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### European Technical Assessment ETA-11/0027 of 26/10/2016

I General Part

Technical Assessment Body issuing the ETA and designated according to Article 29 of the Regulation (EU) No 305/2011: ETA-Danmark A/S

Trade name of the construction product:

fischer Power-Fast screws and fischer construction screws

Product family to which the above construction product belongs: Screws for use in timber constructions

Manufacturer:

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

**Manufacturing plant:** 

fischerwerke

This European Technical Assessment contains:

37 pages including 3 annexes which form an integral part of the document

This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of: European Assessment document (EAD) no. EAD 130118-00-0603 "Screws for timber constructions"

This version replaces:

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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 A18.

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 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 A19. 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

Characteristic	Assessment of characteristic							
3.1 Mechanical resistance and stability*) (BWR	21)							
Tensile strength Screws made from carbon steel	$\begin{array}{llllllllllllllllllllllllllllllllllll$							
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: $f_{tor,k}  /  R_{tor,mean} \geq 1,5$							
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.							

#### Characteristic Assessment of characteristic 3.3 Hygiene, health and the environment (BWR3) Influence on air quality The product does not contain/release dangerous substances specified in TR 034, dated October 2015 \*\*) No Performance Assessed 3.7 Sustainable use of natural resources (BR7) 3.8 General aspects related to the performance The screws have been assessed as having of the product 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.

<sup>\*\*)</sup> 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  $\ell_{ef} \geq 4 \cdot d$ , where d is the outer thread diameter of the screw. For the fixing of rafters, point side penetration must be at least 40 mm,  $\ell_{ef} > 40$  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:  $M_{v,k} = 0.15 \cdot 600 \; (N/mm^2) \cdot d^{2,6}$  [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];

 $\alpha$  angle between screw axis and grain direction.

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

$$f_{h,k} = 20 \cdot d^{-0.5}$$
 [N/mm<sup>2</sup>]

Where

d outer thread diameter [mm]

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

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

#### 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 shall be calculated from:

$$F_{ax,\alpha,Rk} = n_{ef} \cdot k_{ax} \cdot f_{ax,k} \cdot d \cdot \ell_{ef} \cdot \left(\frac{\rho_k}{350}\right)^{0,8} \eqno{[N]}$$

Where

 $F_{ax,\alpha,RK} \quad \begin{array}{ll} \text{Characteristic withdrawal capacity of the} \\ \text{connection at an angle $\alpha$ to the grain $[N]$} \end{array}$ 

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

For inclined screws:  $n_{ef} = max \left\{ n^{0,9} ; 0,9 \cdot n \right\}$ 

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

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

$f_{ax,k}$	Characteristic withdrawal parameter	
	$[N/mm^2]$	

L J	
screw $d = 3.0 \text{ mm}$ :	$f_{ax,k} = 13.8 \text{ N/mm}^2$
screw $d = 3.5 \text{ mm}$ :	$f_{ax,k} = 13,4 \text{ N/mm}^2$
screw $d = 4.0 \text{ mm}$ :	$f_{ax,k} = 13,0 \text{ N/mm}^2$
screw $d = 4.5 \text{ mm}$ :	$f_{ax,k} = 12,6 \text{ N/mm}^2$
screw $d = 5.0$ mm:	$f_{ax,k} = 12,2 \text{ N/mm}^2$
screw $d = 6.0$ mm:	$f_{ax,k} = 11,6 \text{ N/mm}^2$
screw $d \ge 8.0$ mm:	$f_{ax,k} = 10,0 \text{ N/mm}^2$

d Outer thread diameter [mm]

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

Angle between grain and screw axis [°]  $\alpha$ 

Characteristic density [kg/m³], for hardwoods  $\rho_k$ the assumed characteristic density shall not exceed 730 kg/m<sup>3</sup>

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 nef should be determined as follows:

For one row of n screws parallel to the load, the loadcarrying 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.

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:

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

where:

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

effective number of screws according to EN  $n_{ef}$ 

For inclined screws:  $n_{ef} = max \{ n^{0,9} ; 0,9 \cdot n \}$ 

(see axial withdrawal capacity)

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

 $[N/mm^2]$ 

diameter of the screw head [mm]  $d_h$ 

characteristic density [kg/m³], for wood- $\rho_k$ 

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

 $f_{head,k} = 12 \text{ N/mm}^2$ 

Characteristic head pull-through parameter for screws with head diameter 21 mm  $< d_h \le 35$  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:

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

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<sub>h</sub> shall be greater than 1,8·d<sub>s</sub>, where d<sub>s</sub> 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 $d = 4.0 \text{ mm}$ :	4,3 kN
Screw $d = 4.5 \text{ mm}$ :	5,5 kN
Screw $d = 5.0 \text{ mm}$ :	6,8 kN
Screw $d = 6.0 \text{ mm}$ :	10,7 kN
Screw $d = 8.0 \text{ mm}$ :	19,1 kN
Screw $d = 10,0 \text{ mm}$ :	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 $d = 5.0 \text{ mm}$ :	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.

#### 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:

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

#### where

$F_{ax,Ed} \\$	axial design load of the screw
$F_{la,Ed}$	lateral design load of the screw

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:

$$F_{ax,\alpha,Rk} = min \begin{cases} k_{ax} * f_{ax,k} * d * l_{ef} * k_1 * k_2 * \left(\frac{\rho_k}{350}\right)^{0,8} \\ f_{head,k} * d_h^2 * \left(\frac{\rho_k}{350}\right)^{0,8} \end{cases} [N]$$

$$f_{tens,k}$$

where

 $\begin{array}{ll} F_{ax,\alpha,Rk} & \text{ Characteristic withdrawal capacity of the} \\ & \text{ connection at an angle } \alpha \text{ to the grain [N]} \\ k_{ax} & \text{ Factor, taking into account the angle } \alpha \\ & \text{ between screw axis and grain direction} \end{array}$ 

 $k_{ax} = 1.0$  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]

 $\begin{array}{c} \ell_{\rm ef} & \quad \text{Point side penetration length of the threaded} \\ \text{part according to EN 1995-1-1:2008 [mm]} \end{array}$ 

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

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

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

 $t_{HI}$  Thickness of the thermal insulation [mm]  $\sigma_{10\%}$  Compressive stress of the thermal insulation

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

 $\sigma_{10\%} \geq 0.05~N/mm^2$ 

 $f_{head,k}$  Characteristic head pull-through parameter  $\lceil N/mm^2 \rceil$ 

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

 $\rho_k$  Characteristic density [kg/m<sup>3</sup>]

 $f_{\text{tens},k} \qquad \text{Characteristic tensile capacity of the screw}$ 

[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.

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

Wood-based panels 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 A17, 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 A17 may be used together with washers according to Annex A19. Washers according to EN ISO 7094 may be used together with washers according to Annex A19.

Screws according to Annex A3, A4, A8, A9, A10, A12 A15, A16 and A18 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  $a_1$  parallel to the grain  $a_1 = 5 \cdot d$ Spacing  $a_2$  perpendicular to the grain  $a_2 = 5 \cdot d$ Distance  $a_{3,c}$  from centre of the screw-part in timber to the end grain  $a_{3,c} = 9 \cdot d$ Distance  $a_{4,c}$  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 wide face 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  $a_{3,c} = 6 \cdot d$ Distance a<sub>3,t</sub> from centre of the screw-part in timber to the loaded end grain  $a_{3,t} = 6 \cdot d$ 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  $10\cdot d$  may be taken as (see Annex C):

Spacing  $a_1$  parallel to the CLT plane  $a_1 = 10 \cdot d$ Spacing  $a_2$  perpendicular to the CLT plane  $a_2 = 4 \cdot d$ Distance  $a_{3,c}$  from centre of the screw-part in timber to the unloaded end  $a_{3,c} = 7 \cdot d$ Distance  $a_{3,t}$  from centre of the screw-part in timber to the loaded end  $a_{3,t} = 12 \cdot d$ Distance  $a_{4,c}$  from centre of the screw-part in timber to the unloaded edge  $a_{4,c} = 3 \cdot d$ Distance  $a_{4,t}$  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.

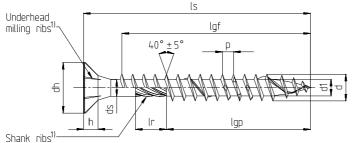
# 5 Technical details necessary for the implementation of the AVCP system, as foreseen in the applicable EAD

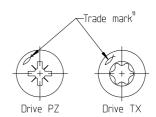
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at ETA-Danmark.

