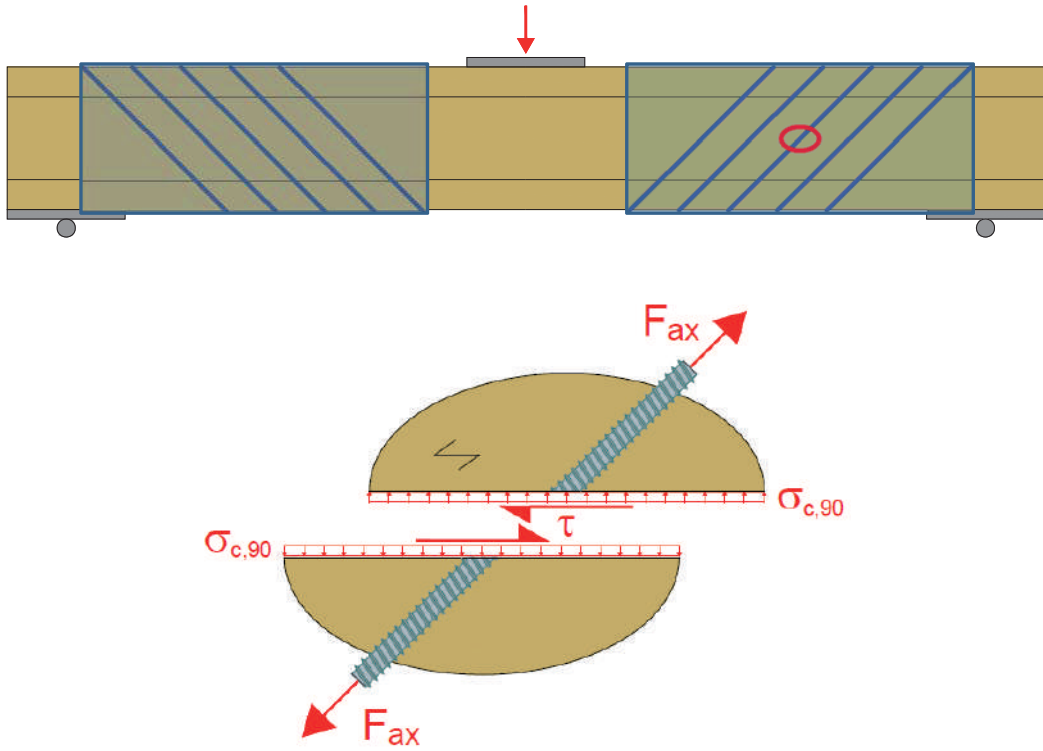


Figura E.1: Elemento de madera con refuerzo cortante; áreas sombreadas: áreas reforzadas con tornillos dispuestos a menos de 45°

Anexo F

Material de aislamiento térmico sobre los cabrios

Los tornillos SPAX con un diámetro exterior de rosca de $6 \text{ mm} \leq d \leq 12 \text{ mm}$ pueden utilizarse para fijar el material de aislamiento térmico en la parte superior de los cabrios.

El espesor del aislamiento no debe exceder los 400 mm. El aislamiento del cabrio debe estar colocado en la parte superior de madera maciza o cabrios de madera laminada encolada o elementos de madera contralaminada y fijarse mediante listones dispuestos en paralelo a los cabrios o en paneles a base de madera sobre la capa de aislamiento. Las normas indicadas aquí también hacen referencia al aislamiento de las fachadas verticales.

Los tornillos deben estar atornillados en el cabrio atravesando los listones o paneles y el aislamiento sin perforación previa en una secuencia.

El ángulo α entre el eje del tornillo y la dirección de la fibra del cabrio debería estar entre 30° y 90° .

El cabrio está formado por madera maciza (madera blanda) conforme a EN 338, madera laminada encolada conforme a EN 14081, madera contralaminada, o madera laminada enchapada conforme a EN 14374 o a la Evaluación Técnica Europea o elementos encolados similares de acuerdo con la Evaluación Técnica Europea y tiene una anchura mínima de 60 mm.

