



FI

#### **SUORITUSTASOILMOITUS**

1. Tuotetyypin yksilöllinen tunniste:

#### **DoP W0003**

fischer Power-Fast-ruuveille ja fischer-rakennusruuveille

**DoP W0003** 

2. Aiottu käyttötarkoitus (aiotut käyttötarkoitukset):

Puurakenteissa käytettävät itsekierteittävät ruuvit, katso lisäys, erityisesti liitteet 1, 2.

3. Valmistaja:

fischerwerke GmbH & Co. KG, Klaus-Fischer-Str. 1, 72178 Waldachtal, Saksa

4. Valtuutettu edustaja:

5. Suoritustason pysyvyyden arvioinnissa ja

varmentamisessa käytetty järjestelmä/käytetyt

<u>järjestelmät:</u>

Eurooppalainen arviointiasiakirja:
 Eurooppalainen tekninen arviointi:

n arviointi: ETA-11/0027; 2019-01-02

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Teknisestä arvioinnista vastaava laitos: ETA-Danmark A/S

Ilmoitettu laitos/ilmoitetut laitokset: 0769 Karlsruher Institut für Technologie (KIT)

7. Ilmoitettu suoritustaso/ilmoitetut suoritustasot:

Mekaaninen kestävyys ja vakaus (BWR 1), Käytön turvallisuus ja esteettömyys (BWR 4)

Liitteet 12-31 Mitat: Tyypillinen tuottomomentti: Liite 5 Taittokulma: Liite 1 Tyypillinen vetäytymisparametri: Liitteet 5,6 Tyypillinen kannan vetoparametri: Liite 6 Tyypillinen vetolujuus: Liite 3 Tyypillinen myötölujuus: Liite 7 Tyypillinen vääntölujuus: Liite 3 Lisäysmomentti: Liite 3

EAD 130118-00-0603

Lisäysmomentti: Liite 3
Ruuvien välistys, pääty- ja kulmaetäisyydet, sekä puupohjaisen materiaalin vähimmäispaksuus Liitteet 9,10,38

Pääosin aksiaalisesti kuormitettujen ruuvien ominaiskimmokerroin

Korroosionkesto Liitteet 1,2,8-10,12-31

Turvallisuus tulipalon sattuessa (BWR 2)

Reaktio paloon: Luokka (A1)

Asianmukainen tekninen asiakirja ja/tai tekninen erityisasiakirja:

Edellä yksilöidyn tuotteen suoritustaso on ilmoitettujen suoritustasojen joukon mukainen. Tämä suoritustasoilmoitus on asetuksen (EU) N:o 305/2011 mukaisesti annettu edellä ilmoitetun valmistajan yksinomaisella vastuulla.

Valmistajan puolesta allekirjoittanut:

 $\hbox{Dr.-Ing. Oliver Geibig, Toimitusjohtaja Liiketoimintayksikk\"{o}~\&~Suunnittelu}$ 

Tumlingen, 2021-01-16

Jürgen Grün, Toimitusjohtaja Kemia & Laatu

Liite 7

Tämä suoritustasoilmoitus on laadittu useilla kielillä. Jos tulkinnasta syntyy erimielisyyttä, englanninkielinen versio on aina katsottava ensisijaiseksi.

Lisäys sisältää vapaaehtoisesti ilmoitettua ja täydentävää englanninkielistä tietoa, joka ylittää (kielestä riippumatta määritellyt) lakisääteiset vaatimukset.

Fischer DATA DOP\_W\_BUHolz\_V6.xlsm

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## II SPECIFIC PART OF THE EUROPEAN TECHNICAL ASSESSMENT

# 1 Technical description of product and intended use

#### Technical description of the product

"fischer Power-Fast" and "fischer construction screws" are self-tapping screws to be used in timber structures. "fischer Power-Fast" screws shall be threaded over a part or over the full length. "fischer construction screws" shall be threaded over a part of the length. The screws shall be produced from carbon steel wire for nominal diameters of 3,0 mm to 12,0 mm and from stainless steel wire for nominal diameters of 3,0 mm to 8,0 mm. The material specification of the stainless steel screws is deposited with ETA-Danmark. Where corrosion protection is required, the material or coating shall be declared in accordance with the relevant specification given in Annex A of EN 14592.

#### **Geometry and Material**

The nominal diameter (outer thread diameter), d, shall not be less than 3,0 mm and shall not be greater than 12,0 mm. The overall length, L, of screws shall not be less than 20 mm and shall not be greater than 600 mm. Other dimensions are given in Annex A1 to Annex A19.

The ratio of inner thread diameter to outer thread diameter  $d_i/d$  ranges from 0,59 to 0,69.

The screws are threaded over a minimum length  $\ell_g$  of 4,0·d (i.e.  $\ell_g \ge 4,0$ ·d).

The lead p (distance between two adjacent thread flanks) ranges from 0,50·d to 0,67·d.

No breaking of screws shall be observed at a bend angle,  $\alpha$ , of less than  $(45/d^{0.7} + 20)$  degrees.

The material specification of the of the stainless steel screws is deposited with ETA-Danmark.

# 2 Specification of the intended use in accordance with the applicable EAD

The screws are used for connections in load bearing timber structures between members of solid timber (softwood and hardwood). Furthermore, all kinds of processed timber products (all softwood and hardwood as well), such as glued laminated timber, cross-laminated timber, laminated veneer lumber, similar glued members, wood-based panels or steel.

Furthermore "fischer Power-Fast" screws with diameter of 6 mm, 8 mm, 10 mm and 12 mm may also be used for the fixing of heat insulation on rafters and on vertical facades.

Steel plates and wood-based panels except solid wood panels, Egger OSB Eurostrand 4 TOP and cross laminated timber shall only be located on the side of the screw head. The following wood-based panels may be used:

- Plywood according to EN 636 or ETA
- Particleboard according to EN 312 or ETA
- Oriented Strand Board, Type OSB/3 and OSB/4 according to EN 300 or ETA
- Fibreboard according to EN 622-2 and 622-3 or ETA (minimum density 650 kg/m³)
- Cement bonded particleboard according to ETA
- Solid wood panels according to EN 13353 and EN 13986, and cross laminated timber according to ETA
- Laminated Veneer Lumber according to EN 14374 or ETA
- Engineered wood products according to ETA if the ETA of the product includes provisions for the use of self-tapping screws, the provisions of the ETA of the engineered wood product apply

The screws shall be screwed into softwood without predrilling or after pre-drilling with a diameter not larger than the inner thread diameter for the length of the threaded part and with a maximum of the smooth shank diameter for the length of the smooth shank. The screws shall be driven into hardwood after pre-drilling with a suitable diameter according to section 3.11.

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

Form and dimensions of washers are given in Annex A20. Washers must be made of steel.

The design of the connections shall be based on the characteristic load-carrying capacities of the screws. The design capacities shall be derived from the characteristic capacities in accordance with Eurocode 5 or an appropriate national code (e.g. DIN 1052:2008-12). Regarding environmental conditions, national provisions at the building site shall apply.

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

The zinc-coated screws are for use in timber structures subject to the dry, internal conditions defined by the service classes 1 and 2 of EN 1995-1-1:2008 (Eurocode 5).

The screws made of stainless steel meet the requirements of Eurocode 5 (EN 1995-1-1:2008), for use in structures subject to the wet conditions defined as service class 3.

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

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

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

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

Char	acteristic	Assessment of characteristic
3.1	Mechanical resistance and stability*) (BWR1)	
	Tensile strength Screws made from carbon steel	Characteristic value f <sub>tens,k</sub> :  Screw d = 3,0 mm: 2,7 kN  Screw d = 3,5 mm: 3,7 kN  Screw d = 4,0 mm: 4,8 kN  Screw d = 4,5 mm: 6,0 kN  Screw d = 5,0 mm: 7,5 kN  Screw d = 6,0 mm: 10,7 kN  Screw d = 8,0 mm: 19,1 kN  Screw d = 10,0 mm: 29,8 kN  Screw d = 12,0 mm: 32,7 kN
	Screws from stainless steel	Screw d = 3,0 mm: 1,6 kN Screw d = 3,5 mm: 2,1 kN Screw d = 4,0 mm: 2,8 kN Screw d = 4,5 mm: 3,5 kN Screw d = 5,0 mm: 4,3 kN Screw d = 6,0 mm: 6,2 kN Screw d = 8,0 mm: 13,0 kN
	Insertion moment	Ratio of the characteristic torsional strength to the mean insertion moment: $f_{tor,k} \ / \ R_{tor,mean} \ge 1,5$
	Torsional strength Screws from carbon steel	Characteristic value f <sub>tor,k</sub> :  Screw d = 3,0 mm: 1,3 Nm  Screw d = 3,5 mm: 2,0 Nm  Screw d = 4,0 mm: 3,0 Nm  Screw d = 4,5 mm: 4,3 Nm  Screw d = 5,0 mm: 6,0 Nm  Screw d = 6,0 mm: 9,5 Nm  Screw d = 8,0 mm: 25,0 Nm  Screw d = 10,0 mm: 40,0 Nm  Screw d = 12,0 mm: 55,0 Nm
	Screws from stainless steel	Screw d = 3,0 mm: 0,9 Nm Screw d = 3,5 mm: 1,3 Nm Screw d = 4,0 mm: 1,9 Nm Screw d = 4,5 mm: 2,6 Nm Screw d = 5,0 mm: 3,7 Nm Screw d = 6,0 mm: 6,5 Nm Screw d = 8,0 mm: 16,0 Nm
3.2	Safety in case of fire (BWR2)	
	Reaction to fire	The screws are made from steel classified as <b>Euroclass A1</b> in accordance with EN 13501-1 and Commission Delegated Regulation 2016/364.

Char	racteristic	Assessment of characteristic						
3.7	Sustainable use of natural resources (BR7)  General aspects related to the performance of the product	No Performance Assessed  The screws have been assessed as having satisfactory durability and serviceability when used in timber structures using the timber species described in Eurocode 5 and subject to the conditions defined by service classes 1, 2 and 3						
	Identification	See Annex A						

<sup>\*)</sup> See additional information in section 3.9 – 3.12.

\*\*) In addition to the specific clauses relating to dangerous substances contained in this European technical Assessment, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Regulation, these requirements need also to be complied with, when and where they apply.

#### 3.9 Mechanical resistance and stability

The load-carrying capacities for "fischer Power-Fast" and "fischer construction screws" are applicable to the wood-based materials mentioned in paragraph 1 even though the term timber has been used in the following.

The characteristic lateral load-carrying capacities and the characteristic axial withdrawal capacities of "fischer Power-Fast" and "fischer construction screws" screws should be used for designs in accordance with Eurocode 5 or an appropriate national code.

Pointside penetration length of the threaded part must be  $\ell_{\rm ef} \ge 4 \cdot d$ , where d is the outer thread diameter of the screw. For the fixing of rafters, point side penetration must be at least 40 mm,  $\ell_{\rm ef} > 40$  mm.

ETA's for structural members may be considered if applicable.

For wood-based panels the relevant ETAs must be considered where applicable.

#### Lateral load-carrying capacity

The characteristic lateral load-carrying capacity of "fischer Power-Fast" and "fischer construction screws" screws shall be calculated according to EN 1995-1-1:2008 (Eurocode 5) using the outer thread diameter d as the nominal diameter of the screw. The contribution from the rope effect may be considered.

The characteristic yield moment shall be calculated from:

Screws from carbon steel for 3,0 mm  $\leq$  d  $\leq$  5,0 mm and 12,0 mm:

$$M_{y,k} = 0.15 \cdot 500 \text{ (N/mm}^2) \cdot d^{2.6}$$
 [Nmm]

Screws from carbon steel for 6,0 mm  $\leq$  d  $\leq$  10,0 mm:  $M_{y,k} = 0.15 \cdot 600 \; (N/mm^2) \cdot d^{2,6} \qquad \qquad [Nmm]$ 

Screws from stainless steel for 3,0 mm < d < 6,0 mm:  $M_{v,k} = 0.15 \cdot 350 \text{ (N/mm}^2) \cdot d^{2.6}$  [Nmm]

Screws from stainless steel for d = 8,0 mm:  $M_{y,k} = 0.15 \cdot 400 \; (N/mm^2) \cdot d^{2.6} \eqno [Nmm]$ 

where

d outer thread diameter [mm]

The embedding strength for screws in non-pre-drilled holes arranged at an angle between screw axis and grain direction,  $0^{\circ} \le \alpha \le 90^{\circ}$  is:

$$f_{h,k} = \frac{0.082 \cdot \rho_k \cdot d^{-0.3}}{2.5 \cdot \cos^2 \alpha + \sin^2 \alpha}$$
 [N/mm<sup>2</sup>]

and accordingly, for screws in pre-drilled holes:

$$f_{h,k} = \frac{0.082 \cdot \rho_k \cdot (1 - 0.01 \cdot d)}{2.5 \cdot \cos^2 \alpha + \sin^2 \alpha}$$
 [N/mm<sup>2</sup>]

Where

 $\rho_k$  characteristic timber density [kg/m<sup>3</sup>];

d outer thread diameter [mm];

α angle between screw axis and grain direction.

