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European Technical Assessment

ETA 23/0569
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General Part

Technical Assessment Body issuing the European Technical Assessment Technický a zkušební ústav stavební Praha, s.p.	
Trade name of the construction product	Dynaplus, Proftec, Rotadrill, Hoenderdaal, PM, Fastec
Product family to which the construction product belongs	Product area code: 13 Screws for use in timber constructions
Manufacturer	HOENDERDAAL FASTENERS B.V. Wageningselaan 18, 3903 LA Veenendaal Netherlands
Manufacturing plant	Plant 1 Plant 2 Plant 3 Plant 4
This European Technical Assessment contains	46 pages including 3 Annexes, which form an integral part of this European Technical Assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 130118-01-0603 Screws and threaded rods for use in timber constructions

1 Technical description of the product

Dynaplus, Proftec, Rotadrill, Hoenderdaal, PM, Fastec are timber screws made from carbon steel grade 10B21. All the screws are zinc coated with protective layer thickness > 5 µm. Outdoor screws have additional AR coating. Type of head is Washer, Pan, Flat, Double flat or CSK. The screws are fully or partially threaded. Dimensions, tolerances, shapes and other description is shown in Annex 1. All screws fulfill the requirement for a minimum bending angle of $\alpha = (45/d^{0.7} + 20)$. The screws are used for connections in load bearing timber structures between wood-based members.

1.1 Shape and dimensions

The outer thread diameter is 3.0, 3.5, 4.0, 4.5, 5.0, 6.0, 8.0 and 10.0 mm. The overall length of the screws is ranging from 16 mm to 400 mm. Further dimensions are shown in Annex 1.

The ratio of inner thread diameter to outer thread diameter d_1/d ranges for all screws from 0.64 to 0.71.

The screws are threaded over a minimum length $l_g \geq 4 \cdot d$.

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

The screws are used for connections in timber constructions.

The screws are intended to be used for connecting wood-based members where requirements for mechanical resistance and stability and safety in use shall be fulfilled. The screws are used for connections in load bearing timber structures between steel plates or wood-based members:

- Solid timber (softwood) of strength classes C14 - C 40 according to EN 338[1] / EN 14081-1+A1[2]
- Glued laminated timber (softwood) of at least strength class GL24c/GL24h according to EN 14080[3]
- Laminated veneer lumber LVL according to EN 14374[4], arrangement of the screws only perpendicular to the plane of the veneers
- Glued laminated solid timber according to EN 14080[3]
- Cross laminated timber according to European Technical Assessments or national provisions that apply at the installation site

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

- Plywood according to EN 636+A1[5] and EN 13986+A1[6]
- Oriented Strand Board, OSB according to EN 300[7] and EN 13986+A1[6]
- Particleboard according to EN 312[8] and EN 13986+A1[6]
- Fibreboards according to EN 622-2[9], EN 622-3[10] and EN 13986+A1[6]
- Cement-bonded particle boards according to national provisions that apply at the building site
- Solid-wood panels according to national provisions that apply at the building site

Wood-based panels shall only be arranged on the side of the screw head.
According to EN 1995-1-1[11] the screws made from special stainless or carbon steel with $d > 4$ mm may be used in timber structures subject to climate conditions defined by service classes 1 and 2.
According to EN 1995-1-1 the screws made from special stainless or carbon steel with $d \leq 4$ mm may be used in timber structures subject to climate conditions defined by service class 1.
Regarding environmental conditions national provisions shall apply at the building site.

Corrosive categories according to EN ISO 12944-2 shall be taken into account.
The use of the screws shall be limited to static and quasi/static actions.

The provisions made in this European Technical Assessment are based on an assumed minimum working life of 50 years, provided that the screws are subject to appropriate use and maintenance.

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1 EN 338 Timber structures - Strength classes
2 EN 14081-1+A1 Timber structures - Strength graded structural timber with rectangular cross section - Part 1: General requirements
3 EN 14080 Timber structures - Glued laminated timber and glued solid timber - Requirements
4 EN 14374 Timber structures - Structural laminated veneer lumber - Requirements
5 EN 636+A1 Plywood - Specification
6 EN 13986+A1 Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking
7 EN 300 Oriented strand boards (OSB) - Definition, classification and specifications
8 EN 312 Particleboards - Specifications
9 EN 622-2 Fibreboards - Specifications - Part 2: Requirements for hardboards
10 EN 622-3 Fibreboards - Specifications - Part 3: Requirements for medium boards
11 EN 1995-1-1 Design of timber structures - Part 1-1: General - Common rules and rules for buildings

The indications given as to the working life cannot be interpreted as a guarantee given by the producer or Technical Assessment Body but are regarded only as a mean 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

The assessment of the fitness for use of the Dynaplus, Proftec, Rotadrill, Hoenderdaal, PM, Fastec screws according to the Basic Work Requirements (BWR) were carried out in compliance with EAD 130118-01-0603.