Issued in Copenhagen on 2016-10-26 by

Thomas Bruun Managing Director, ETA-Danmark

## Annex A Screw sizes and material





1) optional

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

	bon Steel		otments: v	,	•								•			bross i	nloted
Nominal diameter			yellow or blue zinc-plated, blu  3,0  3,5			4,0 4,5				,001111 ,0	1	,0	Ulass J	piated			
Outer diameter				00		50	4,0		4,50		5,00		6,00				
d	Allow.			0.0	,		.,,	±0	,				,				
,	Core diameter				00	2,	20	2,			70	3,	00	4,	00		
$d_1$	Allow. o	devia	ation				-0,25 /	+0,10		-			±0	,20			
1	Head di	ame	ter	6,	00	7,	00	8,0	00	9,	00	10.	,00	12.	,00		
$d_h$	Allow.	levia	ation						-0,50 /	+0,10							
$d_{\rm s}$	Shank d			2,	25	2,	60	2,9		3,		3,	60	4,	20		
	Allow.									+0,10		1					
h	Head he	_			90		10		50		70		00		80		
р	Thread 1			1,	50	1,	80	2,0	00		20	2,	50	3,00	-4,50		
Р	Allow.								±1					1			
$1_{r}^{1}$	Shank ri			3,	75		25	4,	75	5,	50		00	7,	00		
-1	Allow. o		ation				,75	ı				±1,					
	Drive TX			10 20 25							30						
	Drive				1 2 3												a`
	Screw lea	ngth	$l_s$	S	Standard thread length   $l_{gf}$ = Full thread   $l_{gp}$ =Partial thread   Tolerance:											$\pm 2,0$	(2)
Nomi	l m1	n	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	ın			,	5P		517	Ü	517	ì	5P	51	517	51	5P		
20 25			21,05	16 21		16 21	10	16 20	18	16 20							
30	23,7		26,25 31,25	26	18	26	18 18	25	18	25	18	24					
35	33,5		36,50	31	24	31	24	30	24	30	24	29	24	28			
40			41,50	36	24	36	24	35	24	35	24	34	24	33	24		
45	43,5		46,50	41	30	41	30	40	30	40	30	39	30	38	30		
50			51,50		50	46	30	45	30	45	30	44	30	43	30		
55	53,5		56,50					50	36	50	36	49	36	48			
60	58,5		61,50						36		36		36	53	36		
70			71,50						42		42		42	63	42		
80			81,50						50		50		50	73	50		
90			91,75										60		60		
100			101,75										60		60		
110			111,75										70		70		
120	,		121,75										70		70		
	in steps of																
130-300 $l_s - 2,00 l_s + 2,00$			$I_s + 2,00$												70	zec in n	

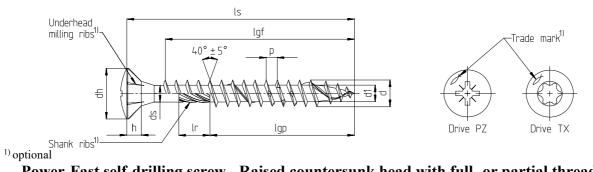
All sizes in mm

- 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

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

tischer Power-Hast and Construction Screws	Annex A1 of European Technical Assessment
Sizes and Material	ETA-11/0027

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

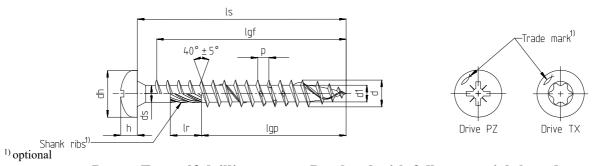
	n steel ole surface to	reatments: y	yellow (	or blue	-zinc-p	lated, b	lue zinc	e-plated	l ≥12μn	n, bonu	ıs- zince	ed, buri	nished,	nickel-	/brass p	olated
Nom	Nominal diameter				3	,5	4,	,0	4,	,5	5.	,0	6,	,0		
d (	Outer diame	eter	3,	00	3,	50	4,	00	4,:	50	5,	00	6,	00	_	
F	Allow. devi								,30							
$\mathbf{d}_1$	Core diame	ter	2,	00	,	20	,	50	2,	70	3,	00	4,0	00		
· /	Allow. devi					-0,25	/+0,10	)				±0	,20			
d	Head diame		6,	00	7,	00	- /	00	,	00	10	,00	12,	,00		
A	Allow. devi								'+0,10							
	Shank diam		2,	25	2,	60	,	90		25	3,	60	4,2	20		
ı A	Allow. devi				1				+0,10		1		1			
	lead heigh			90	,	10		50		70		00		40		
10	hread pitc		1,	50	1,	80	2,	00		20	2,	50	3,00-	-4,50		
- F	Allow. devi						±10%									
11)	Shank ribs length			3,75 4,25			4,75 5,50					00	7,00			
· /	Allow. devi		±0,75			20				,00	20					
	Drive TX		10			20					20	25		30		
	Drive PZ	1		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$											2)	
	crew length	l I <sub>s</sub>	5	standai	rd thre	ad leng	gth   l <sub>gf</sub>	= Full	threac	l   l <sub>gp</sub> =	Partial	thread	d   Tole	erance:	$\pm 2,0$	-) I
Nominal	min	max	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$		
length 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		

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	Annex A2 of European Technical Assessment
Sizes and Material	ETA-11/0027



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

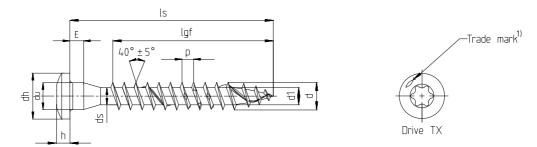
Power-Fast self-drilling screw - Pan nead with full- or partial thread  Carbon steel Possible surface treatments: yellow or blue zinc-plated, blue zinc-plated ≥12μm, bonus- zinced, burnished, nickel-/brass plate																	
			-										-			/brass p	olated
No	minal d			3,			,5	4,		,	,5		,0		,0		
d	Outer di			3,	00	3,	50	4,	00	4,:		5,	00	6,	00		
	Allow.							1 _		±0.		1 _				ı	
$d_1$	Core dia			2,	00		20		50	2,	70	3,	00		00		
<b>G</b> 1	Allow.							+0,10					±0,				
$d_{\rm h}$	Head di			6,	00	7,	00	8,		9,		10	,00	12	,00		
un	Allow.									'+0,10							
$d_s$	Shank d			2,	25	2,	60	2,		3,		3,	60	4,	20		
	Allow.									'+0,10		ı					
h	Head he				30		50		90	3,			40		80		
р	Thread	_		1,	50	1,	80	2,		2,	20	2,	50	3,00	-4,50		
Р	Allow.									0%							
$l_r^{1}$	Shank r			3,75 4,25				4,	4,75 5,50			6,00 7,00					
ır	Allow.		ation			±0	,75					±1,00					
	Drive			10						0		20	25	30			
	Drive	PΖ		]					2	2		3					
	Screw lea	ngth	$l_s$	S	Standard thread length $  l_{gf} = Full$ thread $  l_{gp} = Partial$ thread $  Tolerance$ :									$\pm 2,0$	2)		
Nomin length	1211	n	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$		
20	18,9	95	21,05	16		16		16		16							
25	23,7	75	26,25	21		21	18	20	18	20							
30	28,7		31,25	26	18	26	18	25	18	25	18	24					
35	33,5	50	36,50	31	24	31	24	30	24	30	24	29	24	28			
40	38,5	50	41,50		24	36	24	35	24	35	24	34	24	33	24		
45	43,5	50	46,50		30		30	40	30	40	30	39	30	38	30		
50	48,5	50	51,50				30	45	30	45	30	44	36	43	30		
55	53,5	50	56,50					50	36	50	36	49	36	48			
60	58,5	50	61,50						36		36		42	53	36		
70	68,5	50	71,50						42		42		50	63	42		
80	78,5	50	81,50						50		50		50	73	50		
90	88,2	25	91,75										60		60		
100	98,2	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
- $\blacksquare \qquad \text{Threaded lengths between } 4 \times d \leq l_g \leq l_{gmax} \text{ are possible}$

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

fischer Power-Rast and Construction Screws	Annex A3 of European Technical Assessment
Sizes and Material	ETA-11/0027