Los listones deben de ser de madera maciza (madera blanda) conforme a EN 338:2003-04. El espesor mínimo t y la anchura mínima b de los listones se calcula como sigue:

| | | |
|-------------------------------------|----------------------------|-----------------------------|
| Tornillos $d \leq 8,0 \text{ mm}$: | $b_{\min} = 50 \text{ mm}$ | $t_{\min} = 30 \text{ mm}$ |
| Tornillos $d = 10 \text{ mm}$: | $b_{\min} = 60 \text{ mm}$ | $t_{\min} = 40 \text{ mm}$ |
| Tornillos $d = 12 \text{ mm}$: | $b_{\min} = 80 \text{ mm}$ | $t_{\min} = 100 \text{ mm}$ |

Alternativamente a los listones, pueden utilizarse paneles con un espesor mínimo de 20 mm de madera contrachapada, conforme a EN 636, paneles de madera prensada conforme a EN 312, tableros de virutas orientadas OSB/3 y OSB/4 conforme a EN 300 o Evaluación Técnica Europea y paneles de madera maciza conforme a 13353. Esto sólo se aplica el sistema con tornillos inclinados en paralelo.

El aislamiento debe cumplir los requisitos de la Evaluación Técnica Europea.

Las fuerzas de fricción no deben tenerse en cuenta para el diseño de la capacidad axial característica de los tornillos.

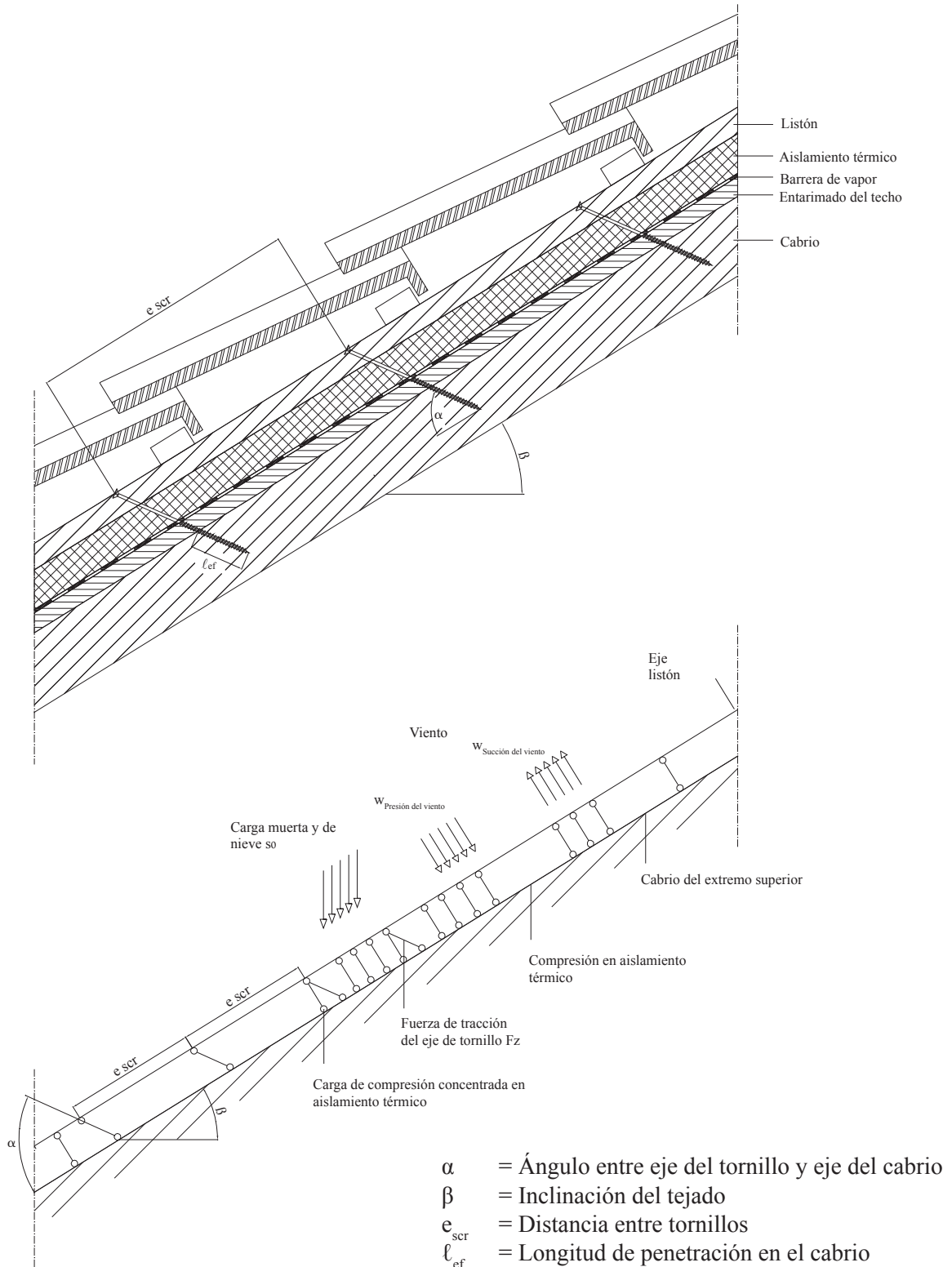
En el diseño debe tenerse en cuenta el anclaje de las fuerzas de succión del viento así como los esfuerzos de flexión de los listones o paneles, respectivamente. En caso necesario deben colocarse tornillos adicionales en perpendicular a la fibra del cabrio (ángulo $\alpha = 90^\circ$).