The European Technical Assessment is issued for the screws on the basis of agreed data and information, deposited at Technický a zkušební ústav stavební Praha, s.p., which identifies screws that has been assessed and judged. Changes to the screws or production process which could result in this deposited data and information being incorrect should be notified to Technický a zkušební ústav stavební Praha, s.p. before the changes are introduced. Technický a zkušební ústav stavební Praha, s.p. will decide whether or not such changes affect the ETA and consequently the validity of the CE marking on the basis of the ETA and if so whether further assessment or alternations to the ETA shall be necessary.

Table 1 Essential characteristics of the product

	Essential characteristic	Performance
3.1 BWR 1: Mechanical resistance and stability		
3.1.1	Dimensions	See Annex 1 and Annex 2
3.1.2	Characteristic yield moment	See Annex 2
3.1.3	Characteristic withdrawal parameter	See Annex 2
3.1.4	Characteristic head pull-through parameter	See Annex 2
3.1.5	Characteristic tensile strength	See Annex 2
3.1.6	Characteristic yield strength	See Annex 2
3.1.7	Characteristic torsional strength	See Annex 2
3.1.8	Insertion moment	See Annex 2
3.1.9	Bending angle	See Annex 2
3.1.10	Durability against corrosion	The screws are zinc coated with protective layer thickness > 5 µm
3.1.11	Spacing, end and edge distances of the screws and minimum thickness of the wood-based material	Point 3.1.11 No performance assessed
3.1.12	Slip modulus for mainly axially loaded screws	No performance assessed
3.2 BWR 2: Safety in case of fire		
3.2.1	Reaction to fire	All screws are made from carbon steel grade 10B21 classified as Euroclass A in accordance with EC Decision 1996/603/EC, as amended by EC
BWR 4: Safety and accessibility in use		
Same as BWR 1		

3.1 Mechanical resistance and stability (BWR 1)

Annex 2 contains essential characteristics for all screws. The design and construction shall be carried out according to national provisions that apply at the installation site in line with the partial safety factor format, e.g. in accordance with EN 1995-1-1.

3.1.1 Dimensions

The dimensions have been measured according to provisions in EN 14592+A1. The dimensions are stated in tables at Annex 1 and measured values in tables at Annex 2.

3.1.2 Characteristic yield moment

The characteristic yield moment $M_{y,k}$ has been determined by tests according to EN 409. The test results are stated in tables at Annex 2.

3.1.3 Characteristic withdrawal parameter

The characteristic withdrawal parameter $f_{ax,90,k}$ has been determined by tests according to EN 1382. Density of used timber is mentioned under tables at Annex 2. The test results are stated in tables at Annex 2.

For angles α between screw axis and grain direction $15° \leq \alpha < 45°$ the characteristic withdrawal capacity $F_{ax,\alpha,Rk}$ shall be determined according to equation:

$F_{ax,\alpha,Rk} = k_{ax} \cdot f_{ax,90,k} \cdot d \cdot l_{ef} \cdot (\rho_k/350)^{0,8}$

where

k_{ax} factor to consider the influence of the angle between screw axis and grain direction and the long term behaviour
$k_{ax} = 0,3+(0,7 \cdot \alpha)/45°$

$f_{ax,90,k}$ short-term characteristic withdrawal parameter for an angle α between screw axis and grain direction of 90° in N/mm²

d outer thread diameter of the screw in mm

l_{ef} penetration length of the threaded part of the screw in the timber member in mm

ρ_k characteristic density of the wood-based member in kg/m³

For angle α between screw axis and grain direction $0° \leq \alpha < 15°$ the following requirements were fulfilled and relevant equations can be used:

1. $f_{ax,0,k} / f_{ax,90,k} \geq 0.6$
2. The penetration length of the screws in the timber member shall be

$$l_{pen,req} = \min \begin{cases} \dfrac{4 \cdot d}{\sin \alpha} \\ 20 \cdot d \end{cases}$$

3. At least four screws shall be used in a connection with screws inserted in the timber member with an angle between screw axis and grain direction of less than 15°.