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

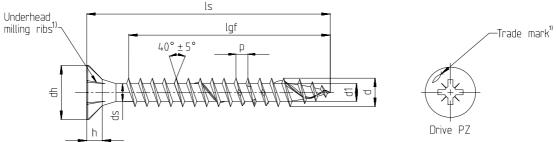
~		me	r-Fast se	cii-ui	1111115	SCIC	- VV - V	v oou	COIIII	CCLUI	SCIC	** **1	ui iu	ii tiii t	au		
	arbon steel ssible surf	ace t	reatments:	vellow	or blue	zinc-n	lated I	Roniis-	zinced	hlue zi	nc-nlate	ed >12	ım				
	ominal d				,0	Zine-p	nateu, 1	Jonus	inceu,	Diuc Zi	пс-ріан	12	u111				
110																	
d	Outer d				00												
	Allow.				,30												
$d_1$	Core di				3,00												
<b>G</b> 1	Allow.	Allow. deviation		±0	,20												
a	Underhead diameter		5,	00													
$d_{\mathrm{u}}$	Allow.	dev	iation	-0,	,35												
1	Head d	iamo	eter	8,	25												
$d_h$	Allow.	dev	iation	±0	,40												
Е	Height			2,	50												
E	Allow. deviation		iation	±0	±0,30												
h	Head h	eigh	t	2,	2,60												
	Thread pitch		h	2,	50												
p	Allow.	dev	iation	±1	±10%												
	Drive	TX		20 25													
	Screw le	ngth	ı l <sub>s</sub>	Stan	dard th	read le	ength	$l_{gf} = F$	ull thre	ead   lg	<sub>gp</sub> =Par	tial thi	read   T	Toleran	ice: ± 2	$2,0^{2)}$	
Nomi	12211	2	max	1.	1												
lengt	n			$l_{gf}$	$l_{gp}$												
20	18,9		21,05	14													
25	23,7		26,25	19													
30	28,7		31,25	24													
35	33,5		36,50	29													
40	38,5		41,50	34													
45	43,5		46,50	39													<u> </u>
50	48,5		51,50	44													<u> </u>
55	53,5		56,50	49													<del>                                     </del>
60	58,5		61,50	54													—
70	68,5		71,50	64													<u> </u>
80	78,5	U	81,50	74													

All sizes in mm

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

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

fischer Power-Fast and Construction Screws	Annex A4 of European Technical Assessment	
Sizes and Material	ETA-11/0027	



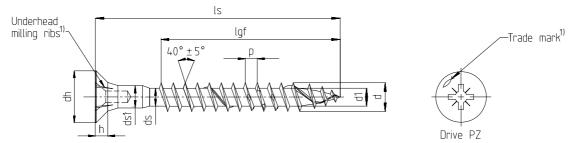
Power-Fast self-drilling screw - Small countersunk head with full thread

- C	Carbon steel																
			reatments:	vellow	or blue	zinc-n	lated k	due zin	c_nlatec	1>12	m						
*		al diam		i	,0		,5	4.	_	1 = 1 2 μ1	.11						
	Ou	ter diam	eter	3,	00	3,50		4,00									
d	All	ow. dev	iation	±0,30													
ı	Core diameter		2,	00	2,	20	2,:	50									
$d_1$	Allow. deviation					-0,25 /	+0,10	)									
a	Head diameter			5,	00	6,	00	7,0	00								
$\mathbf{u}_{\mathrm{h}}$	d <sub>h</sub> Allow. deviation			-0,50 / +0,10													
h	Head height		t	1,90		2,10		2,50									
n	Thi	read pitc	h	1,50		1,80		2,	00								
р	All	ow. dev	iation			±10	0%										
	D	rive PZ		1 2													
	Scre	w length	1 l <sub>s</sub>	Stand	dard th	read le	ength	l <sub>gf</sub> = Fi	ull thre	ad   lgr	,=Part	ial thr	ead   T	oleran	ce: ± 2	$2,0^{2}$	
Nomin lengt		min	max	$l_{ m gf}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{ m gf}$	$l_{gp}$								
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<sub>s</sub> are possible
- Threaded lengths between  $4 \times d \le l_g \le l_{gmax}$  are possible

2)	$10$ mm $\geq 1_g \leq 18$ mm $\triangleq \pm 1,5$ mm
	$8mm \ge l_g \le 30mm \triangleq \pm 1,7mm$

tischer Power-Fast and Construction Screws	Annex A5 of European Technical Assessment
Sizes and Material	ETA-11/0027



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

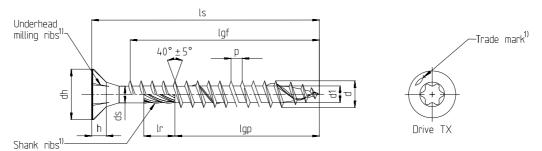
	<ul> <li>Carbon steel</li> <li>Possible surface treatments: blue zinc-plated, blue zinc-plated ≥12μm</li> </ul>																
					-		_							1		1	
No	ominal di			4,	,0		,5		,0	6,	,						
d	Outer dia			4,0	00	4,	50	5,00 6,00									
u	Allow. d						$\pm 0$										
$d_1$	Core dia			2,5		2,70		3,00		4,00							
u <sub>l</sub>	Allow. d					+0,10				,20							
$d_{\rm h}$		Head diameter			00		00		,00	12,	,00						
$\mathbf{u}_{\mathrm{h}}$	Allow. deviation							+0,10									
$d_{\rm s}$	Shank diameter			2,9	90	,	25	,	60	4,3	30						
$\mathbf{u}_{\mathrm{s}}$	Allow. d		ion					+0,10									
h	Head he	_		2,5			70	,	00	3,8							
n	Thread p			2,0	00	2,	20		50	3,00-	-4,50						
Р	p Allow. deviation							0%									
$d_{s1}$		hank diameter		3,70 3,85					50	4,20							
$\mathbf{u}_{\mathrm{s}1}$	Allow. deviation			-0,10													
	Drive PZ					2	2			3	3						
	Screw len	gth l	s	Standard thread length $  l_{gf} = Full$ thread $  l_{gp} = full$								Partia	threa	d   Tol	erance	$: \pm 2,0$	2)
Nomi	nal min		max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	1	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$						
leng	tn			Ŭ	1gp	1gt	$l_{gp}$	1gf	1gp	1gt	1gp						
25	23,7:		26,25	17,5													
27	25,7:		28,25	19,5													
30			31,25	22,5		19											
35	33,50		36,50	27,5		24											
40			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			81,50			59		60		60							
90	88,2		91,75			59		60		60							
100	98,2	5	101,75					60		60					<u></u>	os in m	

All sizes in mm

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

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

tischer Power-Bast and Construction Screws	Annex A6 of European Technical Assessment
Sizes and Material	ETA-11/0027

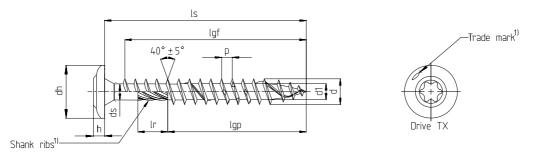


Power-Fast wood construction screw - Countersunk head with full- or partial thread

■ Ca	rbon steel													Part	1001 (1)	ii cau	
	ssible surfac ominal di		nts: :		0		,0		0-plated		n, bont 2 <b>,0</b>	is-zince	a				
	Outer dia	meter			00		00	10	,00		,00						
d	Allow. de			,		,30			,40	±0,50							
	Core dian			4.	00	5.	40		6,40		7,60						
$d_1$	Allow. de						,20			±0,30							
	Head dias			12	12,00		,40	18	,40	22,40							
$d_h$	Allow. de				/+0.10			.40	, <u>-</u>		.50						
	Shank dia			- )	30	5.	90	, -	10		30						
ds	Allow. de				/+0,10				,20								
h	Head heigh				80	5.	10		10	7.	20						
	Thread pi				-4,50	,	00	,		50							
p	Allow. de			- ,				0%									
4 1)	Shank rib			8.	00				,00								
l <sub>r</sub> 1)	Allow. de			- /		l	-2.	,00	<del>)</del>								
	Drive 7			3	0			0		5	0						
					Standa	ard thre	ead len	oth 11	.c= F11	1 threa	d   1=	=Partia	l threa	d l To	lerance	e: ± 2,0	
Nomi	nol				Standa	ii di dili v	lad ICI		gi iui	i unca	IG   Igp	1 artia	ı unca	u   10.	Crance	J. ± 2,0	
lengt	mın	ma	ıx	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$						
60	58,50	61,	50	50	36												
80	78,50			70	50	70	50		52								
90	88,25			70	60	80	50		32								
100					60	80	50		52		60						
120					70	100	75		80		80						
140					70		75		80		80						
160	158,0	0 162.	,00		70		75		80		80						
180	178,0	0 182	,00		70		75		100		100						
200	198,0	0 202	,00		70		100		100		100						
220	218,0	0 222	,00		70		100		100		100						
240					70		100		100		120						
260					70		100		100		120						
280					70		100		115		120						
300					70		100		115		120						
320							100		115								
330									115								
340	,-						100		115								
350							100		1		145						
360							100		115						<u> </u>		
380							100		115						<u> </u>		
400							100		115		1 4 5						
450/50							100		115		145						
550/60	$00   l_s - 3,0$	$0 \mid l_s + 3$	,00								145				Ц.,,	zec in m	