La separación máxima entre tornillos es de $e_{\text{Ser}} = 1,75 \text{ m}$.

Material de aislamiento térmico en cabrios con tornillos inclinados en paralelo

Modelo mecánico

El sistema de cabrios, material de aislamiento térmico en la parte superior de los mismos y listones en paralelo a los cabrios, puede considerarse como una viga sobre una fundación elástica. El listón representa la viga y el material de aislamiento térmico sobre la viga, la base elástica. El esfuerzo de compresión mínimo del material de aislamiento térmico a un 10 % de deformación, medido conforme a EN 826¹, debería ser $\sigma_{(10\%)} = 0,05 \text{ N/mm}^2$. El listón está cargado en perpendicular al eje por cargas puntuales F_b . Otras cargas puntuales F_s provienen de la carga de corte del techo debido a la carga muerta y la carga de nieve que se transfiere de las cabezas de los tornillos a los listones.



¹ EN 826:1996 Productos de aislamiento térmico para edificios - Determinación del comportamiento de compresión

Diseño de los listones

Los esfuerzos de flexión se calculan así:

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

siendo,

ℓ_{char} = Longitud característica

$$\ell_{char} = 4 \sqrt{\frac{4 \cdot EI}{w_{ef} \cdot K}}$$

EI = Rigidez de flexión del listón [Nmm²]

K = Coeficiente de subgrado [N/mm³]

w_{ef} = Anchura efectiva del material de aislamiento térmico [mm]

F_b = Cargas puntuales perpendiculares a los listones [N]

F_s = Cargas puntuales perpendiculares a los listones, aplicación de carga en el área de las cabezas de los tornillos [N]

El coeficiente de subgrado K puede calcularse a partir del módulo de elasticidad E_{HI} y el espesor t_{HI} del material de aislamiento térmico si se conoce la anchura efectiva w_{ef} del material de aislamiento térmico bajo compresión. Debido a la extensión de la carga en el material de aislamiento térmico, la anchura efectiva w_{ef} es superior a la anchura del listón o cabrio, respectivamente. Para más cálculos, la anchura efectiva w_{ef} del material de aislamiento térmico debe determinarse conforme a:

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

siendo,

w = anchura mínima del listón o cabrio, respectivamente [mm]

t_{HI} = espesor del material de aislamiento térmico [mm]

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

Debe satisfacerse la siguiente condición:

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

Para el cálculo del módulo de sección W, debe tenerse en cuenta la sección transversal neta.

Los esfuerzos de corte deben calcularse conforme a:

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

Debe satisfacerse la siguiente condición:

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

Para el cálculo del área de sección transversal, debe tenerse en cuenta la sección transversal neta.

Diseño del material de aislamiento térmico

Los esfuerzos de compresión en el material de aislamiento térmico deben calcularse de acuerdo con:

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

El valor de diseño del esfuerzo de compresión no debe ser superior al 110 % del esfuerzo de compresión a 10 % de deformación calculado conforme a EN 826.