3.1.4 Characteristic head pull-through parameter

The characteristic head pull-through parameter $f_{head,k}$ has been determined by tests according to EN 1383. Density of used timber is mentioned under tables at Annex 2. The test results are stated in tables at Annex 2.

3.1.5 Characteristic tensile strength

The characteristic tensile strength $f_{tens,k}$ has been determined by tests according to EN 1383. The test results are stated in tables at Annex 2.

3.1.6 Characteristic yield strength

The characteristic yield strength has been determined by tests according to EN 1383. The test results are stated in tables at Annex 2.

3.1.7 Characteristic torsional strength

The characteristic torsional strength $f_{tor,k}$ has been determined by tests according to EN ISO 10666. The test results are stated in tables at Annex 2.

3.1.8 Insertion moment

The mean insertion moment $R_{tor,mean}$ has been determined by tests according to EN 15737. The test results are stated in tables at Annex 2.

3.1.9 Bending angle

The bending angle α has been determined for each diameter of the screw. All screws fulfill the requirement for a minimum bending angle $\alpha = (45/d^{0.7} + 20)$. The test results are stated in table at point 4.1.9 of Evaluation Report.

3.1.10 Durability against corrosion

The screws are made from carbon steel grade 10B21 and are zinc coated with protective layer thickness > 5 µm. The test results are stated in tables at Annex 2.

3.1.11 Spacing, end and edge distances of the screws and minimum thickness of the wood-based material

No performance assessed.

Laterally loaded screws
For screws the minimum spacing, end and edge distances are given in EN 1995-1-1, clause 8.7.1.

Axially loaded screws
For screws the minimum spacing, end and edge distances are given in EN 1995-1-1, clause 8.7.2 and Table 8.6.

3.1.12 Slip modulus for mainly axially loaded screws

No performance assessed.

The axial slip modulus K_{ser} of the threaded part of a screw for the serviceability limit state shall be taken independent of angle α to the grain as:
$K_{ser} = 25 \cdot d \cdot l_{ef}$ [N/mm] for screws in members made from softwood
$K_{ser} = 30 \cdot d \cdot l_{ef}$ [N/mm] for screws in members made from hardwood

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

3.2 Safety in case of fire (BWR 2)

3.2.1 Reaction to fire

All screws are made from carbon steel grade 10B21 classified as Euroclass A in accordance with EC Decision 1996/603/EC, as amended by EC.

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

According to the Decision 1997/0176/EC [12], of the European Commission the system(s) of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011 and Commission delegated Regulation (EU) No 568/2014) given in the following table applies:

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity system(s)
Fasteners for structural timber products	Structural timber products		3

[12] 1997/0176/EC - European Commission decision of 17/2/1997, published in the Official Journal of the European Communities No L 73/19

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

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at the Technický a zkušební ústav stavební Praha, s.p.

Issued in Prague on 11/07/2024

By

Ing. Jiří Studnička, Ph.D.
Head of the TAB

TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p.
Technical and Test Institute for Construction Prague SOE
ZÚS
Czech Republic
Technical Assessment Body
Subjekt pro technické posuzování

Annexes:

Annex 1	Dimensions, tolerances and description of screws Dynaplus, Proftec, Rotadrill, Hoenderdaal, PM, Fastec
Annex 2	Essential characteristics of screws Dynaplus, Proftec, Rotadrill, Hoenderdaal, PM, Fastec
Annex 3	Reference documents

Annex 1 Dimensions, tolerances and description of screws Dynaplus, Proftec, Rotadrill, Hoenderdaal, PM, Fastec

Table 2 Dimensions of Dynaplus MDF screw

Dynaplus MDF screw		
Nominal size	**3.5**	**4.0**
l (min)	20	40
l (max)	50	60
*L*g (min)	15	22
*L*g (max)	28	35
*D*1	2.35	2.6
D	3.4 - 3.6	3.9 - 4.1
*D*s	2.25	2.55
*D*h	5.8 - 6.2	6.2 - 6.7
p	1.7	2.1