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

fischer Power-Fast and Construction Screws	Annex A7 of European Technical Assessment
Sizes and Material	ETA-11/0027

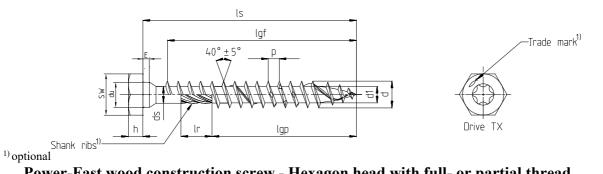


Power-Fast wood construction screw - Flange head with full- or partial thread

- ~	Power-r	ast wood	a Com	struc	HOII S	CICW	- 1·1a	inger	icau	WILII .	Iuii- U	ı pa	ıtıaı	tili Ca	ıu	
	arbon steel ossible surface	treatments:	yellow	or blue	zinc-p	lated, b	lue zin	c-plate	d≥12μ	m, bonı	ıs-zince	d				
N	ominal dian	neter	6	,0	8	,0	10	),0	12	2,0						
d	Outer diame	ter	6,	00	8,	00	10	,00	12	2,00						
a	Allow. devia	ation		±0	,30		±0	,40	±0	),50						
d.	Core diamet	er	4,	00	5,	40	6,	40	7,	,60						
d <sub>1</sub>	Allow. devia	ation			±0	,20			±0	),30						
$d_{\rm h}$	Head diame	ter	13	,70	21	,00	24	,70	27	,90						
uh	Allow. devia	ation	-0,70	/+1,30	±1	,00	-1,20/	+2,80	-1,40/	+2,60						
$d_s$	Shank diame	eter	4,	30	5,	90	7,	10	8,	,30						
us		Allow. deviation		+0,10		$\pm 0$	<u> </u>			),30						
h	Head height				50		5,	60	6,	,70						
11	Allow. devia				,00				,50							
p	Thread pitch		3,00	-4,50	6,	00		7,	50							
Р	Allow. devia					±1	0%									
$1_{r}^{1)}$	Shank rib le		8,	00				,00								
11	Allow. devia				1		,00									
	Drive TX			0			0			50						
	Screw length	ı ls	Standard thread length $  l_{gf} = Full$ thread $  l_{gp} = Partial$ thread									Tole	rance:	$\pm 2,0$	•	
Nomin lengtl		max	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\rm gf}$	$l_{\rm gp}$						
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										
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						
220		222,00		70		100		100		100						
240		242,00		70		100		100		100						
260		262,00		70		100		100		100						
280		282,00		70		100		115		120						
300		302,00		70		100		115		120						
320		323,00				100		115								
330		333,00				100		115								
340		343,00				100		115		1.45						
350	,	353,00								145						
	in steps of 10					100		117								
360-50		l <sub>s</sub> +3,00				100		115								
	in steps of 50									145						
550-600 $l_s$ -3,00 $l_s$ +3,00									143					vac in m		

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

tischer Power-Fast and Construction Screws	Annex A8 of European Technical Assessment
Sizes and Material	ETA-11/0027



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

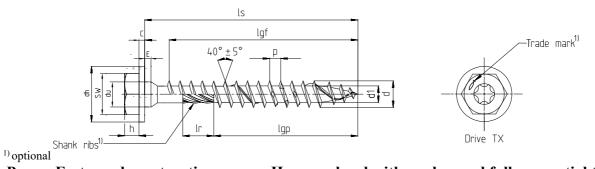
	Power-rast wood construction screw - Hexagon nead with fun- or partial thread														
	<ul> <li>Carbon steel</li> <li>Possible surface treatments: yellow or blue zinc-plated, blue zinc-plated ≥12μm, bonus-zinced</li> </ul>														
No	ominal dian	neter	6	,0	8	,0	10	),0	12	2,0					
.1	Outer diam	eter	6,	00	8,	00	10	,00	12	,00					
d	Allow. dev	iation		±0			±0	,40	±0	,50					
$\mathbf{d}_1$	Core diame	ter	4,	00	5,	40	6,	40	7,	60					
u <sub>1</sub>	Allow. dev	iation				,20			±0	,30					
$d_{\mathrm{u}}$	Underhead		6,	25		25		,30		,40					
$\mathbf{u}_{\mathrm{u}}$	Allow. dev	iation			,80			-0,90		-1,00					
SW	Wrench siz		9,	90	12	,80	14,80		16,80						
5 **	Allow. dev	iation					,30		T						
Е	Height		2,	00	2,	10		30	3,	30					
	Allow. dev						,50		1						
$d_{s}$	Shank dian			30	5,	90		10	8,	30			1		
<b>4</b> 3	Allow. dev			+0,10				,20	1 _						
h	Head heigh		,	00		50	5,	20		70					
	Allow. dev			,30		,40			,50						
р	Thread pitc		3,00	-4,50	6,	00		7,	50						
1	Allow. dev					±l	0%	- 10	0.0						
$1_{r}^{1}$	Shank rib length			8,	00			13	,00						
	Allow. deviation			0			00			^					
	Drive TX			0			0		_	0					
	Screw length	ı ls	Stand	lard the	ead le	ngth   l	<sub>gf</sub> = Ful	l threa	$d \mid l_{gp} =$	Partial	thread	Tole	rance:	$\pm 2,0^{2)}$	
Nomi	min	max	$l_{\mathrm{gf}}$	$l_{\rm gp}$	$l_{\rm gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$					
leng	th		_		5-	ər	5-	ər	5-	ər					
60		61,5	50	30	70	50		50							1
80	78,5	81,5	70	50	70	50		52							1
90	88,25 98,25	91,75 101,75		60	80	50		52		60					
120		121,75		70	100	75		80		80					+
140/16		$l_s + 2,00$		70	100	75		80		80					
180		182,00		70		75		100		100					
200/22		$l_{\rm s}$ +2,00		70		100		100		100					
240/20		$l_s + 2,00$		70		100		100		120					
280/30		$l_s + 2,00$		70		100		115		120					
320		323,00		, ,		100		115		120					
330		333,00						115					1		
340		343,00				100		115							
350		353,00								145					
360/3		$l_s + 3,00$				100		115							
	in steps of 50r														
400-5		$l_s +3,00$				100		115		145					
550/6	$00  l_{\rm s} = 3,00$	$l_s +3,00$								145					

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  $\geq l_g \leq$  30mm  $\triangleq \pm 1{,}7mm$ 

fischer Power-Fast and Construction Screws	Annex A9 of European Technical Assessment
Sizes and Material	ETA-11/0027