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

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

Where

d outer thread diameter [mm]

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

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

#### Axial withdrawal capacity

The characteristic axial withdrawal capacity of "fischer Power-Fast" and "fischer construction screws" in solid timber (softwood and ash, beech or oak hardwood), glued laminated timber (softwood and hardwood, ash, beech or oak), laminated veneer lumber (softwood or hardwood beech) or cross-laminated timber members at an angle of  $0^{\circ} \leq \alpha \leq 90^{\circ}$  to the grain or in Egger Eurostrand OSB 4 TOP at an angle of  $\alpha = 90^{\circ}$  to the panel surface shall be calculated from:

$$F_{ax,\alpha,Rk} = n_{ef} \cdot k_{ax} \cdot f_{ax,k} \cdot d \cdot \ell_{ef} \cdot \left(\frac{\rho_k}{350}\right)^{0.8}$$
 [N]

Where

 $F_{ax,\alpha,RK}$  Characteristic withdrawal capacity of the connection at an angle  $\alpha$  to the grain [N]

n<sub>ef</sub> Effective number of screws according to EN 1995-1-1

For inclined screws:  $n_{ef} = max \{ n^{0.9} ; 0.9 \cdot n \}$ 

 $k_{ax}$  Factor, taking into account the angle  $\alpha$  between screw axis and grain direction  $k_{ax}=1,0 \text{ for } 45^{\circ} \leq \alpha < 90^{\circ}$ 

$$k_{ax} = 0.3 + \frac{0.7 \cdot \alpha}{45}$$
 for  $0^{\circ} \le \alpha \le 45^{\circ}$ 

 $f_{ax,k}$  Characteristic withdrawal parameter [N/mm<sup>2</sup>] for timber members

for Egger Eurostrand OSB 4 TOP with minimum thickness t = 12 mm: screw 5,0 mm  $\leq d \leq 10,0$  mm:

 $f_{ax,k} = 10,0 \text{ N/mm}^2$ 

d Outer thread diameter [mm]

 $\ell_{\rm ef}$  Point side penetration length of the threaded part according to EN 1995-1-1:2008 [mm]

α Angle between grain and screw axis [°]

 $\rho_k$  Characteristic density [kg/m³], for hardwoods the assumed characteristic density shall not exceed 730 kg/m³

For screws arranged under an angle between screw axis and grain direction of less than 90°, the minimum threaded penetration length is:

 $\ell_{ef} \ge \min (4 \cdot d/\sin \alpha ; 20 \cdot d)$ 

For screws penetrating more than one layer of cross laminated timber, the different layers may be taken into account proportionally.

The axial withdrawal capacity is limited by the head pullthrough capacity and the tensile strength of the screw.

For axially loaded screws in tension, where the external force is parallel to the screw axes, the rules in EN 1995-1-1, 8.7.2 (8) should be applied.

For inclined screws in timber-to-timber or steel-to-timber shear connections, where the screws are arranged under an angle  $30^{\circ} \le \alpha \le 60^{\circ}$  between the shear plane and the screw axis, the effective number of screws  $n_{ef}$  should be determined as follows:

For one row of n screws parallel to the load, the load-carrying capacity should be calculated using the effective number of fasteners nef, where

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

and n is the number of inclined screws in a row. If crossed pairs of screws are used in timber-to-timber connections, n is the number of crossed pairs of screws in a row.

Note: For inclined screws as fasteners in mechanically

jointed beams or columns or for the fixing of thermal insulation material,  $n_{ef} = n$ .

#### Head pull-through capacity

The characteristic head pull-through capacity of "fischer Power-Fast" and "fischer construction screws" shall be calculated according to EN 1995-1-1:2008 from:

$$F_{ax,\alpha,Rk} = n_{ef} \cdot f_{head,k} \cdot d_h^2 \cdot \left(\frac{\rho_k}{350}\right)^{0.8}$$
 [N]

where:

 $F_{ax,\alpha,Rk}$  characteristic head pull-through capacity of the connection at an angle  $\alpha \ge 30^{\circ}$  to the grain [N]

n<sub>ef</sub> effective number of screws according to EN 1995-1-1

For inclined screws:  $n_{ef} = max \{n^{0.9}; 0.9 \cdot n\}$ 

(see axial withdrawal capacity)

 $\begin{array}{c} f_{\text{head},k} & \text{characteristic head pull-through parameter} \\ & \lceil N/mm^2 \rceil \end{array}$ 

d<sub>h</sub> diameter of the screw head [mm]

 $\rho_k$  characteristic density [kg/m<sup>3</sup>], for wood-

based panels  $\rho_k = 380 \text{ kg/m}^3$ 

Characteristic head pull-through parameter for screws with head diameter  $\leq 21$  mm in connections with timber and with wood-based panels with thicknesses above 20 mm:  $f_{head,k} = 12 \text{ N/mm}^2$ 

Characteristic head pull-through parameter for screws with head diameter 21 mm < d<sub>h</sub>  $\le$  35 mm in connections with timber and with wood-based panels with thicknesses above 20 mm:

 $f_{head,k} = 10 \text{ N/mm}^2$ 

Characteristic head pull-through parameter for screws in connections with wood-based panels with thicknesses between 12 mm and 20 mm:

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

Screws in connections with wood-based panels with a thickness below 12 mm (minimum thickness of the wood based panels of 1,2·d with d as outer thread diameter):

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

limited to  $F_{ax,\alpha,Rk} = 400 \text{ N}$ 

The head diameter  $d_h$  shall be greater than  $1.8 \cdot d_s$ , where  $d_s$  is the smooth shank or the wire diameter. Otherwise the characteristic head pull-through capacity  $F_{ax,\alpha,Rk} = 0$ .

Outer diameter of washers  $d_h > 35$  mm shall not be considered.

The minimum thickness of wood-based panels according to the clause 3.9 must be observed.

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

#### **Tensile capacity**

The characteristic tensile strength  $f_{tens,k}$  of "fischer Power-Fast" and "fischer construction screws" is:

#### Screws from carbon steel:

Screw $d = 3.0 \text{ mm}$ :	2,7  kN
Screw $d = 3.5 \text{ mm}$ :	3,7  kN
Screw $d = 4.0$ mm:	4,3 kN
Screw $d = 4.5 \text{ mm}$ :	5,5 kN
Screw $d = 5.0$ mm:	6,8 kN
Screw $d = 6.0 \text{ mm}$ :	10,7 kN
Screw $d = 8.0 \text{ mm}$ :	19,1 kN
Screw $d = 10,0$ mm:	29,8 kN
Screw $d = 12,0$ mm:	32,7 kN

#### Screws from stainless steel:

Screw $d = 3.0 \text{ mm}$ :	1,6 kN
Screw $d = 3.5 \text{ mm}$ :	2,1 kN
Screw $d = 4.0 \text{ mm}$ :	2,8 kN
Screw $d = 4.5 \text{ mm}$ :	3,5 kN
Screw $d = 5.0$ mm:	4,3 kN
Screw $d = 6.0$ mm:	6,2 kN
Screw $d = 8.0 \text{ mm}$ :	13,0 kN

For screws used in combination with steel plates, the tearoff capacity of the screw head should be greater than the tensile strength of the screw.

#### **Compressive capacity**

The characteristic compressive capacity  $F_{ax,Rk}$  of fischer Power-Fast screws with the head fixed between two aluminium-, carbon steel- or stainless steel plates according to Annex D and the thread driven completely into timber perpendicular to the grain shall be calculated from:

$$F_{ax,Rk} = min \left\{ f_{ax,k} \cdot d \cdot \ell_{ef} \cdot \left( \frac{\rho_k}{350} \right)^{0,8} ; \kappa_c \cdot N_{pl,k} \right\} [N]$$

Where

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

$$k = 0.5 \cdot \left\lceil 1 + 0.49 \cdot (\overline{\lambda}_k - 0.2) + \overline{\lambda}_k^2 \right\rceil$$

The relative slenderness ratio shall be calculated from:

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

Where

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

is the characteristic value for the axial capacity in case of plastic analysis referred to the smooth shank cross-section.

$$N_{ki,k} = \frac{\pi^2 \cdot EI_S}{\ell_{ef}^2}$$
 [N]

is the characteristic ideal elastic buckling load.

Characteristic yield strength for screws made of carbon steel:

$$f_{y,k} = 1000 \qquad [N/mm^2]$$

Characteristic yield strength for screws made of stainless steel:

$$f_{y,k} = 500 \qquad [N/mm^2]$$

Modulus of elasticity for screws made of carbon steel:

$$E_s = 210000$$
 [N/mm<sup>2</sup>]

Modulus of elasticity for screws made of stainless steel:  

$$E_s = 160000$$
 [N/mm<sup>2</sup>]

Second moment of area:

$$I_{S} = \frac{\pi}{64} \cdot d_{s}^{4}$$
 [mm<sup>4</sup>] 
$$d_{s} = \text{smooth shank diameter}$$
 [mm]

$$\ell_{\rm ef} = 0.7 \cdot \ell$$
 buckling length [mm]

free screw length protruding from the timber member including the screw head [mm]

Note: When determining design values of the compressive capacity it should be considered that  $f_{ax,d}$  is to be calculated using  $k_{mod}$  and  $\gamma_M$  for timber according to EN 1995 while  $N_{pl,d}$  is calculated using  $\gamma_{M,1}$  for steel buckling according to EN 1993.

#### Combined laterally and axially loaded screws

For screwed connections subjected to a combination of axial load and lateral load, the following expression should be satisfied:

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

where

 $\begin{aligned} F_{ax,Ed} & \text{axial design load of the screw} \\ F_{la,Ed} & \text{lateral design load of the screw} \end{aligned}$ 

F<sub>ax,Rd</sub> design load-carrying capacity of an axially

loaded screw

F<sub>la,Rd</sub> design load-carrying capacity of a laterally

loaded screw

#### Slip modulus

The axial slip modulus  $K_{ser}$  of a screw for the serviceability limit state should be taken independent of angle  $\alpha$  to the grain as:

$$C = K_{ser} = 780 \cdot d^{0.2} \cdot \ell_{ef}^{0.4}$$
 [N/mm]

Where

d outer thread diameter [mm]

 $\ell_{\rm ef}$  penetration length in the structural member [mm]

#### Thermal insulation material on top of rafters

"fischer Power-Fast" screws with an outer thread diameter of d = 6 mm, 8 mm, 10 mm and 12 mm may be used for the fixing of thermal insulation material on top of rafters.

The thickness of the insulation ranges up to 400 mm. The rafter insulation must be placed on top of solid timber or glued laminated timber rafters or cross-laminated timber members and be fixed by battens placed parallel to the rafters or by wood-based panels on top of the insulation layer. The insulation of vertical facades is also covered by the rules given here.

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

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

The battens must be from solid timber (softwood) according to EN 338:2003-04. The minimum thickness of the battens is 80 mm and the minimum width 100 mm for screws with outer thread diameter d=12 mm. The minimum thickness of the battens is 40 mm and the minimum width 60 mm for screws with outer thread diameter d=10 mm. For screws with outer thread diameter d=6 mm and 8 mm the minimum thickness of the battens is 30 mm and the minimum width 50 mm.

Alternatively, to the battens, boards with a minimum thickness of 20 mm from plywood according to EN 636, particle board according to EN 312, oriented strand board OSB/3 and OSB/4 according to EN 300 or ETA and solid wood panels according to EN 13353 may be used.

The rafter consists of solid timber (softwood) according to EN 338, glued laminated timber according to EN 14081, cross-laminated timber, laminated veneer lumber according to EN 14374 or to ETA or similar glued members according to ETA and has a minimum width of 60 mm.

The insulation must comply with a ETA.

The insulation must have a minimum compressive stress of  $\sigma_{10\%} = 0.05 \text{ N/mm}^2$  at 10 % deformation according to EN 826:1996-05.

The analysis of the fixing of the insulation and battens or boards, respectively, may be carried out using the static model in Annex B. The battens or boards, respectively, must have sufficient strength and stiffness. The maximum pressure between the battens or boards, respectively, and the insulation shall not exceed  $1,1\cdot\sigma_{10\%}$ .