Diseño de los tornillos

La carga sobre los tornillos es principalmente axial. La fuerza de tensión axial en el tornillo debe calcularse a partir de las cargas de corte del techo R_s :

$$T_s = \frac{R_s}{\cos \alpha}$$

La capacidad de carga de los tornillos cargados axialmente es el valor de diseño mínimo de la capacidad de arranque axial de la parte roscada del tornillo, la capacidad de extracción de la cabeza del tornillo y la capacidad de tracción del tornillo. Para limitar la deformación de la cabeza del tornillo para espesores del material de aislamiento térmico superiores a 200 mm o con fuerza de compresión por debajo de 0,12 N/mm², respectivamente, la capacidad axial de arranque del tornillo debe reducirse por los factores k_1 y k_2 :

$$F_{ax,\alpha,Rd} = \min \left\{ \frac{f_{ax,d} \cdot d \cdot \ell_{ef} \cdot k_1 \cdot k_2}{1,2 \cdot \cos^2 \alpha + \sin^2 \alpha} \cdot \left(\frac{\rho_k}{350} \right)^{0,8}; f_{head,d} \cdot d_h^2 \cdot \left(\frac{\rho_k}{350} \right)^{0,8}; \frac{f_{tens,k}}{\gamma_{M2}} \right\} \text{ para tornillos SPAX con rosca parcial}$$

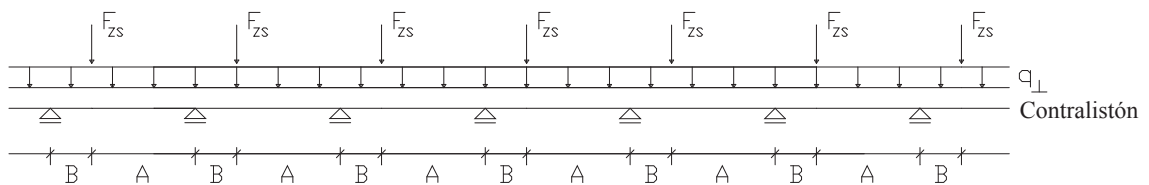
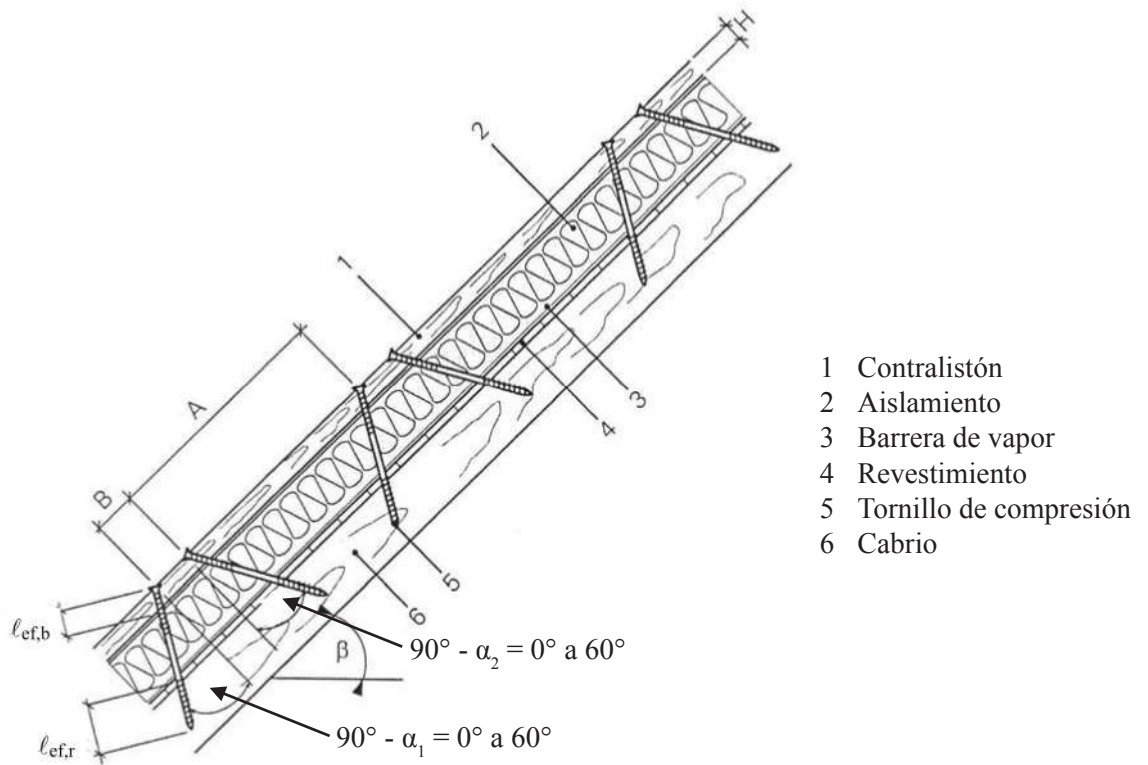
$$F_{ax,\alpha,Rd} = \min \left\{ \begin{array}{l} \frac{f_{ax,d} \cdot d \cdot \ell_{ef} \cdot k_1 \cdot k_2}{1,2 \cdot \cos^2 \alpha + \sin^2 \alpha} \cdot \left(\frac{\rho_k}{350} \right)^{0,8} \\ \max \left\{ f_{head,d} \cdot d_h^2; \frac{f_{ax,d} \cdot d \cdot \ell_{ef,b} \cdot k_1 \cdot k_2}{1,2 \cdot \cos^2 \alpha + \sin^2 \alpha} \cdot \left(\frac{\rho_k}{350} \right)^{0,8} \right\} \\ \frac{f_{tens,k}}{\gamma_{M2}} \end{array} \right\} \text{ para tornillos SPAX con rosca completa o doble}$$