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

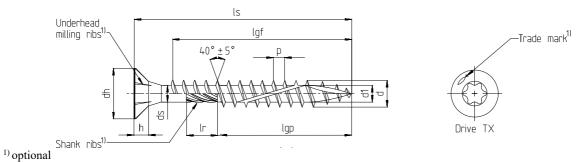
	arbon steel	u consti		501		LUAUE	, , , , , ,		, 1,41		- 4111		VI			
■ Possible surface treatments: yellow or blue zinc-plated, blue zinc-plated ≥12μm, bonus-zinced																
	minal dian		ľ	,0		,0		),0		2,0						
d	Outer diame		6,	00		00		,00	12	,00						
u	Allow. devia			±0.				,40		,50						
$d_1$	Core diamet		4,	00		40	6,40 7,60									
G1	Allow. deviation					,20				,30						
$d_{\rm h}$	Head diame		15,00 18,00			21,50 23,40										
CON .	Allow. devia		1,20													
$d_{\mathrm{u}}$	Underhead of		6,			25		,30		,40						
	Allow. devia				80			,90		,00						
SW	Wrench size		9,	90	12	,80		,80	16	,80						
	Allow. devia			0.0	2	±0,	,	20		<b>7</b> 0						
С	Washer heig	tht		80		00		20		50						
Е	Height		2,	00	2,	10		30	3,	30						
	Allow. devia		4	20	_	90	,50	10	0	20						
$d_{s}$	Shank diame Allow. devia			30 /+0,10	٥,	90		10	8,	30						
1	Head height			00	1	50		20		70						
h	Allow. devia						٥,		,50	/0						
			$\begin{array}{c ccc} \pm 0,30 & \pm 0,40 \\ \hline 3,00-4,50 & 6,00 \end{array}$						,30 50							
p	p Thread pitch Allow. deviation		3,00	-4,30	0,	±10	00/	/,								
	Short vib longth			8,0	20	Σ1	J%0	12	,00							
$l_r^{1)}$	$l_r^{(1)}$ Allow. deviation			0,0	JU	2	00	13	,00							
l	Drive TX	111011	3	0			0 50									
	Screw length	n 1			ad leng	$th \mid l_{gf} =$	•	read   1			l   Tole	rance: +	2 (12)			
Nomin		1 1 <sub>S</sub>	Stand	aru tiire	ad icing	tii   igi —	run un	rcau   1gp	-1 alti	ii uiicac	i   Tolc	iance. 1	2,0	T	I	
lengt	mın	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		101,75		60	80	50		52		60						
120	118,25	121,75		70	100	75		80		80						
140/16	$\frac{1}{1}$ $\frac{1}$	$l_s + 2,00$		70		75		80		80						
180	178,00	182,00		70		75		100		100						
200/22	$l_{\rm s} = 2,00$	$l_s + 2,00$		70		100		100		100						
240/26	$l_{\rm s} = 2,00$	$l_s + 2,00$		70		100		100		120						
280/30		$l_s + 2,00$		70		100		115		120						
320	317,00	323,00				100		115								
330		333,00						115								
340		343,00				100		115								
350		353,00								145						
360/38		$l_s +3,00$				100		115								
	in steps of 501															
400-50		$l_s + 3,00$				100		115		145						
550/60	$l_{\rm s} = 3,00$	$l_s + 3,00$								145					os in m	

All sizes in mm

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

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

fischer Power-Fast and Construction Screws	Annex A10 of European Technical Assessment
Sizes and Material	ETA-11/0027

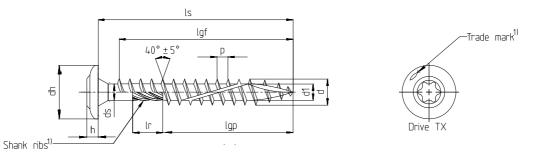


FCS wood construction screw - Countersunk head with full- or partial thread

			Constitu	Cuoi	SCIC	W - C	vuiit	CISUL	IK IIC	au W	itii iu	11- 01	part	iai tii	rcau		
		n steel		11	1.1		1 , 1 1		1.	1 > 10							
			treatments:					olue zin	e-plate	d≥12μ Γ	m, bon	us-zinc	ed	1		I	
No	omiı	nal dian	ıeter	8	,0	10	),0										
d	Οι	ıter diame	eter	8,	00	10	,00										
a	Allow. deviation		ation	±0	±0,30 ±0,40												
$d_1$	Co	re diame	ter	5,40 6,35			35										
$\mathbf{u}_1$	Al	low. devi	ation	-0,30/+0,20													
$d_h$		ead diame		14	,40	18	,40										
$u_h$	Al	low. devi	ation		±0	,40											
ds		ank diam		5,	90		10										
$\mathbf{u}_{\mathrm{s}}$		low. devi				+0,10											
h	h Head height			6,00	-7,00		-8,50										
р		read pitcl		5,	20 5,60												
Р		low. devi				0%											
$l_r^{1)}$		ank rib le		13,0													
-1		low. devi		-2,00													
	I	Drive TX		40													
	Scr	ew lengtl	ı l <sub>s</sub>	Stand	dard th	read le	ength	$l_{gf} = F_1$	ıll thre	ead   lg	<sub>p</sub> =Part	tial thr	ead   T	oleran	ce: ± 2	2,0	
Nomir lengt		min	max	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$										
80		78,50	81,50	70	50		52										
90																	
100	)	98,25	101,75	80	50		52										
110	0 108,25 111,75 100 75 80		80														
120	120 118,25 121,75		75		80												
	in st	eps of 10	mm														
	$130-400$ $1_s-2,00$ $1_s+2,00$			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 Screws	Annex A11 of European Technical Assessment
Sizes and Material	ETA-11/0027

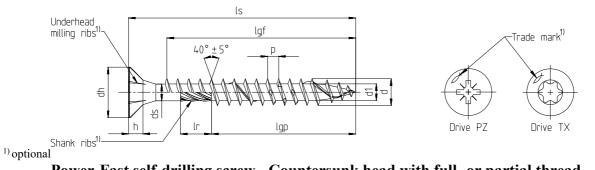


FCS wood construction screw - Flange head with partial thread

	res wood construction serew - rrange near with partial thread																
_	<ul> <li>Carbon steel</li> <li>Possible surface treatments: yellow or blue zinc-plated, blue zinc-plated ≥12μm</li> </ul>																
				Ť				lue zin	e-plated	1≥12µ	ım	1				1	
No	Nominal diameter				,0	1(	),0										
d		ter diame		8,	00	10	,00										
a	Allow. deviation		ation	-0,40/	±0/+0,30 ±		,40										
$d_1$	Co	re diamet	ter	5,	5,40		35										
$\mathbf{u}_1$	All	ow. devi	ation		$\pm 0$	,30											
$d_{\rm h}$	He	ad diame	ter	21	,00	24	24,70										
$\mathbf{u}_{\mathrm{h}}$	All	ow. devi	ation	±1	,00	-1,20/	+2,80										
$d_{s}$		ank diam		5,	90	,	10										
$\mathbf{u}_{\mathrm{s}}$		ow. devi				+0,20											
h		ad height		2,50	-4,50	3,70	-5,70										
n		read pitcl		5,	20	5,60											
p		ow. devi		±10%													
$1_{r}^{1}$		ank rib le		12,00													
17		ow. devi		±1,00													
	Γ	Prive TX			4	0											
	Scre	ew length	ı l <sub>s</sub>	Stand	dard th	read le	ength	$l_{gf} = F\iota$	ıll thre	ad   lg	p =Part	ial thr	ead   T	oleran	ce: ± 2	,0	
Nomin leng		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	80 50 52												
100	)	98,25	101,75	80	50		52										
110	)	108,25   111,75   100   75   80		80													
120	120   118,25   121,75			75		80											
	in steps pf 10mm																
130-4	$30-400$ $l_s-2,00$ $l_s+2,00$			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

fischer Power-Fast and Construction Screws	Annex A12 of European Technical Assessment
Sizes and Material	ETA-11/0027



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

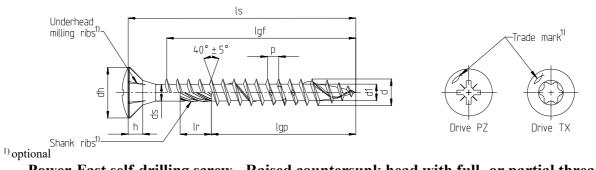
■ St	ainless steel			<u> </u>								<u> </u>				
No	minal dian	neter	3	,0	3	,5	4.	,0	4	,5	5.	,0	6	,0		
1	Outer diame	eter	3,	00	3,	50	4,	00	4,	50	5,	00	6,	00		
d	Allow. devi	ation						±0	,30							
a	Core diamet	ter	2,	00	2,	20	2,	50	2,	70	3,	00	4,	00		
$d_1$	Allow. devi	ation				-0,25 /	+0,10					±0	,20			
$d_{\rm h}$	Head diame		6,	00	7,	00	,	00	,	00	10	,00	12	,00		
$\mathbf{u}_{\mathrm{h}}$	Allow. devi		-0,50 / +0,10													
$d_{s}$	Shank diam		2,	25	2,	60	,	90		25	3,	60	30			
	Allow. devi								+0,10							
h	Head height			90		10	,	50		70		00		80		
p	Thread pitcl		1,	50	1,	80	2,	00		20	2,	50	3,00	-4,50		
Р	Allow. devi								0%							
$1_{r}^{1}$	Shank rib le		3,	75		25	4,	75	5,	50		00	7,	00		
-1	Allow. devi					,75	ı					,00				
	Drive TX		10						0.0					0		
	Drive PZ			1					2					3		
	Screw length	ı l <sub>s</sub>	Stan	Standard thread length   $l_{gf}$ = Full- thread   $l_{gp}$ =Partial thread   Tolerance: $\pm 2$												
Nomi	mın	max	$l_{\rm gf}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$		
leng	tn			*gp	Ü	*gp	Ŭ	*gp	Ü	*gp	-gı	*gp	-gı	-gp		
20	18,95	21,05	16		16	4.0	16	4.0	16							<u> </u>
25	23,75	26,25	21	1.0	21	18	20	18	20	10	2.4					
30	28,75	31,25	26	18	26	18	25	18	25	18	24	24	20			
35 40	33,50	36,50	31	24	31	24	30	24	30	24	29 34	24	28 33	24		
40	38,50 43,50	41,50 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			40	30	50	36	50	36	49	36	48	30		
60	58,50	61,50					50	36	50	36	77	36	53	36	<del>                                     </del>	<del>                                     </del>
70	68,50	71,50						42		42		42	63	42	<del>                                     </del>	<del>                                     </del>
80	78,50	81,50						50		50		50	73	50		
90	88,25	91,75						- 50		50		60	,,,	60		+
100		101,75										60		60		<del>                                     </del>
110		111,75										70		70		1
120		121,75										70		70		1
	in steps of 10mm															
	$00   l_s - 2,00$													70		1