The characteristic axial withdrawal capacity of the screws for rafter or facade insulation shall be calculated from:

$$F_{ax,\alpha,Rk} = min \begin{cases} k_{ax} \cdot f_{ax,k} \cdot d \cdot \ell_{ef} \cdot k_{1} \cdot k_{2} \left(\frac{\rho_{k}}{350}\right)^{0.8} \\ f_{head,k} \cdot d_{h}^{2} \cdot \left(\frac{\rho_{k}}{350}\right)^{0.8} \end{cases}$$

$$[N]$$

$$f_{tens,d}$$

where

 $F_{ax,\alpha,RK}$  Characteristic withdrawal capacity of the connection at an angle  $\alpha$  to the grain [N]

 $k_{ax}$  Factor, taking into account the angle  $\alpha$  between screw axis and grain direction

 $k_{ax}$  = 1,0 for  $45^{\circ} \le \alpha < 90^{\circ}$ 

$$k_{ax}=~0,3+\frac{0,7\cdot\alpha}{45}~~for~0^{\circ}\leq\alpha<45^{\circ}$$

 $f_{ax,k}$  Characteristic withdrawal parameter  $\lceil N/mm^2 \rceil$ 

D Outer thread diameter [mm]

Point side penetration length of the threaded part according to EN 1995-1-1:2008 [mm]

 $\alpha$  Angle between grain and screw axis ( $\alpha \ge 30^{\circ}$ )

 $k_1 \quad \min\{1; 220/t_{HI}\}$ 

 $k_2 \quad \min\{1; \sigma_{10\%}/0,12\}$ 

t<sub>HI</sub> Thickness of the thermal insulation [mm]

 $\sigma_{10\%}$  Compressive stress of the thermal insulation

under 10 % deformation [N/mm<sup>2</sup>]

 $\sigma_{10\%} \ge 0.05 \text{ N/mm}^2$ 

 $f_{\text{head},k} \qquad \text{Characteristic head pull-through parameter}$ 

 $[N/mm^2]$ 

d<sub>h</sub> Outer diameter of the screw head [mm]

ρ<sub>k</sub> Characteristic density [kg/m³]

 $f_{tens,d}$  Characteristic tensile capacity of the screw

[N]

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

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

Screws for the anchorage of rafter insulation shall be arranged according to Annex B.

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

#### 3.10 Aspects related to the performance of the product

3.10.1 Corrosion protection in service class 1, 2 and 3. The fischer Power-Fast and fischer construction screws are produced from carbon wire. Screws made from carbon steel

are electrogalvanised and yellow or blue chromate. The mean thickness of the zinc coating is  $5\mu m$ .

The material specification of the stainless steel screws is deposited with ETA-Danmark.

# 3.11 General aspects related to the intended use of the product

The screws are manufactured in accordance with the provisions of the European Technical Assessment using the automated manufacturing process and laid down in the technical documentation.

The installation shall be carried out in accordance with Eurocode 5 or an appropriate national code unless otherwise is defined in the following. Instructions from fischerwerke GmbH & Co. KG should be considered for installation.

The screws are used for connections in load bearing timber structures between members of solid timber (softwood and hardwood), glued laminated timber (softwood and hardwood), cross-laminated timber (minimum diameter d = 6,0 mm, softwood and hardwood), laminated veneer lumber (softwood and hardwood), similar glued members (softwood and hardwood), wood-based panels or steel members.

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

Furthermore, the screws with diameters between 6 mm and 12 mm may also be used for the fixing of insulation on top of rafters or at vertical facades.

A minimum of two screws should be used for connections in load bearing timber structures. A single screw may be used in structural connections if the penetration length of the screw including an unthreaded part of the shank is at least  $20 \cdot d$  and the screw is only axially loaded. The load-bearing capacity of the single screw in this case shall be reduced by 50 %.

A single screw per connection may also be used, if the member is fixed with at least two screws and the screws are used for the fixing of boards, battens and wind braces, or for the fixing of rafters, purlins or similar on main beams or top plates.

The minimum penetration depth in structural members made of solid, glued or cross-laminated timber is 4·d.

Wood-based panels - except Egger Eurostrand OSB 4 TOP - and steel plates should only be arranged on the side of the

screw head. The minimum thickness of wood-based panels should be 1,2·d. Furthermore, the minimum thickness for following wood-based panels should be:

- Plywood, Fibreboards: 6 mm
- Particleboards, OSB, Cement Particleboards: 8 mm
- Solid wood panels: 12 mm

For structural members according to ETA's the terms of the ETA's must be considered.

If screws with an outer thread diameter  $d \ge 8$  mm are used in load bearing timber structures, the structural solid or glued laminated timber, laminated veneer lumber and similar glued members must be from spruce, pine or fir. This does not apply for screws in pre-drilled holes.

The minimum angle between the screw axis and the grain direction is  $\alpha = 0^{\circ}$ .

The screws shall be driven into softwood without predrilling or after pre-drilling. The screws shall be driven into hardwood with a maximum characteristic density of 730 kg/m³ after predrilling.

The drill hole diameters are:

Outer thread	Drill hole diameter							
diameter	Softwood	Hardwood						
4,0	2,5	3,0						
4,5	2,5	3,0						
5,0	3,0	3,0						
6,0	4,0	4,0						
8,0	5,0	6,0						
10,0	6,0	7,0						
12,0	7,0	8,0						

The hole diameter in steel members must be predrilled with a suitable diameter.

Only the equipment prescribed by fischerwerke GmbH & Co. KG shall be used for driving the screws.

In connections with screws with countersunk head according to Annexes A1, A5, A6, A7, A11, A13 and A18, the head must be flush with the surface of the connected structural member. A deeper countersink is not allowed.

Screws from carbon steel and stainless steel with countersunk head according to Annex A1, A2, A5, A6, A7, A11, A13, A14 and A18 may be used together with washers according to Annex A20. Washers according to EN ISO 7094 may be used together with washers according to Annex A20.

Screws according to Annex A3, A4, A8, A9, A10, A12 A16, A17 and A19 may be used together with washers according to EN ISO 7094.

Washers from carbon steel should be used with screws from carbon steel and screws from stainless steel with washers from stainless steel. Washers should have a full bearing area.

For structural timber members, minimum spacing and distances for screws in predrilled holes are given in EN 1995-1-1:2008 (Eurocode 5) clause 8.3.1.2 and table 8.2 as for nails in predrilled holes. Here, the outer thread diameter d must be considered.

For screws in non-predrilled holes, minimum spacing and distances are given in EN 1995-1-1:2008 (Eurocode 5) clause 8.3.1.2 and table 8.2 as for nails in non-predrilled holes.

Alternatively, minimum distances and spacing for exclusively axially loaded "fischer Power-Fast" screws in non-predrilled holes in members of solid timber (softwood and hardwood), glued laminated timber or similar glued products (softwood and hardwood) with a minimum thickness  $t=12\cdot d$  and a minimum width of  $8\cdot d$  or 60 mm, whichever is the greater, may be taken as:

Spacing a <sub>1</sub> parallel to the grain	$a_1 = 5 \cdot d$
Spacing a <sub>2</sub> perpendicular to the grain	$a_2 = 5 \cdot d$
Distance a <sub>3,c</sub> from centre of the screw-part in	
timber to the end grain	$a_{3,c} = 9 \cdot d$
Distance a <sub>4,c</sub> from centre of the screw-part in	
timber to the edge	$a_{4,c} = 4 \cdot d$

Spacing  $a_2$  perpendicular to the grain may be reduced from 5·d to 2,5·d, if the condition  $a_1 \cdot a_2 \ge 25 \cdot d^2$  is fulfilled.

For Douglas fir members minimum spacing and distances parallel to the grain shall be increased by 50%.

Minimum distances from loaded or unloaded ends must be  $15 \cdot d$  for screws in non-predrilled holes with outer thread diameter  $d \ge 8$  mm and timber thickness  $t < 5 \cdot d$ .

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

Unless specified otherwise in the technical specification (ETA or hEN) of cross laminated timber, minimum distances and spacing for screws in the plane surface of cross laminated timber members with a minimum thickness  $t = 10 \cdot d$  may be taken as (see Annex C):

Spacing a <sub>1</sub> parallel to the grain	$a_1 = 4 \cdot d$
Spacing a <sub>2</sub> perpendicular to the grain	$a_2 = 2.5 \cdot d$
Distance a <sub>3,c</sub> from centre of the screw-part in	
timber to the unloaded end grain of	
the plane surface	$a_{3,c} = 6 \cdot d$
Distance a <sub>3,t</sub> from centre of the screw-part in	
timber to the loaded end grain	

of the plane surface	$a_{3,t} = 6 \cdot d$
Distance a <sub>4,c</sub> from centre of the screw-part in	
timber to the unloaded edge	$a_{4,c} = 2.5 \cdot d$
Distance a <sub>4,t</sub> from centre of the screw-part in	
timber to the loaded edge	$a_{4,t} = 6 \cdot d$

Unless specified otherwise in the technical specification (ETA or hEN) of cross laminated timber, minimum distances and spacing for screws in the edge surface of cross laminated timber members with a minimum thickness  $t = 10 \cdot d$  and a minimum penetration depth perpendicular to the edge surface of 10·d may be taken as (see Annex C): Spacing a<sub>1</sub> parallel to the CLT plane surface  $a_1 = 10 \cdot d$ Spacing a<sub>2</sub> perpendicular to the CLT plane surface  $a_2 = 4 \cdot d$ Distance a<sub>3,c</sub> from centre of the screw-part in timber to the unloaded end  $a_{3,c} = 7 \cdot d$ Distance a<sub>3,t</sub> from centre of the screw-part in timber to the loaded end  $a_{3,t} = 12 \cdot d$ Distance a<sub>4,c</sub> from centre of the screw-part in timber to the unloaded edge  $a_{4,c} = 3 \cdot d$ Distance a<sub>4,t</sub> from centre of the screw-part in timber to the loaded edge  $a_{4,t} = 6 \cdot d$ 

For a crossed screw couple the minimum spacing between the crossing screws is 1,5·d.

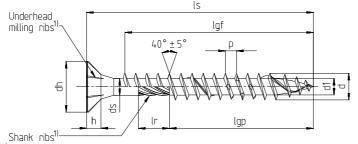
Minimum thickness for structural members is t=24 mm for screws with outer thread diameter d < 8 mm, t=30 mm for screws with outer thread diameter d=8 mm, t=40 mm for screws with outer thread diameter d=10 mm and t=80 mm for screws with outer thread diameter d=12 mm.

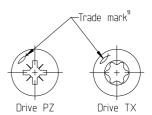
# 4 Attestation and verification of constancy of performance (AVCP)

## 4.1 AVCP system

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

#### Screw sizes and material





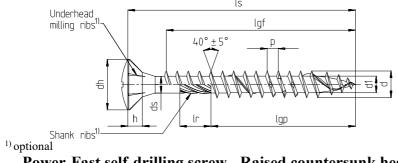
1) optional

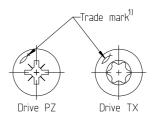
Power-Fast self-drilling screw - Countersunk head with full- or partial thread

N	minal dia		3,0		2	3,5		4,0		4,5		Λ	6	Λ		
	Outer dian		3,00 3,50		_	, ,		<b>5,0</b> 5,00		<b>6,0</b> 6,00						
d	Allow. dev		3,	00	٥,	30	4,00 4,50 ±0,30				ا, ر	50	0,	00		
	Core diam		2	00	2	20	2,50 2,70			3,0	00	4,00				
$d_1$	Allow. deviation						+0.10		,	70			,20			
	Head diam		6.	00		00	8,0		9.0	00	10.		<u> </u>	,00		
$d_h$	Allow. dev	υ,						+0,10		10,			, , , ,			
,	Shank diameter			25	2,	60	2,		3,		3,	50	4,	20		
$d_s$	Allow. dev	iation						-0,30 /	+0,10							
h	Head heigl	nt	1,	90	2,	10	2,:		2,		3,0	00	3,	80		
,	Thread pit		1,	50	1,	80	2,0	00	2,2	20	2,	50	3,00	-4,50		
p	Allow. dev							±1								
$l_r^{1)}$	Shank ribs		3,	75		25	4,	75	5,:	50	6,		7,	00		
ır	Allow. dev					,75	1				±1.					
	Drive TX			10				20				25	30			
	Drive P2	,	ļ .	1 2 3												
	Screw lengt	h ls	S	Standard thread length   $l_{gf}$ = Full thread   $l_{gp}$ =Partial thread   Tolerance								erance	$: \pm 2,0$	)2)		
Nomi	mın	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$		
lengt	n			1gp	_	1gp		1gp	Ŭ	1gp	1gī	1gp	1gī	1gp		
20	18,95	21,05	16		16	4.0	16	10	16							<u> </u>
25	23,75	26,25	21	1.0	21	18	20	18	20	1.0	2.4					
30	28,75	31,25	26	18	26	18	25	18	25	18	24	24	20			
35 40	33,50 38,50	36,50 41,50	31	24 24	31	24 24	30 35	24 24	30 35	24 24	29 34	24 24	28 33	24		<u> </u>
45	43,50	46,50	41	30	41	30	40	30	40	30	39	30	38	30		
50	48,50	51,50	41	30	46	30	45	30	45	30	44	30	43	30		
55	53,50	56,50			70	30	50	36	50	36	49	36	48	30		
60	58,50	61,50					30	36	30	36	17	36	53	36		
70	68,50	71,50						42		42		42	63	42		
80	78,50	81,50						50		50		50	73	50		
90	88,25	91,75										60		60		
100		101,75										60		60		
110		111,75										70		70		
120												70		70		
	in steps of 10															
130-300 $l_s$ -2,00 $l_s$ +2,00														70	İ	

All sizes in mm

- Intermediate lengths at l<sub>s</sub> are possible
- Screws with partial thread > 50 mm length with shank ribs
- Threaded lengths between  $4 \times d \le l_g \le l_{gmax}$  are possible