Dabei ist:

- $f_{ax,d}$ Valor de diseño del parámetro de arranque característico de la parte roscada del tornillo [N/mm²]
- d Diámetro exterior de la rosca del tornillo [mm] (d_i en los dibujos del anexo)
- ℓ_{ef} Longitud de penetración de la punta de la parte roscada del tornillo en el listón [mm], $\ell_{ef} \geq 40$ mm
- $\ell_{ef,b}$ Longitud de penetración de la parte roscada del tornillo en el listón [mm]
- α Ángulo entre la fibra y el eje del tornillo [°] ($\alpha \geq 30^\circ$)
- ρ_k Densidad característica del elemento a base de madera [kg/m³]
- $f_{head,d}$ Valor de diseño de la capacidad de extracción de la cabeza del tornillo [N/mm²]
- d_h Diámetro de la cabeza [mm] (d_k en los dibujos del anexo)
- $f_{tens,k}$ Capacidad de tracción característica del tornillo [N]
- γ_{M2} Factor parcial conforme a EN 1993-1-1 o al anexo nacional particular
- k_1 $\min \{1; 200/t_{HI}\}$
- k_2 $\min \{1; \sigma_{10\%}/0,12\}$
- t_{HI} Espesor del material de aislamiento térmico [mm]
- $\sigma_{10\%}$ Esfuerzo de compresión del material de aislamiento térmico por debajo de 10 % de deformación [N/mm²]

Si se tienen en cuenta las ecuaciones k_1 y k_2 , no es necesario tener en cuenta la deflexión de los listones. Alternativamente a los listones, puede utilizarse paneles con un espesor mínimo de 20 mm en madera contrachapada conforme a EN 636 o una ETA o disposiciones nacionales vigentes en el lugar de la instalación, paneles de madera prensada conforme a EN 312 o a una ETA o disposiciones nacionales vigentes en el lugar de la instalación, paneles de virutas orientadas antes del proceso de prensado conforme a EN 300 o una ETA o disposiciones nacionales vigentes en el lugar de la instalación, y paneles de madera maciza conforme a EN 13353 o una ETA o disposiciones nacionales vigentes en el lugar de la instalación, o madera contralaminada conforme a una ETA.