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	Annex A13 of European Technical Assessment	
Sizes and Material	ETA-11/0027	



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

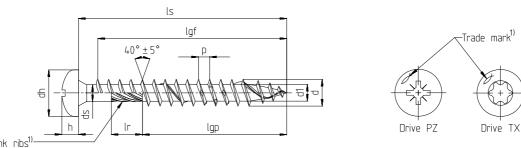
Stainless steel      Stainless steel      Stainless steel																
			_	^	1 _	_			l .	_	l _		1 .		1	
No	minal dian			,0	3	,5	4	,0		,5		,0		,0		
d	Outer diam	eter	3,	00	3,	50	4,	00	4,	50	5,	00	6,	00		
u	Allow. dev	iation						±0	,30							
ı	Core diame	ter	2,	00	2,	20	2,	50	2,	70	3,00		4,	00		
$d_1$	Allow. dev	iation				-0,25	/+0,10	1				±0	,20			
	Head diame	eter	6,	00	7,	00	8,	00	9,	00	10.	,00	12	,00		
d <sub>h</sub>	Allow. dev	iation	-0,50/+0,10										-			
1	Shank dian	neter	2,	25	2,	60	2,	90	3,	25	3,	60	4,	30		
d <sub>s</sub>	Allow. dev	iation						-0,30	+0,10	)						
h	Head heigh	t	1,	90	2,	10	2,	50	2,	70	3,	00	3,	80		
	Thread pitc	h	1,	50	1,	80	2,	00	2,	20	2,	50	3,00	-4,50		
p				±10%									I			
1 1)	Shank ribs length		3,75 4,25			25	4,	75	5,	5,50		00	7,00			
$l_r^{1)}$	Allow. dev	iation			±0	,75					±1	,00				
	Drive TX			1	0			2	0		20	25	3	0		
	Drive PZ			1				,	2		ı		3			
,	Screw lengt	h l <sub>s</sub>	Stand	Standard thread length   $l_{gf}$ = Full thread   $l_{gp}$ =Partial thread   Tolerance: $\pm 2$										ce: ± 2	$0^{(2)}$	
Nomina	mın	max	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	lgp	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{\rm gp}$		
lengtl	1			1gp	ŭ	1gp		1gp	0	1gp	1gf	1gp	1gt	1gp		
20	18,95	21,05	16		16	1.0	16	1.0	16							
25 30	23,75 28,75	26,25 31,25	21 26	18	21 26	18 18	21 26	18 18	20 25	18	24					
35	33,50	36,50	31	24	31	24	31	24	30	24	29	24	28			
40	38,50	41,50	31	24	36	24	36	24	35	24	34	24	33			+
45	43,50	46,50		30	20	30	41	30	40	30	39	30	38			$\vdash$
50	48,50	51,50				30	46	30	45	30	44	30	43			<u> </u>
55	53,50	56,50						36		36		36				
60	58,50	61,50						36		36		36	53			
70	68,50	71,50						42		42		42	63			
80	78,50	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

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

fischer Power-Fast and Construction Screws	Annex A14 of European Technical Assessment
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Shank ribs<sup>1)</sup> optional

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

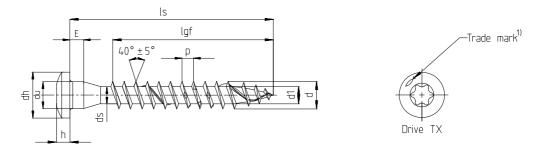
Power-Fast self-drilling screw - Pan nead with full- or partial thread																
■ St	ainless steel															
No	minal diar	neter	3	,0	3	,5	4	,0	4.	,5	5	,0	6	,0		
d	Outer diameter		3,	00	3,	50	4,	00	4,	50	5,	00	6,	00		
a	Allow. dev	iation		±0,30												
$d_1$	Core diame	eter	2,00 2,20			2,50 2,70			3,00		4,00					
$\mathbf{u}_1$	Allow. dev	iation	-0,25 /			'+0,10	)				$\pm 0$	,20				
$d_h$	Head diam	eter	6,	00	7,	00	8,	00	9,	00	10	,00	12	,00		
$a_h$	Allow. dev	iation						-0,50 /	+0,10	)						
1	Shank dian	neter	2,	25	2,	60	2,	90	3,	25	3,	60	4,	30		
$d_{\rm s}$	Allow. dev	iation						-0,30 /	+0,10	)						
h	Head heigh	ıt	2,	30	2,	50	2,	90	3,	10	3,	40	3,	80		
	Thread pito	h	1,	50	1,	80	2,	00	2,	20	2,	50	3,00	-4,50		
р	p Allow. deviation							±1	0%							
$l_r^{1)}$	Shank ribs length		3,	75	4,	25	4,	75	5,	50	6,	6,00		7,00		
I <sub>r</sub> -/	Allow. deviation				±0	,75					±1	,00				
	Drive TX			1	0			2	0		20	25	3	0		
	Drive PZ			1 2 3							3					
	Screw length l <sub>s</sub>			Standard thread length $\mid$ $l_{gf}$ = Full thread $\mid$ $l_{gp}$ =Partial thread $\mid$ Tolerance: $\pm$ 2,										$,0^{2)}$		
Nomin leng	min	max	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$	$l_{\mathrm{gf}}$	$l_{gp}$		
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	<u> </u>	ļ
55	53,50	56,50					50	36	50	36	49	36	48	2.5	<u> </u>	<u> </u>
60	58,50	61,50						36		36		42	53	36	<u> </u>	-
70	68,50	71,50						42		42		50	63 73	42	<del>                                     </del>	
80 90	78,50 88,25	81,50 91,75						50		50		50 60	/3	50 60	<del>                                     </del>	
												60		60		
100	100 98,25 101,75				l	l		l				UU		A 11 ci 7	<del></del>	<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
- $\blacksquare \qquad \text{Threaded lengths between } 4 \times d \leq l_g \leq l_{gmax} \text{ are possible}$

 $\begin{array}{c} ^{2)} \ 10mm \geq l_{g} \leq \! 18mm \triangleq \pm 1,\! 5mm \\ 18mm \geq l_{g} \leq \! 30mm \triangleq \pm 1,\! 7mm \end{array}$ 

tischer Power-Bast and Construction Screws	Annex A15 of European Technical Assessment
Sizes and Material	ETA-11/0027