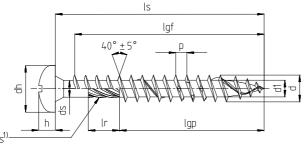
Power-Fast self-drilling screw - Raised countersunk head with full- or partial thread

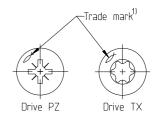
Power-Fast self-drilling screw - Raised countersunk head with full- or partial thread																	
		steel e surface ti	reatments: y	ellow (	or blue	-zinc-p	lated, b	lue zinc	-plated	l≥12μn	n, bonu	s- zince	ed, buri	nished,	nickel-	/brass j	plated
N	Nominal diameter				3,0		3,5		4,0		4,5		,0	6	,0		
d	d Outer diameter			3,	00	3,	50	4,	00	4,5	50	5,0	00	6,	00		
u	Al	low. devi	ation				±0,30										
$d_1$		Core diameter			00	,	20	,	50	2,7	70	3,0	00	4,	00		
<b>u</b> 1		low. devi			-0,25 / +0,10 ±0,20												
$d_{\rm h}$		ead diame		6,	00	7,	00	8,	00	9,0	00	10,	,00	12,	,00		
u <sub>h</sub>		low. devi								+0,10							
$d_s$		ank diam		2,	25	2,	60		90	3,2		3,	60	4,2	20		
us		low. devi								+0,10							
h	Head height				90		10		50	2,7			00		40		
p		read pitcl		1,	50	1,	80	2,	00	2,2	20	2,	50	3,00-	4,50	<u> </u>	
Р		low. devi			±10%						T				<u> </u>		
$1_{r}^{1}$	Shank ribs length		3,	3,75 4,25		4,	4,75 5,50				00	7,00					
-1		low. devi		±0,75						±1,00			<u> </u>				
		Drive TX		10			20			20	25	30					
		Drive PZ			1 2 3												
	Scr	ew length	l <sub>s</sub>	S	Standa	d thre	ad leng	gth $  l_{gf} =$ Full thread $  l_{gp} =$				Partial	thread	d   Tole	erance	$\pm 2,0^{2}$	2)
Nomi:		min	max	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$		
20		18,95	21,05	16		16		16		16							
25		23,75	26,25	21		21	18	20	18	20							
30		28,75	31,25	26	18	26	18	25	18	25	18	24					
35		33,50	36,50	31	24	31	24	30	24	30	24	29	24	28			
40	_	38,50	41,50	36	24	36	24	35	24	35	24	34	24	33	24		
45		43,50	46,50	41	30	41	30	40	30	40	30	39	30	38	30		
50	_	48,50	51,50			46	30	45	30	45	30	44	30	43	30		
55		53,50	56,50					50	36	50	36	49	36	48			
60		58,50	61,50						36		36		36	53	36	<u> </u>	
70		68,50	71,50						42		42		42	63	42	<u> </u>	
80 7		78,50	81,50						50		50		50	73	50		

All sizes in mm

- Intermediate lengths at  $l_{\rm s}$  are possible
- Screws with partial thread > 50 mm length with shank ribs
- Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible

 $^{2)}~10mm \geq l_g \leq \!\! 18mm \triangleq \pm 1,\!5mm$  $18mm \geq l_g \leq 30mm \triangleq \pm 1{,}7mm$ 





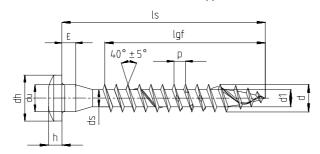
Shank ribs<sup>1)</sup> optional

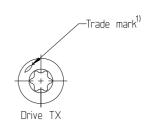
## Power-Fast self-drilling screw - Pan head with full- or partial thread

	bon steel sible surface t	reatments:			Ť										/brass p	olated
No	minal dian	neter	3,0 3,5		4	4,0 4,5		,5	5,0		6,0					
	Outer diam	eter	3,	00	3,	50	4,	00	4,:	50	5,	00				
d	Allow. dev	iation							±0.	±0,30						
	Core diame	ter	2,	00	2,	20	2,	2,50		2,70		00	4,	00		
$d_1$	Allow. dev	iation				-0,25	+0,10					$\pm 0$	,20			
	Head diame	eter	6,	00	7,	00	8,	00	9,0	00	10	,00	12	,00		
$d_h$	Allow. dev		-0,50 / +0,10													
d	Shank diameter			25	2,	60	2,	90	3,2	25	3,	60	4,	20		
$d_{s}$	Allow. dev	iation						-0,30 /	'+0,10							
h	Head heigh			30		50		90		10		40	,	80		
	Thread pitc		1,	50	1,	80	2,	00		20	2,	50	3,00	-4,50		
р	Allow. dev			±10%												
$1_{r}^{1)}$	Shank ribs length			3,75 4,25				75	5,	50		00	7,	00		
ır	Allow. deviation				±0	,75						,00				
	Drive TX			1	0				.0		20	25		0		
	Drive PZ			[				2	2				3	3		
	Screw lengtl	ı l <sub>s</sub>	S	Standard thread length   $l_{gf}$ = Full thread   $l_{gp}$ =Partial thread   Tolerance:											$: \pm 2,0$	2)
Nomina	al min	may	1.	1	1.	1	1.	1	1.	1	1.	1	1 .	1		
length		max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$		
20	18,95	21,05	16		16		16		16							
25	23,75	26,25	21		21	18	20	18	20							
30	28,75	31,25	26	18	26	18	25	18	25	18	24					
35	33,50	36,50	31	24	31	24	30	24	30	24	29	24	28			
40	38,50	41,50		24	36	24	35	24	35	24	34	24	33	24		
45	43,50	46,50		30		30	40	30	40	30	39	30	38	30		
50	48,50	51,50				30	45	30	45	30	44	36	43	30		
55	53,50	56,50					50	36	50	36	49	36	48			
60	58,50	61,50						36		36		42	53	36		
70	68,50	71,50						42		42		50	63	42		
80	78,50	81,50						50		50		50	73	50		
90	88,25	91,75										60		60		
100	98,25	101,75										60		60		

All sizes in mm

- Intermediate lengths at l<sub>s</sub> are possible
- Screws with partial thread > 50 mm length with shank ribs
- Threaded lengths between  $4 \times d \le l_g \le l_{gmax}$  are possible





 $^{1)}$  optional

Power-Fast self-drilling screw - Wood connector screw with full thread

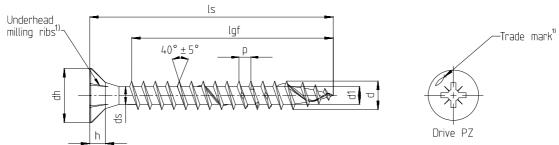
		er-Fast s	en-ar	THIRE	g scre	:w - v	v oou	conn	ecto	rscre	W WI	ın rui	ı uıre	au			
	rbon steel ssible surface	treatments:	vellow	or blue	zinc-n	lated I	30nus-2	zinced i	hlue zi	nc-nlate	ed >12ı	ım					
	minal dian			,0	Zine p	ratea, 1	Jonus 2	inicca,	l lac zi	ne pian		A111					
110	Outer diam			5,00											<del>                                     </del>		
d			_												₩		
	Allow. dev		-0,30												<u> </u>		
$d_1$	Core diame			3,00											<u> </u>		
•	Allow. dev			,20													
du	Underhead diameter		5,	00													
uu	Allow. deviation		-0.	,35													
d <sub>h</sub>	Head diameter		8,	25													
$\mathbf{u}_{\mathrm{h}}$	Allow. dev	iation	±0	,40													
П	Height		2,	50													
E	Allow. deviation		±0	±0,30													
h	Head heigh	nt	2.	2,60													
	Thread pite			50											1		
p	Allow. dev			0%											-		
	Drive TX			20 25													
	Screw lengtl				read 1	enoth	1 a= F	ull thre	ad   1	=Par	tial thr	ead   T	Tolerance: $\pm 2,0^{2}$				
Nomin		I I <sub>S</sub>	Stan	uaru ii	reau i	l gui	Igt — I	un unv	zau   1 <sub>9</sub>	<sub>zp</sub> –1 a1	1141 1111	cau   1	Olcian	ICC. ± 2	2,0	Т	
lengtl	mın	max	$l_{gf}$	$l_{gp}$													
20	18,95	21,05	14														
25	23,75	26,25	19														
30	28,75	31,25	24														
35	33,50	36,50	29														
40	38,50	41,50	34														
45	43,50	46,50	39														
50	48,50	51,50	44												<u> </u>	<del>                                     </del>	
55	53,50	56,50	49				-				-					1	
60	58,50	61,50	54													<u> </u>	
70	68,50	71,50	64												<u> </u>		
80	80 78,50 81,50		74											A 11 '			

All sizes in mm

fischer Power-Fast and Construction Screws
Sizes and Material

<sup>■</sup> Intermediate lengths at l<sub>s</sub> are possible

 $<sup>\</sup>blacksquare \qquad \text{Threaded lengths between } 4 \times d \leq l_g \leq l_{gmax} \text{ are possible}$ 



 $^{1)}$  optional

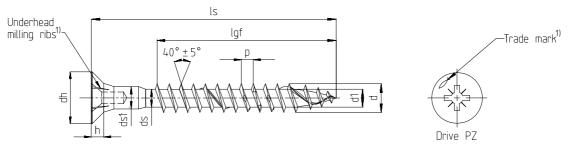
Power-Fast self-drilling screw - Small countersunk head with full thread

	Carbon steel																
					ميرا ما سم	-i	1a+ad 1=	مند جند	a mlata	1 ~ 12							
_		nal diam	reatments:	Ĭ		•			_	ı <u>∠</u> 12μι	11	1					
11(	HIII	iai diaii	ieter	3	,0	٥,	,5	4,	,0								
d	Οι	uter diam	eter	3,	00	3,	50	4,	00								
u	Allow. deviation				±0,30												
1	Core diameter			2,	00	2,	20	2,	50								
$\mathbf{d}_1$	Al	llow. dev	iation			-0,25 /	+0,10	)									
1	Н	ead diam	eter	5,	00	6,00 7,00											
$d_{\rm h}$	Al	llow. dev	iation	-0,50 / +0,10													
h	Head height			1,90		2,10		2,50									
	Th	nread pito	h	1,50		1,80		2,	00								
p	Al	llow. dev	iation	±10%													
	I	Drive PZ		1 2													
	Scr	ew length	ı l <sub>s</sub>	Stand	dard th	read le	ength	$l_{gf} = F_1$	ull thre	ad   lgr	,=Part	ial thre	ead   T	oleran	ce: ± 2	$2,0^{2}$	
	Nominal min max		max	$l_{ m gf}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$								
lengt	uıı			_		_		_									
20		18,95	21,05	16		16		16									
25		23,75	26,25	21		21		20									
30		28,75	31,25	26													

- Intermediate lengths at  $l_s$  are possible Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible

2) $10 \text{mm} \ge l_g \le 18 \text{mm} \triangleq \pm 1,$	5mm
$18$ mm $\geq l_g \leq 30$ mm $\triangleq \pm 1$ ,	7mm

fischer Power-Fast and Construction Screws
Sizes and Material



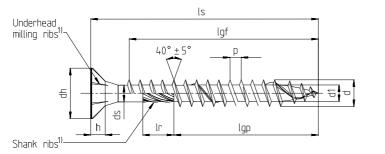
Power-Fast self-drilling screw - Countersunk headhole screw with full thread

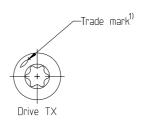
Carbon steel																	
			reatments:	hlue zin	c_nlate	d blue	zinc-nl	lated >1	2um								
				4.	_		,5				Λ						
INC		nal diam						,	,0		,0						
d		ıter diame		4,0	)()	4,	50		00	6,0	00						
		low. devi						,30									
$d_1$		ore diame		2,50 2,70				3,00 4,00									
G <sub>1</sub>		low. devi		-0,25 / +0,10						,20							
$d_{\rm h}$	Head diameter			8,0	00	9,0			,00	12,	,00						
G <sub>II</sub>	Allow. deviation							+0,10		ı							
$d_{\rm s}$	Shank diameter			2,9	90	3,2		- ,	60	4,3	30						
		low. devi					,	'+0,10									
h	Head height			2,5			70		00		80						
n		read pitcl		2,0	00	2,2	20		50	3,00-	-4,50						
p		low. devi		±10%													
$d_{s1}$	Shank diameter			3,7	70	3,	85		50	4,2	20						
$\mathbf{u}_{\mathrm{s}1}$		low. devi	ation					,10									
	]	Drive PZ				2	2			3	3						
	Scr	ew length	l <sub>s</sub>	Standard thread length $  l_{gf} =$ Full the							1   1 <sub>gp</sub> =	Partia	thread	d   Tol	erance	$: \pm 2.0^{\circ}$	2)
Nomi	nal	min	***	1	1	1	1	1	1	1	1						
leng		ШШ	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$						
25		23,75	26,25	17,5													
27		25,75	28,25	19,5													
30		28,75	31,25	22,5		19											
35		33,50	36,50	27,5		24											
40		38,50	41,50	32,5		29		29									
45		43,50	46,50	37,5		34		34									
50		48,50	51,50	42,5		39		39		41							
55		53,50	56,50	47,5		44		44		46							
60		58,50	61,50	50,0		49		49		51							
70		68,50	71,50			59		60		60							
80		78,50	81,50			59		60		60							
90		88,25	91,75			59		60		60							
100	)	98,25	101,75					60		60							