Material de aislamiento térmico en cabrios con tornillos alternativamente inclinados



Modelo mecánico

Dependiendo de la separación entre tornillos y la disposición de los tornillos de tracción y de compresión con diferentes inclinaciones, los listones están cargados con momentos de flexión importantes. Los momentos de flexión se extraen en base a los siguientes supuestos:

- Las cargas de tracción y compresión en los tornillos se determinan en función de las condiciones de equilibrio de las acciones en paralelo y en perpendicular al plano del techo.
Estas acciones son líneas de carga constantes q_{\perp} y q_{\parallel} .
- Los tornillos actúan como columnas articuladas soportadas 10 mm dentro del listón o cabrio, respectivamente. Consecuentemente, la longitud efectiva de la columna es igual a la longitud del tornillo entre el listón y el cabrio más 20 mm.
- El listón se considera una viga continua con una distancia entre apoyos constante $\ell = A + B$.
Los tornillos de compresión constituyen los soportes de la viga continua mientras que los tornillos de tracción transfieren cargas concentradas en perpendicular al eje del listón.

Los tornillos están cargados principalmente en el arranque o la compresión, respectivamente. Las fuerzas normales de los tornillos se determinan en base a las cargas paralelas y perpendiculares al plano del techo:

$$\text{Tornillo de compresión: } F_{c,Ed} = (A+B) \cdot \left(- \frac{q_{\parallel}}{\cos \alpha_1 + \sin \alpha_1 / \tan \alpha_2} - \frac{q_{\perp} \cdot \sin (90^{\circ} - \alpha_2)}{\sin (\alpha_1 + \alpha_2)} \right)$$

$$\text{Tornillo de tracción: } F_{t,Ed} = (A+B) \cdot \left(\frac{q_{\parallel}}{\cos \alpha_2 + \sin \alpha_2 / \tan \alpha_1} - \frac{q_{\perp} \cdot \sin (90^{\circ} - \alpha_1)}{\sin (\alpha_1 + \alpha_2)} \right)$$

Los momentos de flexión en el listón resultan de la carga de línea constante q_{\perp} y los componentes de carga en perpendicular al listón resultan de los tornillos de tracción. La envergadura de la viga continua es (A + B). El componente de carga perpendicular al listón desde el tornillo de tracción es:

$$F_{ZS,Ed} = (A + B) \cdot \left(\frac{q_{\parallel}}{1/\tan \alpha_1 + 1/\tan \alpha_2} - \frac{q_{\perp} \cdot \sin(90^{\circ} - \alpha_1) \cdot \sin \alpha_2}{\sin(\alpha_1 + \alpha_2)} \right)$$

Dabei ist:

- q_{\parallel} Carga de línea constante en paralelo al listón [N/mm]
- q_{\perp} Carga de línea constante en perpendicular al listón [N/mm]
- α_1 Ángulo entre el eje de compresión del tornillo y la dirección de la fibra [°]
- α_2 Ángulo entre el eje del tornillo de tracción y la dirección de la fibra [°]

Un valor positivo para F_{ZS} significa una carga hacia el cabrio, un valor negativo una carga que se aleja del cabrio.

Diseño de los tornillos

La capacidad de carga de los tornillos debe calcularse como se indica a continuación:

Tornillos cargados en tensión:

$$F_{ax,\alpha,Rd} = \min \left\{ \frac{f_{ax,d} \cdot d \cdot \ell_{ef,b}}{1,2 \cdot \cos^2 \alpha_2 + \sin^2 \alpha_2} \cdot \left(\frac{\rho_{b,k}}{350} \right)^{0,8} ; \frac{f_{ax,d} \cdot d \cdot \ell_{ef,r}}{1,2 \cdot \cos^2 \alpha_2 + \sin^2 \alpha_2} \cdot \left(\frac{\rho_{r,k}}{350} \right)^{0,8} ; \frac{f_{tens,k}}{\gamma_{M2}} \right\}$$

Tornillos cargados en compresión:

$$F_{ax,\alpha,Rd} = \min \left\{ \frac{f_{ax,d} \cdot d \cdot \ell_{ef,b}}{1,2 \cdot \cos^2 \alpha_1 + \sin^2 \alpha_1} \cdot \left(\frac{\rho_{b,k}}{350} \right)^{0,8} ; \frac{f_{ax,d} \cdot d \cdot \ell_{ef,r}}{1,2 \cdot \cos^2 \alpha_1 + \sin^2 \alpha_1} \cdot \left(\frac{\rho_{r,k}}{350} \right)^{0,8} ; \frac{\kappa_c \cdot N_{pl,k}}{\gamma_{M1}} \right\}$$