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

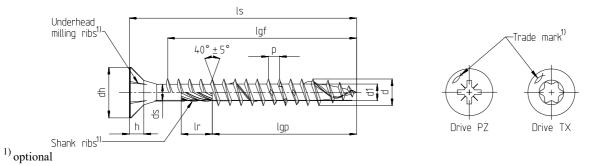
Stainless steel																	
Nominal diameter				5,	,0												
d	Outer dia	Outer diameter		5,0	5,00												
a	Allow. d	eviati	ion	-0,	30												
$d_1$	Core dia	neter	r	3,0	00												
$\mathbf{u}_1$	Allow. d	eviati	ion	±0,	,20												
$d_{\mathrm{u}}$	Underhe			5,0	00												
$\mathbf{u}_{\mathrm{u}}$	Allow. d			-0,													
$d_{\rm h}$	Head dia			8,2													
u <sub>h</sub>	Allow. d	eviati	ion	±0,													
Е	Height			2,													
	Allow. d		ion	±0,													
h				2,0													
p	Thread pitch		2,:														
Г	Allow, deviation		±10														
	Drive TX			20	25												
	Screw len	gth l	s	Stand	lard th	read le	ength	$l_{gf} = F$	ull thre	ead   lg	,=Part	ial thr	ead   T	oleran	ce: ± 2	$2,0^{2)}$	
Nomir	mın		max	$l_{\mathrm{gf}}$	$l_{\rm gp}$												
leng		-  -	21.05		<i>5</i> 1												
20 25			21,05	14 19													
30	23,7:	_	26,25 31,25	24													
35			36,50	29													
40			41,50	34													
45		_	46,50	39													
50			51,50	44													
55	53,50		56,50	49													
60			61,50	54													
70			71,50	64													
80			81,50	74													

All sizes in mm

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

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

fischer Power-Fast and Construction Screws	Annex A16 of European Technical Assessment
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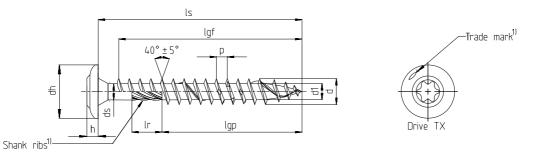
Power-Fast wood construction screw - Countersunk head with full- or partial thread

■ Stainl	ess steel															
Nominal diameter			6	,0	8	,0										
ı (	Outer diameter		6,	00	8,00											
d A	Allow. dev	iation		±0	,30	30										
	Core diame		4,	00	5,40											
$u_1$	Allow. dev	iation		$\pm 0$	,20											
d	Head diam		12	,00	14	,40										
F	Allow. dev		-0,50	/+0,10		,40										
	Shank dian			30		90										
J A	Allow. dev		-0,30	/+0,10		,20										
	Head heigh		3,	80		10										
	Thread pito		3,00-		,	00										
	Allow. dev				0%											
	Shank rib l			00		,00										
. A	Allow. deviation			,00	-2,00											
	Drive TX			50	4	10										
	Drive PZ			3		-										
Sc	Screw length l <sub>s</sub>		Standard thread length			$l_{gf} = F_1$	ull thre	ead   lg	p =Part	ial thr	ead   T	oleran	ce: ± 2	2,0		
Nominal	min	max	$l_{\mathrm{gf}}$	$l_{\mathrm{gp}}$	$l_{gf}$	$l_{\mathrm{gp}}$										
length			Ŭ		1gf	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																
	l <sub>s</sub> -2,00			70		100										
	teps of 201															
320-500	$l_{\rm s} = 3,00$	$l_s +3,00$				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

fischer Power-Fast and Construction Screws	Annex A17 of European Technical Assessment
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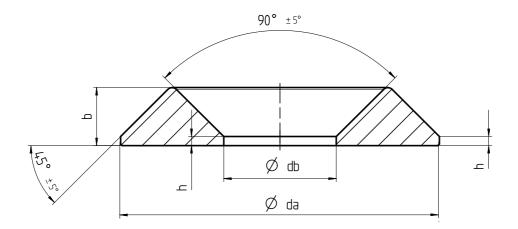


Power-Fast wood construction screw - Flange head with full- or partial thread

Nominal diameter	1 over-Past wood construction serew - Plange near with run- of partial timeau																
$\begin{array}{ c c c c c c c }\hline d & Outer diameter & 6,00 & 8,00 \\ \hline Allow. deviation & \pm 0,30 \\ \hline d_1 & Core diameter & 4,00 & 5,40 \\ \hline Allow. deviation & -0,30/+0,20 \\ \hline d_h & Head diameter & 13,70 & 21,00 \\ \hline Allow. deviation & -0,70/+1,30 & \pm 1,00 \\ \hline d_s & Shank diameter & 4,30 & 5,90 \\ \hline Allow. deviation & -0,30/+0,10 \\ \hline h & Head height & 3,50 \\ \hline Allow. deviation & \pm 1,00 \\ \hline p & Thread pitch & 3,00-4,50 & 6,00 \\ \hline Allow. deviation & \pm 10\% \\ \hline 1_r^{1} & Shank rib length & 8,00 & 13,00 \\ \hline Allow. deviation & -2,00 \\ \hline \hline Drive TX & 30 & 40 \\ \hline \hline Nominal length & min & max & l_{gf} & l_{gp} & l_{gf} & l_{gp} \\ \hline 60 & 58,50 & 61,50 & 50 & 36 \\ \hline \end{array}$																	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	No	minal dia	meter	6	,0	8	,0										
$\begin{array}{ c c c c c c c c }\hline Allow. deviation & \pm 0,30 & 5,40 & & & & & \\\hline d_1 & Core diameter & 4,00 & 5,40 & & & & & \\\hline Allow. deviation & -0,30/+0,20 & & & & & \\\hline d_h & Head diameter & 13,70 & 21,00 & & & & \\\hline Allow. deviation & -0,70/+1,30 & \pm 1,00 & & & & \\\hline d_s & Shank diameter & 4,30 & 5,90 & & & & \\\hline Allow. deviation & -0,30/+0,10 & & & & \\\hline h & Head height & 3,50 & & & & \\\hline Allow. deviation & \pm 1,00 & & & \\\hline p & Allow. deviation & \pm 1,00 & & & \\\hline Allow. deviation & \pm 10\% & & & \\\hline l_r^{1)} & Shank rib length & 8,00 & 13,00 & & & \\\hline b & Allow. deviation & -2,00 & & & \\\hline Drive TX & 30 & 40 & & & \\\hline Screw length l_s & Standard thread length   l_{gf} = Full thread   l_{gp} = Partial thread   Tolerance: \pm 2,0 \\\hline Nominal length & min & max & l_{gf} & l_{gp} & l_{gf} & l_{gp} \\\hline 60 & 58,50 & 61,50 & 50 & 36 & & & & \\\hline \end{array}$	a	Outer diam	eter	6,	00	8,	00										
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	a	Allow. dev	iation		±0,30												
$\begin{array}{ c c c c c c c }\hline Allow. \ deviation & -0,30/+0,20 \\ \hline d_h & Head \ diameter & 13,70 & 21,00 \\ \hline Allow. \ deviation & -0,70/+1,30 & \pm 1,00 \\ \hline d_s & Shank \ diameter & 4,30 & 5,90 \\ \hline Allow. \ deviation & -0,30/+0,10 \\ \hline h & Head \ height & 3,50 \\ \hline Allow. \ deviation & \pm 1,00 \\ \hline p & Thread \ pitch & 3,00-4,50 & 6,00 \\ \hline P & Allow. \ deviation & \pm 10\% \\ \hline I_r^{1} & Shank \ rib \ length & 8,00 & 13,00 \\ \hline Drive \ TX & 30 & 40 \\ \hline \hline & Screw \ length \ l_s & Standard \ thread \ length \ l_{gf} = Full \ thread \  \ l_{gp} = Partial \ thread \  \ Tolerance: \pm 2,0 \\ \hline \hline Nominal \ length & min \ max & l_{gf} \ l_{gp} \ l_{gf} \ l_{gp} \\ \hline \hline 60 & 58,50 & 61,50 & 50 & 36 \\ \hline \end{array}$	d.			4,			40										
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	ul																
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	dı —				,		_										
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	un						_										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	d.			4,			90										
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	us																
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	h –																
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$																	
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	р			3,00	_		00										
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1						0.0										
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	$l_r^{1)}$			8,			,00										
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$				2			^										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							1 5	11 .1	1   1	ъ.	. 1 .1	1   1			. 0		
length         min         max         lgf         lgp         lgf         lgp           60         58,50         61,50         50         36			1 l <sub>s</sub>	Stand	dard th	read le	ength	I <sub>gf</sub> = Fi	all thre	ead   l <sub>g</sub>	<sub>p</sub> =Part	ial thre	ead   T	oleran	ce: ± 2	.,0	ı
60 58,50 61,50 50 36		mın	max	$l_{gf}$	l <sub>op</sub>	$l_{gf}$	lon										
			(1.50	Ü		- 5-	5r										
						70	50										
90 88,25 91,75 60 80 50				/0													
90 88,25 91,75 60 80 50 100 98,25 101,75 60 80 50																	
100 98,25 101,75 00 80 30 1 120 118,25 121,75 70 100 75																	
140 138,00 142,00 70 75						100											
140 138,00 142,00 70 75 160 158,00 162,00 70 75																	
180 178,00 182,00 70 75 180 180 178,00 182,00 180 170 175 180 180 180 180 180 180 180 180 180 180			- í														
in steps of 20mm					, 0		,,,										
200-300   l <sub>s</sub> -2,00   l <sub>s</sub> +2,00   70   100					70		100										
in steps of 20mm																	
$320-500 \mid 1_s - 3,00 \mid 1_s + 3,00 \mid 100 $							100										