All sizes in mm

fischer Power-Fast and Construction Screws
Sizes and Material

Intermediate lengths at  $l_s$  are possible Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible



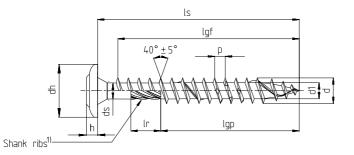


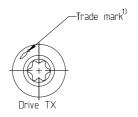
 $^{1)}$  optional

Power-Fast wood construction screw - Countersunk head with full- or partial thread

Power-Fast wood construction screw - Countersunk head with full- or partial thread  Carbon steel																
	bon steel sible surface t	reatments:	yellow	or blue	zinc-pl	ated, b	lue zinc	-plated	l ≥12μn	n, bonu	s-zince	d				
No	minal dian	ieter	6	,0	8	,0	10,0		12	2,0						
	Outer diame	ter	6,	00	8,	8,00		,00	12.	,00						
d	Allow. devia	ation		±0.	,30		±0	,40	±0.	,50						
1	Core diamet	er	4,	00	5,	40	6,40		7,60							
d <sub>1</sub>	Allow. devia	ation		<u> </u>	±0.	,20			±0,30							
,	Head diamet	ter	12.	,00	14.	,40	18,40		22,40							
d <sub>h</sub>	Allow. devia	-0,50	/+0,10		±0	,40		±0.	,50							
.1	Shank diame	eter	4,	30	5,	90	7,	10	8,3	30						
ds	Allow. devia	ation	-0,30	/+0,10			±0	,20								
h	Head height		3,	80	5,	10	6,	10	7,2	20						
	Thread pitch	1	3,00	-4,50	6,	00		7,:	50							
p	Allow. devia	ation				±1	0%									
l <sub>r</sub> 1)	Shank ribs lo	ength	8,	00			13	,00								
Ir ′	Allow. devia	ation				-2,	00									
	Drive TX		3	0		4	0		5	0						
			Standard thread length   l <sub>gf</sub> = Full thread   l <sub>gp</sub> = P									l threa	ıd   To	lerance	$e: \pm 2,0$	)
Nomin	al min	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{gf}$	lgp						
lengtl	1			0.1	1gt	Igp	1gt	1gp	1gt	1gp						
60	58,50	61,50	50	36												
80	78,50	81,50	70	50	70	50		52								
90	88,25	91,75		60	80	50										ļ
100	98,25	101,75		60	80	50		52		60						<u> </u>
120	118,25	121,75		70	100	75		80		80						<u> </u>
140	138,00	142,00		70		75 75		80		80 80						<u> </u>
160 180	158,00 178,00	162,00 182,00		70 70		75		100		100						<u> </u>
200	198,00	202,00		70		100		100		100					1	
220	218,00	202,00		70		100		100		100						
240	238,00	242,00		70		100		100		120						
260	258,00	262,00		70		100		100		120						
280	278,00	282,00		70		100		115		120						
300	298,00	302,00		70		100		115		120						
320	317,00	323,00				100		115								
330	327,00	333,00						115								
340	337,00	343,00				100		115								
350	347,00	353,00								145						
360	357,00	363,00				100		115								
380	377,00	383,00				100		115								<u> </u>
400	397,00	403,00														
450/50		$l_s + 3,00$				100		115		145						<u> </u>
550/60	$0 l_{s} -3,00$	$l_s +3,00$								145						

- Intermediate lengths at  $l_s$  are possible Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible



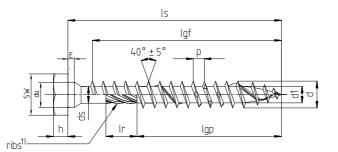


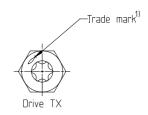
Power-Fast wood construction screw - Flange head with full- or partial thread

_	Carbon steel															
	arbon steel ossible surface	treatments	vellow	or blue	zine-n	lated b	lue zin	c-nlate	1>1211	m hom	IS-Zince	d				
	ominal dia:			,0		,0		0.0		2,0	AS-ZIIICC					
	Outer diame			00		00		,00		,00						
d	Allow. devi		- ,		,30		±0,40 ±0,50									
ı	Core diame	ter	4,	00	5,	40	6,40 7,60									
$\mathbf{d}_1$	Allow. devi	ation		±0,20				±0,30								
dı.	d <sub>h</sub> Head diameter			,70	21,00			,70	27,90							
un	Allow. deviation			+1,30		,00		+2,80								
$d_{\rm s}$	Shank diam			30	5,	90		10		,30						
43	Allow. devi		-0,30/	+0,10		±0	,20			,30						
h	Head height				50		5,	60		,70						
	Allow. devi		2.00		,00	0.0			,50 50							
р	Thread pitcl		3,00	-4,50	6,	00	00/	7,	50							
_	Allow. devi		0	00		±1	0%	00								
$l_{r}^{1)}$	Shank rib le Allow. devi		8,	00		2	00	,00								
	Drive TX		2	0					-	50						
	Screw lengt		$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$								الم مرما	Tolor		120		
Nomir		II I <sub>S</sub>	Stant	iaiu iiii	ead le	ոցտ լ դ	gf – Ful	i iiiiea	I   Igp =	-rainai	unead	10161	ance.	± 2,0	l	
lengt		max	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$						
60	58,50	61,50	50	36												
80		81,50	70	50	70	50		52								
90		91,75		60	80	50										
100		101,75		60	80	50		52		60						
120		121,75		70	100	75		80		80						
140		142,00		70		75		80		80						
160		162,00		70		75		80		80						
180		182,00		70		75		100		100						
200		202,00		70		100		100		100						
220 240		222,00		70 70		100		100		100						
260		242,00 262,00		70		100		100		100						
280		282,00		70		100		115		120						
300		302,00		70		100		115		120						
320		323,00		70		100		115		120						
330		333,00				100		115								
340		343,00				100		115								
350		353,00								145						
	in steps of 10															
360-50		$l_s + 3,00$				100		115								
	in steps of 50mm															
550-60	00 l <sub>s</sub> -3,00	$l_s +3,00$								145						

- Intermediate lengths at l<sub>s</sub> are possible
- $\blacksquare \qquad \text{Threaded lengths between } 4 \times d \leq l_g \leq l_{gmax} \text{ are possible}$

fischer Power-Fast and Construction Screws
Sizes and Material





Shank ribs<sup>1).</sup>

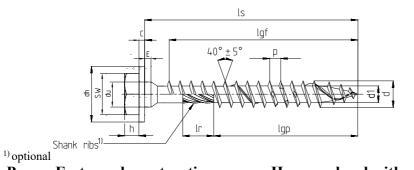
optional

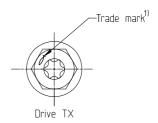
Pow	er-Fast w	ood cons	<u>struct</u>	tion s	crew	<u>- Нех</u>	kagor	ı heac	d wit	<u>h full</u>	<u>- or p</u>	<u>artia</u>	ıl thr	<u>ead</u>	
	rbon steel														
	ssible surface		yellow	or blue							ıs-zince	ed	1		
No	minal diar	neter	6	,0	8	,0	10	),0	12	2,0					
a l	Outer diam	eter	6,	00	8,	00	10	,00	12	,00					
d	Allow. dev	iation		±0	,30		±0	,40	±0	,50					
a	Core diame	eter	4,	00	5,	40	6,	40	7,	60					
$d_1$	Allow. dev	iation				,20				±0,30					
du	Underhead	diameter	6,	25	8,25		10,30		12,40						
Сu	Allow. dev			-0	,80			,90	-1	,00					
sw	Wrench siz	e	9,	90	12	,80		,80	16	,80					
3 W	Allow. dev	iation					,30								
Е	Height		2,	00	2,	10		30	3,	30					
Ľ	Allow. dev					,50									
ds	Shank dian		30	5,	90		10	8,	30						
us	Allow. dev			+0,10				,20							
h	Head heigh			00		50	5,	20		70					
11	Allow. dev			,30	±0	,40			,50						
,	Thread pite		3,00	-4,50	6,	00		7,	50						
р	Allow. dev	iation				±1	0%								
$l_r^{1)}$	Shank rib l			8,	00			13	,00						
Ir ′	Allow. dev					-2,	,00								
Drive TX			3	0		4	0		5	0					
	Screw lengt	h ls	Stand	dard the	read le	ngth   l	gf= Ful	l threa	d   l <sub>gp</sub> =	Partial	thread	Tole	rance:	$\pm 2,0^{2)}$	
Nomina	al .														T
lengtl	mın	max	$l_{gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$					
60	58,5	61,5	50	30											
80	78,5	81,5	70	50	70	50		52							
90	88,25	91,75		60	80	50									
100	98,25	101,75		60	80	50		52		60					
120	118,25	121,75		70	100	75		80		80					
140/16		$l_s + 2,00$		70		75		80		80					
180	178,00	182,00		70		75		100		100					
200/22	$0  l_{\rm s} = 2,00$	$l_s + 2,00$		70		100		100		100					
240/26		$l_s + 2,00$		70		100		100		120					
280/30		$l_s + 2,00$		70		100		115		120					
320	317,00	323,00				100		115							
330	327,00	333,00						115							
340	337,00	343,00				100		115							
350	347,00	353,00								145					
360/38		$l_s + 3,00$				100		115							
	1 steps of 50r														
400-50		$l_s + 3,00$				100		115		145					
550/60		$l_s + 3,00$								145					

All sizes in mm

- Intermediate lengths at l<sub>s</sub> are possible
- Threaded lengths between  $4{\times}d \leq l_g \leq l_{gmax}$  are possible

 $^{2)}$  18mm  $\geq l_{\rm g} \leq$  30mm  $\triangleq \pm 1,7mm$ 





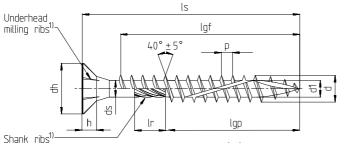
Power-Fast wood construction screw - Hexagon head with washer and full- or partial thread

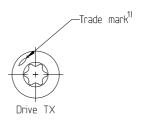
<ul> <li>Carbon steel</li> <li>Possible surface treatments: yellow or blue zinc-plated, blue zinc-plated ≥12μm, bonus-zinced</li> </ul>															
		treatments:	vellow	or blue	zinc-r	olated, b	olue zin	c-plate	d≥12µ	m, bonı	ıs-zinc	ed			
	minal dian			,0		,0		),0		2,0					
ı	Outer diame	ter	6,	00	8,	00	10	,00	12	,00					
d	Allow. devia	ation		±0.	,30		±0	,40	±0	,50					
$d_1$	Core diamet	er	4,	00		40	6,	40		60					
u <sub>l</sub>	Allow. devia					,20				,30					
$d_h$	Head diame		15	,00		,00	21	21,50		23,40					
G <sub>II</sub>	Allow. devia				20			1,							
$d_{\mathrm{u}}$	Underhead of		6,	25		25	10,30 12,40								
- Cu	Allow. deviation				80			,90		,00					
SW	Wrench size			90	12	,80		,80	16	,80				1	
	Allow. deviation				_		,30	•	_					-	
c	Washer heig	ght		80		00		20		50				-	
Е	Height		2,	00	2,	10		30	3,	30					
	Allow. devia		4	20	-		,50	1.0	0	20				1	
$d_{s}$	Shank diame			30	٥,	90		.20	δ,	30				-	
	Allow. devia Head height			(+0,10 00	1	50		<u>,20                                    </u>	5	70					
h	Allow. devia			,30		,40	٥,		,50	70				1	
	Thread pitch			<u>,30</u> -4,50		00			<u>,50                                    </u>						
p	Allow. devia		3,00	-4,50	0,		0%	7,	50						
	Shank rib le			8 1	00		0 / 0	12	,00						
$l_r^{1)}$	Allow. devia			0,	00	-2	,00	13	,00						
l.	Drive TX		3	0			0		5	50					
	Screw length				ad leno	th   l <sub>gf</sub> =		read   1 <sub>cm</sub>			l   Tole	rance: +	2 02)		
Nomi	nal	1 18	Stand		aa reng	tii   igi		Cuu   Igp	, rurer	in threat	1 1010		2,0		T
lengt	min	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$					
60	58,50	61,50	50	30											
80	78,50	81,50	70	50	70	50		52							
90	88,25	91,75		60	80	50									
100	98,25	101,75		60	80	50		52		60					
120		121,75		70	100	75		80		80					
140/16		$l_s + 2,00$		70		75		80		80					
180		182,00		70		75		100		100					
200/22		$l_s + 2,00$		70		100		100		100					
240/26		$l_s + 2,00$		70		100		100		120					
280/30		$l_s + 2,00$		70		100		115		120					
320		323,00				100		115							
330		333,00				460		115							<u> </u>
340		343,00				100		115		4					
	350 347,00 353,00					100		11-		145					
	$\frac{160/380}{1_s}$ $\frac{1_s-3,00}{1_s}$ $\frac{1_s+3,00}{1_s}$					100		115				<u> </u>			
	in steps of 50mm					100		115		1.45		<u> </u>			
400-50		$l_s + 3,00$				100		115		145					-
330/60	$\frac{1}{1} \frac{1}{1} \frac{1}$									145				os in m	