Figure 1 Dynaplus MDF screw

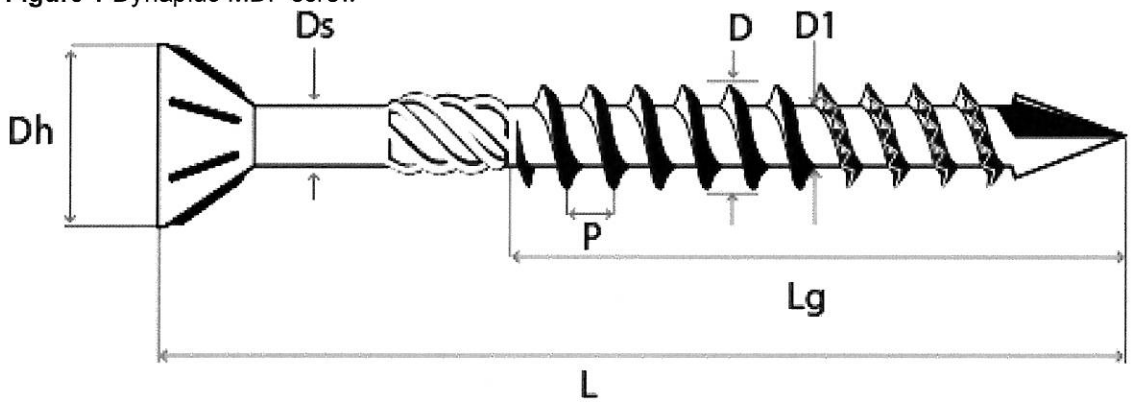


Table 3 Dimensions of Dynaplus Glazing bead screw

Dynaplus Glazing bead screw	
Nominal size	**3.5**
l (min)	30
l (max)	50
*L*g (min)	18
*L*g (max)	25
*D*1	2.35
D	3.3 - 3.6
*D*s	2.25
*D*h	5.8 - 6.2
p	1.7

Figure 2 Dynaplus Glazing bead screw

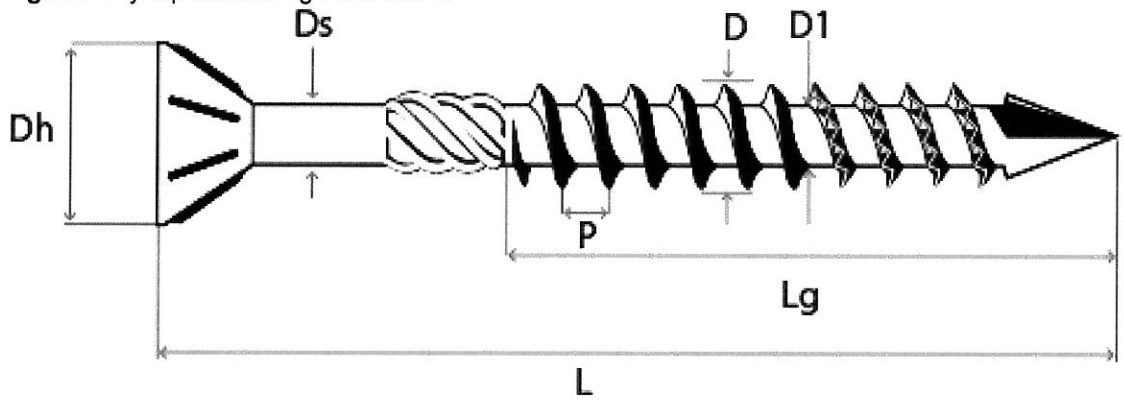


Table 4 Dimensions of Dynaplus washerhead screw

Dynaplus washerhead screw					
Nominal size	**4.0**	**5.0**	**6.0**	**8.0**	**10.0**
l (min)	30	30	30	40	100
l (max)	60	100	280	400	400
*L*g (min)	--	42	42	42	55
*L*g (max)	--	55	100	100	100
*D*1	2.6	3.2	3.95	5.2	6.3
D	3.9 - 4.1	4.9 - 5.1	5.9 - 6.2	7.9 - 8.1	9.9 - 10.1
*D*s	2.9	3.5	4.3	5.8	6.9
*D*h	10.0 – 10.5	12.0 – 12.5	14.0 – 14.5	21.0 – 21.5	25.0 – 25.5
p	2.3	2.9	3.4	5	5.3