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

fischer Power-Fast and Construction Screws	Annex A18 of European Technical Assessment
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#### Washer for Power-Fast and construction screws

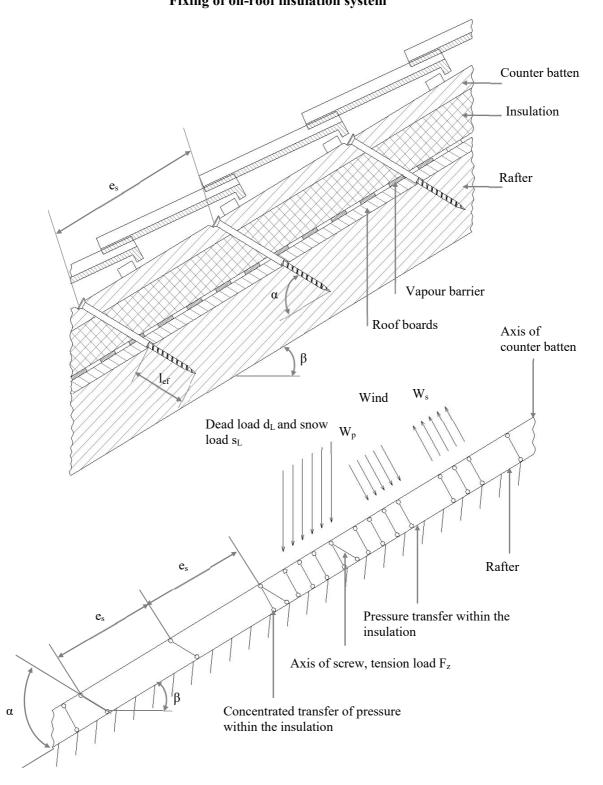
	washer for 1 ower-rast and construction screws												
	<ul> <li>Carbon Steel - possible surface treatments: yellow or blue zinc-plated, bonus- zinced, ≥12μm blue zinc-plated</li> <li>Stainless steel</li> </ul>												
N	Nominal diameter		Tyj	oe 1		Type 2							
	Size	6	8	10	12	6	8	10					
db	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					
ua	Allow. deviation	±2,0											
b	Height	4,70	5,20	6,20	8,30	4,70	5,20	6,20					
Ü	Allow. deviation	-0,40											
h	Height	1,50	1,80	2,00	2,20	1,50	1,80	2,00					
п	Allow. deviation				-0,15								

fischer Power-Fast and Construction Screws	Annex A19 of European Technical Assessment
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Annex B

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

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

fischer Power-Fast and Construction Screws	Annex B1 of European Technical Assessment
Fixing of on-roof insulation system	ETA-11/0027

#### **Design of the battens**

The bending stresses are calculated as:

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

Where

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

EI = bending stiffness of the batten

K = coefficient of subgrade

w<sub>ef</sub> = effective width of the heat insulation

 $F_b$  = Point loads perpendicular to the battens

F<sub>s</sub> = Point loads perpendicular to the battens, load application in the area of the screw heads

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

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

where

w = minimum width of the batten or rafter, respectively

 $t_{HI}$  = thickness of the heat insulation

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

The following condition shall be satisfied:

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

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  $k_2$ :

$$F_{ax,\alpha,Rd} = min \begin{cases} k_{ax} * f_{ax,d} * d * l_{ef} * k_1 * k_2 * \left(\frac{\rho_k}{350}\right)^{0.8} \\ f_{head,d} * d_h^2 * \left(\frac{\rho_k}{350}\right)^{0.8} \end{cases} [N]$$

$$f_{tens,d}$$

where:

f<sub>ax,d</sub> 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,  $l_{ef} \ge 40 \text{ mm}$ 

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

 $\rho_k$  characteristic density of the wood-based member [kg/m<sup>3</sup>]

 $f_{\text{head,d}}$  design value of the head pull-through capacity of the screw

d<sub>h</sub> head diameter

 $k_1 \qquad \quad min \; \{1; \, 200/t_{HI} \}$ 

 $k_2$  min  $\{1; \sigma_{10\%}/0,12\}$   $t_{HI}$  thickness of the heat insulation [mm]

 $\sigma_{10\%}$  compressive stress of the heat insulation under 10 % deformation [N/mm<sup>2</sup>]

f<sub>tens,d</sub> Design value of the tensile capacity of the screw [N]

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:

$$F_{v,Rk} = min \begin{cases} f_{h,b,k} \cdot d \cdot t_{b} \\ f_{h,r,k} \cdot d \cdot f_{r} \\ \frac{f_{h,b,k} \cdot d \cdot \beta}{1+\beta} \cdot \left( \sqrt{4t_{il}^{2} + (2+\frac{1}{\beta})t_{b}^{2} + (2+\beta)t_{r}^{2} + 4t_{il}\left(t_{b} + t_{r}\right) + 2t_{b}t_{r}} - 2t_{il} - t_{b} - t_{r} \right) + \frac{F_{ax,Rk}}{4} \\ 1,05 \cdot \frac{f_{h,b,k} \cdot d \cdot \beta}{\frac{1}{2} + \beta} \left( \sqrt{t_{il}^{2} + t_{il}t_{b} + \frac{t_{b}^{2}}{2} \left(1 + \frac{1}{\beta}\right) + \frac{M_{y,k}}{f_{h,b,k}} d} \left(1 + \frac{2}{\beta}\right) - t_{il} - \frac{t_{b}}{2}\right) + \frac{F_{ax,Rk}}{4}} \\ 1,05 \cdot \frac{f_{h,b,k} \cdot d \cdot \beta}{\frac{1}{2} + \beta} \left( \sqrt{t_{il}^{2} + t_{il}t_{r} + \frac{t_{r}^{2}}{2} (1 + \beta) + \frac{M_{y,k}}{f_{h,b,k}} d} \left(2 + \frac{1}{\beta}\right) - t_{il} - \frac{t_{r}}{2}\right) + \frac{F_{ax,Rk}}{4}} \\ 1,15 \cdot \frac{f_{h,b,k} \cdot d}{1 + \beta} \left( \sqrt{\beta^{2}t_{il}^{2} + 4\beta (\beta + 1) \cdot \frac{M_{y,k}}{f_{h,b,k}} d} - \beta t_{il} \right) + \frac{F_{ax,Rk}}{4}} \end{cases}$$

Where:

 $f_{h,b,k}$  Characteristic batten embedding strength [N/mm<sup>2</sup>]  $f_{h,r,k}$  Characteristic rafter embedding strength [N/mm<sup>2</sup>]

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

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]

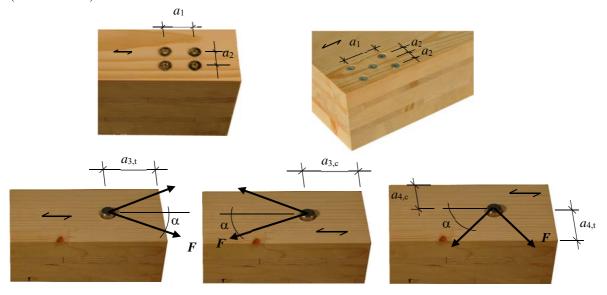
F<sub>ax,Rk</sub> Characteristic axial tensile capacity of the screw [N]

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## Annex C Minimum distances and spacing

#### Axially or laterally loaded screws in the plane or edge surface of cross laminated timber

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



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

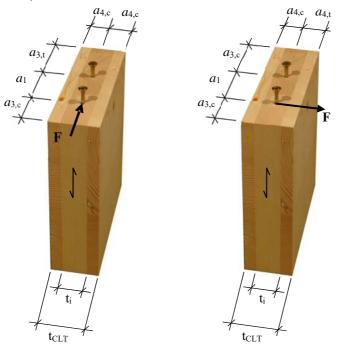


Table C1: Minimum spacing, end and edge distances of screws in the plane or edge surfaces of cross laminated timber

	aı	a <sub>3,t</sub>	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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