All sizes in mm

- Intermediate lengths at  $l_s$  are possible
- Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible

 $^{2)}$  18mm  $\geq l_{\rm g} \leq$  30mm  $\triangleq \pm 1,7mm$ 



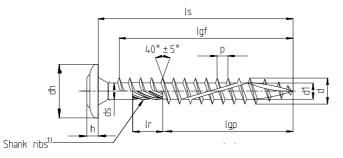


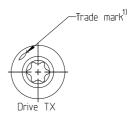
 $^{1)}$  optional

FCS wood construction screw - Countersunk head with full- or partial thread

	r	_5 wood	constru	iction	i scre	w - C	ount	ersun	ik ne	aa w	ith Iu	II- Or	part	iai th	reau		
		n steel		11	1.1		1 , 1 1		1.	1 > 10			,				
			treatments:					lue zin	c-plate	d ≥12μ I	m, bon	us-zinc	ed	<u> </u>			
N(		inal dian			,0		),0										
d		uter diame		8,	00	10	,00										
u	A	llow. devi	ation	±0	,30	±0	,40										
$d_1$		ore diame		5,	40		35										
ալ	A.	llow. devi	ation		-0,30/	+0,20											
$d_{\rm h}$		ead diame		14	,40	18	,40										
$u_h$	A.	llow. devi	ation		$\pm 0$	,40											
$d_s$	Sł	nank diam	eter	5,	90		10										
$\mathbf{u}_{\mathrm{s}}$	A.	llow. devi	ation	-0,30/+0,10													
h	U				-7,00	-	-8,50										
n	Thread pitch				20		60										
p		llow. devi			±1	0%											
$1_{r}^{1}$		nank rib le			13	3,0										<u> </u>	
1r		llow. devi		-2,00												<u> </u>	
		Drive TX			4	0											
		rew lengtł	ı l <sub>s</sub>	Stan	dard th	read le	ength	$l_{gf} = F_1$	ull thre	ead   lg	p=Par	tial thr	ead   T	oleran	ce: ± 2	.,0	
Nomin lengt		min	max	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$										
80		78,50	81,50	70	50		52										
90		88,25	91,75	80	50		52										
100		98,25	101,75	80	50		52										
110		108,25	111,75	100	75		80										
120		118,25	121,75		75		80										
j	in st	teps of 10	mm														
130-4	00	$l_{s}$ -2,00	$l_s + 2,00$		75		80										

- Intermediate lengths at l<sub>s</sub> are possible
- Threaded lengths between  $4 \times d \le l_g \le l_{gmax}$  are possible



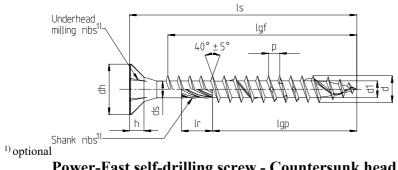


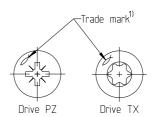
FCS wood construction screw - Flange head with partial thread

			CS W00	u con	Struc	tion	scren	- г га	inge	neau	WILII	part	iai tii	reau			
		n steel		11	1.1		1 . 1 .		1.	1 > 10							
			treatments:					lue zin	c-plate	d ≥12µ I	ım						
No	omi	nal diam	ieter	8	,0	10	),0										
d		uter diame		,	00		10,00										
u	A	llow. devi	ation	-0,40	/+0,30												
$d_1$	Co	ore diamet	ter	5,	40	6,	6,35										
uı	Allow. deviation					,30											
$d_h$	Head diameter			21	,00	24,70											
uh	A	llow. devi	ation	±1	,00	-1,20	+2,80										
Shank diameter				5,	90	,	10										
$d_{\rm s}$	A	llow. devi	ation		-0,30/	+0,20											
h	Н	ead height	<u>t</u>	2,50	-4,50	3,70	-5,70										
n		read pitcl		5,	20		60										
p		llow. devi			±1	0%											
$l_r^{1)}$		nank rib le			12	,00											
Ir		llow. devi			±1	,00											
		Drive TX			4												
	Scı	rew length	ı l <sub>s</sub>	Stan	dard th	read le	ength	$l_{gf} = F\iota$	ıll thre	ad   1	gp =Part	ial thr	ead   T	`oleran	ce: ± 2	,0	
Nomin leng		min	max	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{gp}$										
80		78,50	81,50	70	50		52										
90		88,25	91,75	80	50		52										
100		98,25	101,75	80	50		52										
			111,75	100	75		80										
120		118,25	121,75		75		80										
		teps pf 10	,														
130-4		l <sub>s</sub> -2,00			75		80										

- Intermediate lengths at l<sub>s</sub> are possible
- $\blacksquare \qquad \text{Threaded lengths between } 4 \times d \leq l_g \leq l_{gmax} \text{ are possible}$

fischer Power-Fast and Construction Scre
Sizes and Material





Power-Fast self-drilling screw - Countersunk head with full- or partial thread

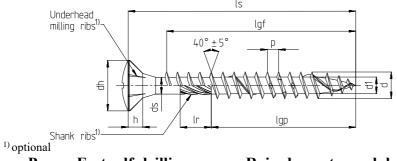
	ower-Fas	st sen-ui	11111115	z scre	- W	Jount	ersui	ік пе	au w	tii iu	11- 01	part	iai tii	reau		
• Stai	inless steel															
Nor	ninal diam	eter	3.	,0	3	,5	4.	,0	4	,5	5,	,0	6	,0		
,	Outer diame	ter	3,	00	3,	50	4,	00	4,	50	5,	00	6,00			
d –	Allow. devi	ation						±0	,30							
a	Core diamet	er	2,	00	2,	20	2,	50	2,	70	3,00		4,00			
$d_1$	Allow. devi	ation				-0,25 /	+0,10						),20			
	Head diame		6,	00	7,	00	,	00	,	00	10.	,00	12	,00		
	Allow. deviation								'+0,10		ı					
_	Shank diameter			25	2,	60	,	90	,	25	3,	60	4,	30		
	Allow. devi							+0,10								
	C			90		10		50		70	3,0			80		
	Thread pitch		1,	50	1,	80	2,	00		20	2,	50	3,00	-4,50		
	Allow. devia		2	7.5	4	2.5	1 4		0%	<u> </u>		00		00		
	Shank rib le		3,	75		25	4,	/5	5,	50	6,00 ±1,00		7,00			
	Allow. devia	ation		1	$\frac{\pm 0}{0}$	,75		2	.0		$\frac{\pm 1}{20}$	25	30			
	Drive PZ		<u>1</u> [	U				2		20	23		3			
				1.1	.1.1	1 E			D	. 1.1	1.1.5			2 02)		
	Screw length	l I <sub>s</sub>	Stand	Standard thread length $\mid$ $l_{gf}$ = Full- thread $\mid$ $l_{gp}$ =Partial thread $\mid$ Tolerance: $\pm$ 2												
Nomina length	mın	max	$l_{gf}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$		
20	18,95	21,05	16		16		16		16		_					
25	23,75	26,25	21		21	18	20	18	20							
30	28,75	31,25	26	18	26	18	25	18	25	18	24					
35	33,50	36,50	31	24	31	24	30	24	30	24	29	24	28			
40	38,50	41,50	36	24	36	24	35	24	35	24	34	24	33	24		
45	43,50	46,50	41	30	41	30	40	30	40	30	39	30	38	30		
50	48,50	51,50			46	30	45	30	45	30	44	30	43	30		
55	53,50	56,50					50	36	50	36	49	36	48			
60	58,50	61,50						36		36		36	53	36		
70	68,50	71,50						42		42		42	63	42		
80	78,50	81,50						50		50		50	73	50		
90	88,25	91,75										60		60		<u> </u>
100	98,25	101,75										60		60		<u> </u>
110	108,25	111,75										70		70	<u> </u>	<u> </u>
120	118,25	121,75										70	-	70		
	steps of 10r													70		
130-300	$l_{\rm s} - 2,00$	$I_s + 2,00$												70		

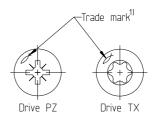
All sizes in mm

- Intermediate lengths at  $l_{s}$  are possible
- Screws with partial thread > 50 mm length with shank ribs
- Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible

 $^{2)}~10mm \geq l_{\rm g} \leq \!\! 18mm \, \triangleq \pm 1,\! 5mm$  $18mm \geq l_g \leq 30mm \triangleq \pm 1,7mm$ 

fischer Power-Fast and Construction Screws
Sizes and Material





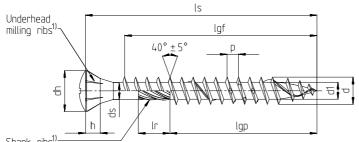
Power-Fast self-drilling screw - Raised countersunk head with full- or partial thread

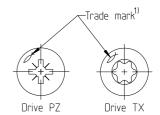
		ss steel	en-ariii	ng sc	rew -	Nais	eu co	unte	rsunk	пеас	u witi	ı ıuıı-	or p	artia	ı uıre	au	
		al diam	notor	2	,0	2	<u>,</u> 5	1	,0	1	,5	5	,0	6	,0		
110		ter diame			00				, <b>u</b> 00		<del>,5</del> 50		00		<del>,0</del> 00		
d				3,	00	3,	50	4,			30	3,0	JU	0,	00		
		ow. devi			0.0	_	20			,30	<b>-</b>	3,00		1.00			
$d_1$		re diame		2,	00		20		2,50		2,70				00		
		ow. devi			-0,25 / +0,10 ±0,20												
$d_h$		ad diame		6,	6,00 7,00 8,00 9,00 10,00								12	,00			
G <sub>II</sub>	All	ow. devi	ation		-0,50 /+0,10												
Shank diameter			2,	25	2,	60	2,	90	3,	25	3,0	60	4,	30			
d <sub>s</sub>	All	ow. devi	ation		-0,30 / +0,10												
h	h Head height				90	2,	10	2,	50	2,	70	3,0	00	3,	80		
	Thread pitch			1,	50	1,	80	2,	00	2,	20	2,50		3,00-4,50			
p	All	ow. devi	ation			ı			±1	0%		l.					
1)	Shank ribs length		3,	75	4,	25	4,	75	5,	50	6,	00	7,	00			
$l_r^{1)}$		ow. devi				±0	,75					±1.	,00				
<u> </u>		Drive TX			1	0	,		2	.0		20	25	3	0		
		Orive PZ		-	1 2												
		ew length	ı 1.	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$												$0^{2)}$	
Nomin			* *S				ead length   Igf = Full thread   Igp = Partial 1									,,,	
lengt		min	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{gf}$	$l_{gp}$		
20		18,95	21,05	16		16		16		16							
25		23,75	26,25	21		21	18	21	18	20							
30		28,75	31,25	26	18	26	18	26	18	25	18	24		•			
35	4	33,50	36,50	31	24	31	24	31	24	30	24	29	24	28			-
40		38,50 43,50	41,50 46,50		30	36	24 30	36 41	24 30	35 40	24 30	34 39	30	33			
50		48,50	51,50		30		30	46	30	45	30	44	30	43			
55	+	53,50	56,50				30	70	36	7.5	36	77	36	7.3			
60	+	58,50	61,50						36		36		36	53			
70		68,50	71,50						42		42		42	63			
80			81,50						50		50		50	73			

All sizes in mm

- Intermediate lengths at ls are possible
- Screws with partial thread > 50 mm length with shank ribs
- Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible

fischer Power-Fast and Construction Screws
Sizes and Material





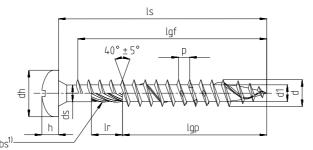
Shank ribs<sup>1)</sup>optional

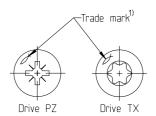
Power-Fast self-drilling screw - Facade screw with full- or partial thread