Donde:

- $f_{ax,d}$ Valor de diseño de la capacidad de arranque axial de la parte roscada del tornillo [N/mm²]
- d Diámetro exterior de la rosca del tornillo [mm] (d_1 en los dibujos del anexo)
- $\ell_{ef,b}$ Longitud de la parte roscada en el listón, incluida la cabeza para la fuerza de tracción y excluida la cabeza para la fuerza de compresión [mm]
- $\ell_{ef,r}$ Longitud de penetración de la parte roscada del tornillo en el cabrio [mm], $\ell_{ef} \geq 40$ mm
- $\rho_{b,k}$ Densidad característica del listón [kg/m³]
- $\rho_{r,k}$ Densidad característica del cabrio [kg/m³]
- α Ángulo α_1 o α_2 entre el eje del tornillo y la dirección de la fibra, $30^{\circ} \leq \alpha_1 \leq 90^{\circ}$, $30^{\circ} \leq \alpha_2 \leq 90^{\circ}$
- $f_{tens,k}$ Capacidad de tracción característica del tornillo [N]
- γ_{M1}, γ_{M2} Factor parcial conforme a EN 1993-1-1 o al anexo nacional particular
- $\kappa_c \cdot N_{pl,k}$ Capacidad de deformación por pandeo del tornillo [N]

| Longitud libre del tornillo [mm] | Acero al carbono | | | | Acero inoxidable | |
|----------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| | 6,0 mm | 8,0 mm | 10,0 mm | 12,0 mm | 10,0 mm | 12,0 mm |
| | $\kappa_c \cdot N_{pl,k}$ [kN] | $\kappa_c \cdot N_{pl,k}$ [kN] | $\kappa_c \cdot N_{pl,k}$ [kN] | $\kappa_c \cdot N_{pl,k}$ [kN] | $\kappa_c \cdot N_{pl,k}$ [kN] | $\kappa_c \cdot N_{pl,k}$ [kN] |
| ≤ 100 | 1,12 | 2,79 | 6,09 | 14,3 | 5,22 | 11,3 |
| 120 | 0,85 | 2,12 | 4,68 | 11,2 | 4,16 | 9,37 |
| 140 | 0,66 | 1,66 | 3,70 | 8,98 | 3,36 | 7,79 |
| 160 | 0,53 | 1,34 | 2,99 | 7,33 | 2,76 | 6,53 |
| 180 | 0,43 | 1,10 | 2,48 | 6,09 | 2,30 | 5,52 |
| 200 | | 0,92 | 2,07 | 5,13 | 1,94 | 4,71 |
| 220 | | 0,78 | 1,76 | 4,38 | 1,66 | 4,06 |
| 240 | | 0,67 | 1,51 | 3,79 | 1,44 | 3,53 |
| 260 | | 0,58 | 1,32 | 3,30 | 1,26 | 3,10 |
| 280 | | 0,51 | 1,15 | 2,90 | 1,11 | 2,74 |
| 300 | | 0,45 | 1,02 | 2,57 | 0,98 | 2,44 |
| 320 | | 0,40 | 0,91 | 2,29 | 0,88 | 2,18 |
| 340 | | 0,36 | 0,82 | 2,06 | 0,79 | 1,97 |
| 360 | | 0,32 | 0,73 | 1,86 | 0,71 | 1,78 |
| 380 | | 0,29 | 0,67 | 1,68 | 0,65 | 1,62 |
| 400 | | 0,26 | 0,61 | 1,53 | 0,59 | 1,48 |
| 420 | | 0,24 | 0,55 | 1,40 | 0,54 | 1,36 |
| 440 | | 0,22 | 0,51 | 1,29 | 0,49 | 1,25 |
| 460 | | 0,20 | 0,47 | 1,19 | 0,46 | 1,15 |
| 480 | | 0,19 | 0,43 | 1,10 | 0,42 | 1,06 |