	1 UWEI -	Fast sell	-uiii	nng s	crew	- rac	caue	screw	WILL	i iuii-	or pa	ai tiai	une	au		
■ Stai	nless steel															
Non	ninal dian	neter	4	,0	4	,5	5	,0								
	Outer diam	eter	4,00		4,	4,50		5,00								
d –	Allow. devi	iation			±0	,30	•									
	Core diame	ter	2,	50	2,	70	3,	3,00								
$d_1$	Allow. devi	iation		-0,25 /	+0,10	)	±0	,20								
	Head diameter			90	6,	90	7,	80								
d <sub>h</sub>	Allow. devi	iation			±0	,50										
	Shank diam		2.	90		25	3.	60								
I d 🛏	Allow. devi		,			'+0,10										
	Head heigh		2.	50	_	70		00								
	Thread pitc			00		20		50								
n	Allow. devi		2,			0%	۷,	50								
	Shank ribs		1	75		50	6,00									
1 1)	Allow. deviation			,75	υ,		,00	00								
-	Drive TX				.0		20	25								
	Drive PZ					2	20	23								
C	Screw length		Standard thread length   lgf					-11 41	_1 1	_D	-1 41	_ 1   T.	. 1	2	02)	
Nomina		1 1 <sub>S</sub>	Stan	dard in	read le	ngin	$I_{gf} = F$	ili thre	aa   I <sub>gr</sub>	=Parti	ai inre	ad   10	oieranc	:e: ± ∠, I	0-7	
length	mın	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$								
20	18,95	21,05	16		16											
25	23,75	26,25	21	18	20											
30	28,75	31,25	26	18	25	18	24									
35	33,50	36,50	31	24	30	24	29	24								
40	38,50	41,50	36	24	35	24	34	24								
45	43,50	46,50	41	30	40	30	39	30								
50	48,50	51,50	46	30	45	30	44	30								
55	53,50	56,50		36		36		36								
60	58,50	61,50		36		36		36								
70	68,50	71,50		42		42		42								
80	78,50	81,50		50		50		50								
90	88,25	91,75						60								
100	98,25	101,75						60								
110	108,25	111,75						70								
120	118,25	121,75						70								

All sizes in mm

- Intermediate lengths at l<sub>s</sub> are possible
- Screws with partial thread > 50 mm length with shank ribs
- Threaded lengths between  $4 \times d \le l_g \le l_{gmax}$  are possible





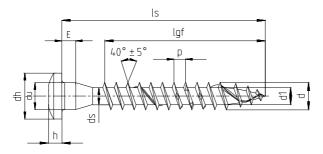
Shank ribs<sup>1).</sup>
optional

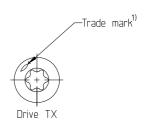
Power-Fast self-drilling screw - Pan head with full- or partial thread

	1000	rast s	cii di	11111118	SCIC	** 1	an ne	au w	itii iu	111- 01	part	iai tii	ırcau			
■ St	ainless steel															
No	Nominal diameter			,0	3	,5	4	,0	4	,5	5	,0	6	,0		
d	Outer diam	eter	3,	3,00 3,50 4,00 4,50 5,00 6,00								00				
u	Allow. dev			±0,30												
$d_1$	Core diame		2,	00		20	-	50	2,	70	3,	00	4,00			
u <sub>1</sub>	Allow. dev						'+0,10						,20			
$d_{\rm h}$	Head diameter			00	7,	00	8,	00	9,	00	10	,00	12	,00		
$\mathbf{u}_{\mathrm{h}}$	Allow. dev						-0,50 /	'+0,10	)							
$d_{\rm s}$	Shank diameter			25	2,	60	2,	90	3,	25	3,	60	4,	30		
us	Allow. dev	iation						-0,30 /	'+0,10	)						
h	Head heigh	ıt	2,	30	2,	50	2,	90	3,	10	3,	40	3,	80		
n	Thread pito		1,	50	1,	80	2,	00	2,	20	2,	50	3,00	-4,50		
р	Allow. dev	iation						±10	0%							
$l_{r}^{1)}$	Shank ribs length			75	4,	25	4,	75	5,	50	6,	00	7,	00		
ır	Allow. dev		$\pm 0.75$ $\pm 1.00$													
	Drive TX		1	0			2	0		20	25	3	0			
	Drive PZ	,		1 2 3									3			
	Screw lengt	h l <sub>s</sub>	Stan	Standard thread length   $l_{gf}$ = Full thread   $l_{gp}$ =Partial thread   Tolerance: $\pm$ 2,										$,0^{2)}$		
Nomin	min	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$		
leng 20	18,95	21,05	16		16		16									
25	23,75	26,25	21		21	18	20	18	20							
30	28,75	31,25	26	18	26	18	25	18	25	18	24					
35	33,50	36,50	31	24	31	24	30	24	30	24	29	24	28			
40	38,50	41,50		24	36	24	35	24	35	24	34	24	33	24		
45	43,50	46,50		30		30	40	30	40	30	39	30	38	30		
50	48,50	51,50				30	45	30	45	30	44	36	43	30		
55	53,50	56,50					50	36	50	36	49	36	48			
60	58,50	61,50						36		36		42	53	36		
70	68,50	71,50						42		42		50	63	42		<del>                                     </del>
80	78,50	81,50						50		50		50	73	50		
90	88,25	91,75										60		60		1
100	98,25	101,75										60		60	<u> </u>	

All sizes in mm

- Intermediate lengths at l<sub>s</sub> are possible
- Screws with partial thread > 50 mm length with shank ribs
- $\blacksquare \qquad \text{Threaded lengths between } 4 \times d \leq l_g \leq l_{gmax} \text{ are possible}$





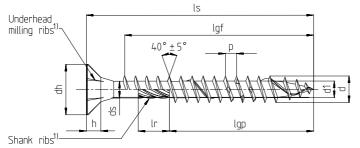
Power-Fast self-drilling screw - Wood connector screw with full thread

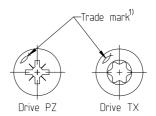
	1000	C1 -	r ast sei	1-4111	iiig ,	JC1 C 11		Jou C	omic	ctor s	, C1 C VV	**1111	Iuii (	ııı ca	u	_	
• Sta	ainless steel																
No	minal di	am	eter	5,	0												
d	Outer dia			5,0	00												
a	Allow. d	evia	ıtion	-0,30													
$d_1$	Core dia	mete	er	3,0	3,00												
$\mathbf{u}_1$	Allow. deviation		ıtion	±0,	,20												
d <sub>u</sub>	Underhead diameter				00												
uu	Allow. d			-0,													
$d_{\rm h}$	Head dia			8,2													
un	Allow. d	evia	ition	±0,													
Е	Height				50												
	Allow. de		ition	±0,													
h	Head height				50												
р	Thread pitch				50												
1	Allow. de		ition	±10													
	Drive 7			20	25												
	Screw len	gth	$l_{\rm s}$	Stand	lard th	read le	ength	$l_{gf} = F$	ull thr	ead   lg	p=Par	tial thr	ead   T	oleran	ce: ± 2	$2,0^{2)}$	
Nomin lengt	mın		max	$l_{\mathrm{gf}}$	$l_{\rm gp}$												
20	18,95	5	21,05	14													
25	23,75	5	26,25	19													
30	28,75	5	31,25	24													
35	33,50	)	36,50	29													
40	38,50	)	41,50	34													
45	43,50		46,50	39													
50	48,50	_	51,50	44													
55	53,50	_	56,50	49													
60	58,50		61,50	54													
70	68,50	_	71,50	64													
80	78,50	)	81,50	74													

All sizes in mm

- Intermediate lengths at  $l_s$  are possible Threaded lengths between  $4\times d \leq l_g \leq l_{gmax}$  are possible

fischer Power-Fast and Construction Screws
Sizes and Material

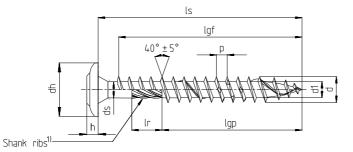


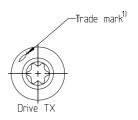


Power-Fast wood construction screw - Countersunk head with full- or partial thread

1000	er-Fast w	oou con	Sti ut	tion ;	screw	/ <del>- C</del> (	unte	Sulli	Пеа	u witi	ı ıuıı	- 01 p	ai ua	11 (111)	tau	
■ Stain	less steel															
Nom	inal diam	eter	6	,0	8	,0										
d	Outer diam	eter	6,	00	8,00											
a	Allow. dev	iation		±0,30												
d (	Core diame	eter	4,00		5,	40										
	Allow. dev			±0	,20											
d	Head diam		12	,00	14	,40										
- 4	Allow. dev			/+0,10		,40										
4	Shank dian			30		90										
- 4	Allow. dev			+0,10		,20										
	Head heigh			80		10										
	Thread pito		3,00-			00										
	Allow. dev				0%											
1 1 /	Shank rib length			00	13,00											
11	Allow. deviation			,00	_	-2,00										
	Drive TX			0	4	-0										
	Drive PZ		,	3		-										
So	crew length	ı l <sub>s</sub>	Stan	dard th	read le	ength	$l_{gf} = F_1$	ull thre	ead   lg	<sub>p</sub> =Part	ial thr	ead   T	oleran	ce: ± 2	,0	
Nominal	- main	***	1	1	1	1										
length	min	max	$l_{ m gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$										
60	58,50	61,50	50	36												
80	78,50	81,50	70	50	70	50										
90	88,25	91,75		60	80	50										
100	98,25	101,75		60	80	50										
120	118,25	121,75		70	100	75										
140	138,00	142,00		70		75										
160	158,00	162,00		70		75										
	180   178,00   182,00			70		75										
	in steps of 20mm															
	200-300 $  1_s - 2,00   1_s + 2,00  $			70		100										
	in steps of 20mm															
320-500	$320-500  1_s -3,00  1_s +3,00$					100										

- Intermediate lengths at l<sub>s</sub> are possible
- Screws with partial thread > 50 mm length with shank ribs
- Threaded lengths between  $4 \times d \le l_g \le l_{gmax}$  are possible

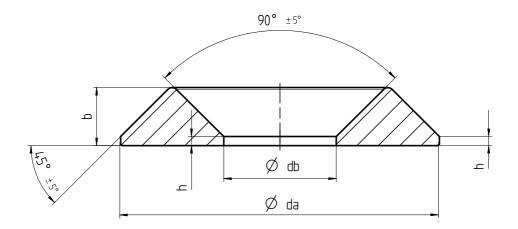




Power-Fast wood construction screw - Flange head with full- or partial thread

	rower-ras	st wood	const	rucu	on sc	I CW -	Tian	ge ne	au w	Itili Iti	11- 01	part	iai ti	ii cau		
■ Sta	inless steel															
No	ominal dia	meter	6	,0	8	,0										
1	Outer diam	eter	6,	00	8,00											
d	Allow. dev	iation	±0,30													
a	Core diameter			00	5,	40										
$d_1$	Allow. dev	iation		-0,30/	+0,20											
$d_h$	Head diam	eter		,70		,00										
$u_h$	Allow. dev		-0,70/	+1,30		,00										
$d_s$	Shank dian		4,	30		90										
us	Allow. dev				+0,10											
h –	Head heigh				50											
11	Allow. dev				,00											
p	Thread pito		3,00	-4,50		00										
Р	Allow. deviation			±10%												
1 <sub>r</sub> 1)	Shank rib length		8,	00		,00										
-1	Allow. dev		_	-2,		_										
	Drive TX			0		0										
	Screw length	ı l <sub>s</sub>	Stand	dard th	read le	ength	$l_{gf} = F_1$	all thre	ead   lg	<sub>p</sub> =Part	ial thre	ead   T	oleran	ce: ± 2	2,0	
Nomina	min	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$										
length	1				1gī	1gp										
60	58,50	61,50	50	36												
80	78,50	81,50	70	50	70	50										
90	88,25	91,75		60	80	50										
100	98,25	101,75		60	80	50										
120	118,25	121,75		70	100	75										
140	138,00	142,00		70		75										
160	158,00	162,00		70		75										
	180 178,00 182,00			70		75										
	in steps of 20mm			70		100										
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			70		100										
	in steps of 20mm					100										
320-300	$320-500 \mid l_s - 3,00 \mid l_s + 3,00$					100								A 11 '		

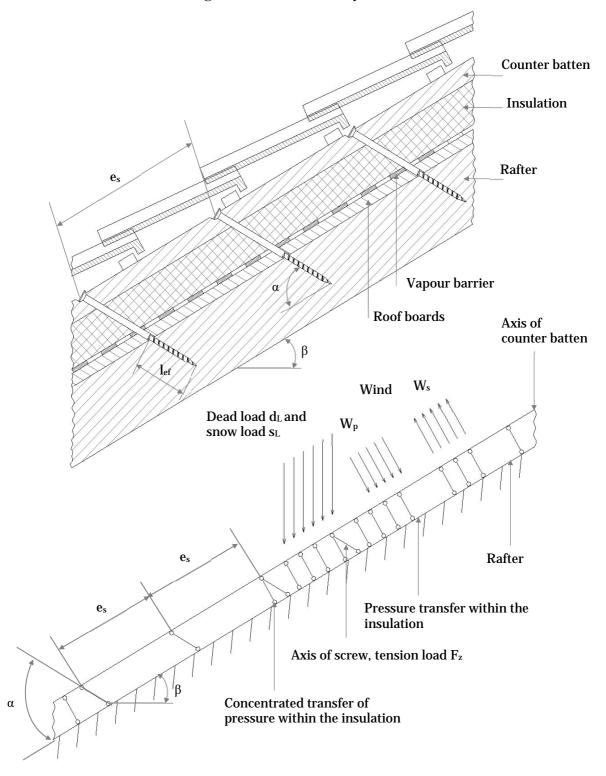
- Intermediate lengths at l<sub>s</sub> are possible
- Threaded lengths between  $4 \times d \le l_g \le l_{gmax}$  are possible



## Washer for Power-Fast and construction screws

	arbon Steel - possible su tainless steel	ırface treatme	nts: yellow o	r blue zinc-pl	lated, bonus-	zinced, ≥12µ	m blue zinc-pl	ated				
N	lominal diameter		$Ty_{J}$	pe 1		Type 2						
	Size	6	8	10	12	6	8	10				
db	Inner diameter	6,70	8,70	11,20	6,70	6,70	8,70	11,20				
ab	Allow. deviation		-0,40									
da	Outer diameter	21	30	35	43	21	25,50	30,50				
aa	Allow. deviation				±2,0							
1.	Height	4,70	5,20	6,20	8,30	4,70	5,20	6,20				
b	Allow. deviation				-0,40							
1.	Height	1,50	1,80	2,00	2,20	1,50	1,80	2,00				
h	Allow. deviation				-0,15							

Fixing of on-roof insulation system



 $W_S$  = Wind suction  $W_P$  = Wind pressure

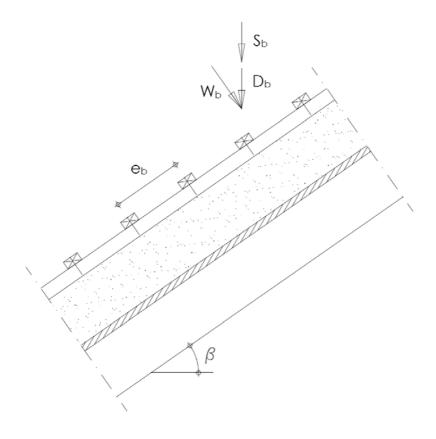
 $e_s$  = Spacing of screws  $l_{ef}$  = Thread part part of screw in rafter

B = Roof inclination  $\alpha$  = Angle between axis of screw and axis of rafter

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# Fixing of on-roof insulation system Point loads $F_b$ perpendicular to the battens



$$D_b\!=d\,\cdot\,e_b\cdot\,e_r$$

$$S_b \! = \! s \, \cdot \, e_b \cdot \, e_r \cdot \, cos \; \beta$$

$$W_b\!=w_p\cdot e_b\cdot e_r$$

$$F_b = W_b + (D_b + S_b) \cdot \cos \beta$$

#### where

 $D_b = point load by dead load$ 

 $S_b = point load by snow load$ 

W<sub>b</sub> = point load perpendicular to the batten by wind load (pressure)

 $e_b = distance$  of the battens

 $e_r$  = distance of the rafters

 $s = snow \ load \ per \ m^2 \ ground \ area$ 

 $w_p$  = wind pressure on the roof area

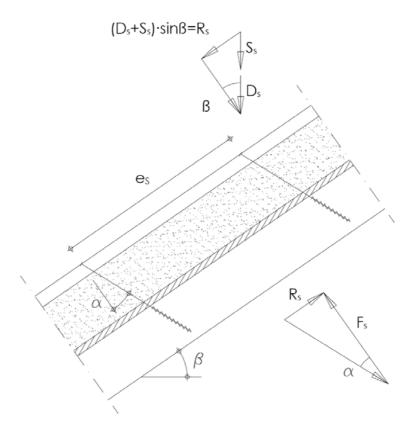
 $d = dead load per m^2 roof area$ 

 $\beta = \text{roof angle}$ 

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## Point loads $F_s$ perpendicular to the battens by screws



$$D_s\!=d\cdot e_s\cdot e_r$$

$$S_s \! = \! _S \cdot e_s \cdot e_r \cdot \cos \beta$$

$$R_s = (D_s + S_s) \cdot \sin \beta$$

$$F_s = R_s / tan \alpha$$

#### where

 $D_s$  = point load by dead load

 $S_s = point load by snow load$ 

 $R_s$  = shear load of the roof by dead load and snow load

 $e_s$  = distance of the screws

 $e_r$  = distance of the rafters

 $\alpha$  = angle between screw axis and perpendicular to rafter axis

Accessories

#### Design of the battens

The bending stresses are calculated as:

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

Where

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

EI = bending stiffness of the batten

K = coefficient of subgrade

 $w_{ef}$  = effective width of the heat insulation

 $F_b$  = Point loads perpendicular to the battens

 $F_s$  = Point loads perpendicular to the battens, load application in the area of the screw heads

The coefficient of subgrade K may be calculated from the modulus of elasticity E<sub>HI</sub> and the thickness t<sub>HI</sub> of the heat insulation if the effective width wef of the heat insulation under compression is known. Due to the load extension in the heat insulation the effective width wef is greater than the width of the batten or rafter, respectively. For further calculations, the effective width wef of the heat insulation may be determined according to:

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

where

w = minimum width of the batten or rafter, respectively

t<sub>HI</sub> = thickness of the heat insulation

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

The following condition shall be satisfied:

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

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

The shear stresses shall be calculated according to:

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

The following condition shall be satisfied:

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

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

#### **Design of the heat insulation**

The compressive stresses in the heat insulation shall be calculated according to:

$$\sigma = \frac{1.5 \cdot F_b + F_s}{2 \cdot \ell_{char} \cdot w}$$

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

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#### Design of the screws

The screws are loaded predominantly axially. The axial tension force in the screw may be calculated from the shear loads of the roof R<sub>s</sub>:

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

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

In order to limit the deformation of the screw head for heat insulation thicknesses over 200 mm or with compressive strength below  $0.12 \text{ N/mm}^2$ , respectively, the axial withdrawal capacity of the screws shall be reduced by the factors  $k_1$  and  $k_2$ :

$$F_{\text{ax},\alpha,\text{Rd}} = \text{min} \begin{cases} k_{\text{ax}} \cdot f_{\text{ax},\text{d}} \cdot \text{d} \cdot \ell_{\text{ef}} \cdot k_{_{1}} \cdot k_{_{2}} \bigg(\frac{\rho_{_{k}}}{350}\bigg)^{^{0,8}} \\ \\ f_{\text{head},\text{d}} \cdot d_{_{h}}^{^{2}} \cdot \bigg(\frac{\rho_{_{k}}}{350}\bigg)^{^{0,8}} \end{cases}$$

where:

 $f_{ax,d}$  design value of the axial withdrawal parameter of the threaded part of the screw

d outer thread diameter of the screw

Point side penetration length of the threaded part of the screw in the rafter,  $l_{ef} \ge 40$  mm

 $\alpha$  Angle between grain and screw axis ( $\alpha \ge 30^{\circ}$ )

 $ho_k$  characteristic density of the wood-based member [kg/m³]  $f_{head,d}$  design value of the head pull-through capacity of the screw

 $\begin{array}{ll} d_h & \text{head diameter} \\ k_1 & \text{min } \{1; 200/t_{HI}\} \\ k_2 & \text{min } \{1; \sigma_{10\%}/0, 12\} \end{array}$ 

thickness of the heat insulation [mm]

σ<sub>10%</sub> compressive stress of the heat insulation under 10 % deformation [N/mm²]

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

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#### Thermal insulation material on rafters with parallel screws perpendicular to the roof plane

Alternatively to the battens, panels with a minimum thickness of 20 mm from plywood according to EN 636, particleboard according to EN 312, oriented strand board OSB/3 and OSB/4 according to EN 300 or European Technical Approval and solid wood panels according to EN 13353 may be used.

Characteristic load-carrying capacity of a screw loaded in shear:

$$F_{v,Rk} = min \begin{cases} f_{h,b,k} \cdot d \cdot t_b \\ f_{h,r,k} \cdot d \cdot f_r \\ \frac{f_{h,b,k} \cdot d \cdot \beta}{1+\beta} \cdot \left( \sqrt{4t_{il}^2 + (2+\frac{1}{\beta})t_b^2 + (2+\beta)t_r^2 + 4t_{il}\left(t_b + t_r\right) + 2t_bt_r} - 2t_{il} - t_b - t_r \right) + \frac{F_{ax,Rk}}{4} \\ f_{v,Rk} = min \begin{cases} f_{h,b,k} \cdot d \cdot \beta \\ \frac{1}{2} + \beta \end{cases} \left( \sqrt{t_{il}^2 + t_{il}t_b + \frac{t_b^2}{2} \left(1 + \frac{1}{\beta}\right) + \frac{M_{y,k}}{f_{h,b,k}} d \left(1 + \frac{2}{\beta}\right)} - t_{il} - \frac{t_b}{2} \right) + \frac{F_{ax,Rk}}{4} \\ f_{h,b,k} \cdot d \cdot \beta \left( \sqrt{t_{il}^2 + t_{il}t_r + \frac{t_r^2}{2} \left(1 + \beta\right) + \frac{M_{y,k}}{f_{h,b,k}} d \left(2 + \frac{1}{\beta}\right)} - t_{il} - \frac{t_r}{2} \right) + \frac{F_{ax,Rk}}{4} \\ f_{h,b,k} \cdot d \cdot \beta \left( \sqrt{\beta^2 t_{il}^2 + 4\beta (\beta + 1) \cdot \frac{M_{y,k}}{f_{h,b,k}} d - \beta t_{il}} \right) + \frac{F_{ax,Rk}}{4} \end{cases}$$

Where:

 $\begin{array}{ll} f_{h,b,k} & \quad & \text{Characteristic batten embedding strength } [N/mm^2] \\ f_{h,r,k} & \quad & \text{Characteristic rafter embedding strength } [N/mm^2] \end{array}$ 

 $\beta$   $f_{h,r,k}/f_{h,b,k}$ 

d Outer thread diameter [mm]

t<sub>b</sub> Batten thickness [mm]

t<sub>r</sub> The lower value of rafter thickness or screw penetration length [mm]

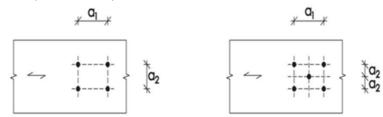
t<sub>il</sub> Interlayer thickness [mm]

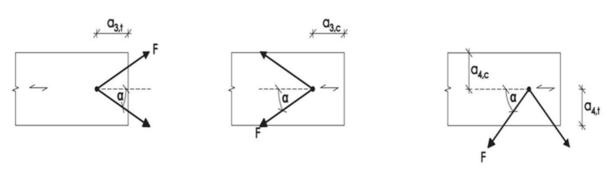
M<sub>y,k</sub> Characteristic fastener yield moment [Nmm]

 $F_{ax,Rk}$  Characteristic axial tensile capacity of the screw [N]

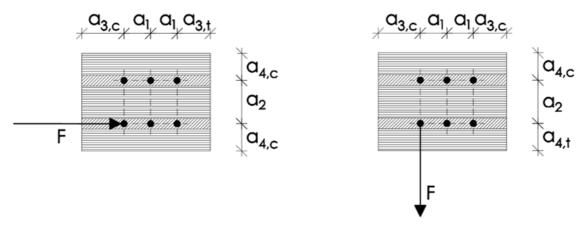
#### Minimum distances and spacing

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





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



For screws in the edge surface,  $a_1$  and  $a_3$  are parallel to the CLT plane surface,  $a_2$  and  $a_4$  perpendicular to CLT plane surface.

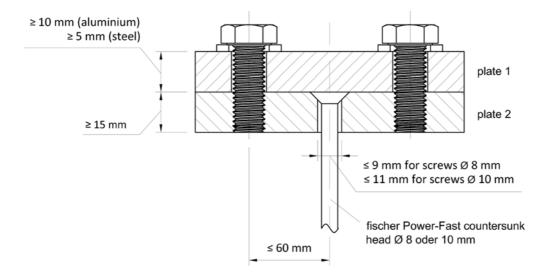
Table C1: Minimum spacing, end and edge distances of screws in the plane or edge surfaces of cross laminated timber

	$a_1$	$a_{3,t}$	a <sub>3,c</sub>	$\mathbf{a}_2$	a <sub>4,t</sub>	a <sub>4,c</sub>
Plane surface (see Figure 1)	4 · d	6 · d	6 · d	2,5 · d	6 · d	2,5 · d
Edge surface (see Figure 2)	10 ⋅ d	12 · d	7 · d	4 · d	6 · d	3 · d

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Minimum distances and spacings

#### Visualisation of the Power-Fast screw head clamped between two metal plates

Metric screws with hexagon head, countersunk head or cylindric head or threaded rods with nut and washer – each according to the structural requirements – at least 2xM8 (≥4.6 respectively A2-50) for the connection of the two plates made of aluminium (mechanical properties at least like e.g. EN AW 6082, EN AW 5083, EN AW 6060 or EN AC-44100); made of carbon steel or made of stainless steel (each at least S235).



Information for the structural analysis of the metric screw connection and the metal plates are not part of this European Technical Assessment.

(Fig. not to scale)

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clamping of the screw head for compression impact	