Figure 3 Dynaplus washerhead screw

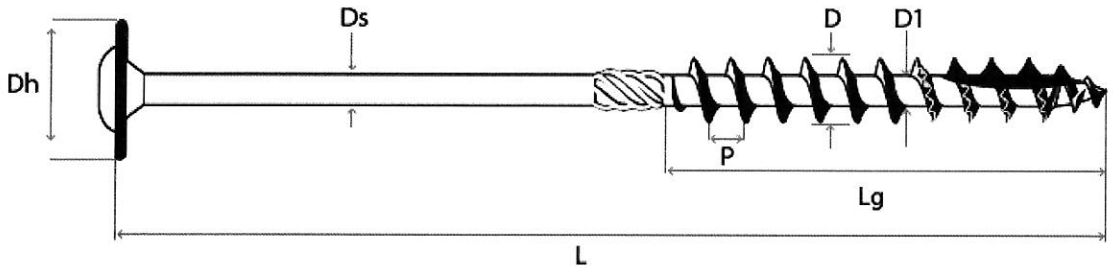


Table 5 Dimensions of Dynaplus decking screw

Dynaplus decking screw		
Nominal size	**5.0**	**8.0**
l (min)	40	80
l (max)	110	--
*L*g (min)	20	42
*L*g (max)	50	--
*D*1	3.3	5.5
D	5.1 – 5.3	7.8 – 8.1
*D*s	3.7	5.8
*D*h	7.1 – 7.3	9.1 – 9.3
p	2.9	5.0
*p*2	2.6	4.0

Figure 4 Dynaplus decking screw

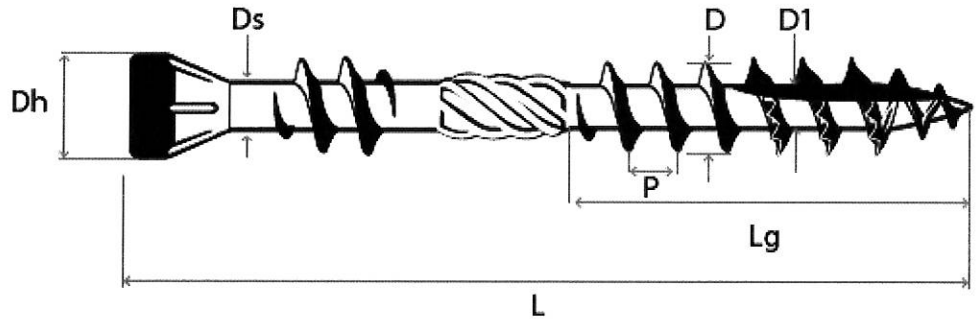


Table 6 Dimensions of Dynaplus construction screw

Dynaplus construction screw TX FH		
Nominal size	**6.0**	**8.0**
l (min)	40	80
l (max)	200	280
*L*g (min)	24	42
*L*g (max)	80	100
*D*1	3.95	5.5
D	5.8 – 6.1	7.8 – 8.1
*D*s	4.3	5.8
*D*h	11.0 – 11.5	14-15
p	3.4	5

Figure 5 Dynaplus construction screw

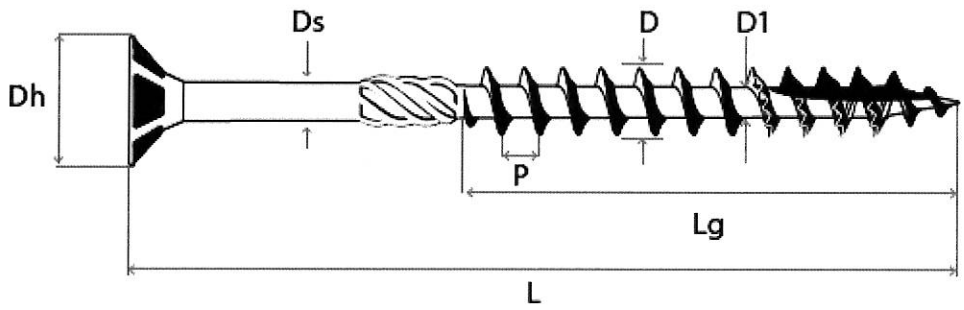


Table 7 Dimensions of Dynaplus universal screw

Dynaplus universal screw TX PH						
Nominal size	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**6.0**
l (min)	16	16	20	20	25	30
l (max)	25	30	50	40	70	100
*L*g (min)	--	--	--	--	35	35
*L*g (max)	--	--	--	--	42	55
*D*1	1.85	2.35	2.6	2.9	3.2	3.95
D	2.9 – 3.1	3.4 – 3.6	3.9 – 4.1	4.4 – 4.6	4.8 – 5.1	5.8 – 6.1
*D*s	2.1	2.6	2.9	3.25	3.5	4.3
*D*h	5.7 – 6.0	6.7 – 7.0	7.7 – 8.0	8.7 – 9.0	9.7 – 10.0	11.7 – 12.0
p	1.7	2.1	2.3	2.6	2.9	3.4

Figure 6 Dynaplus universal screw

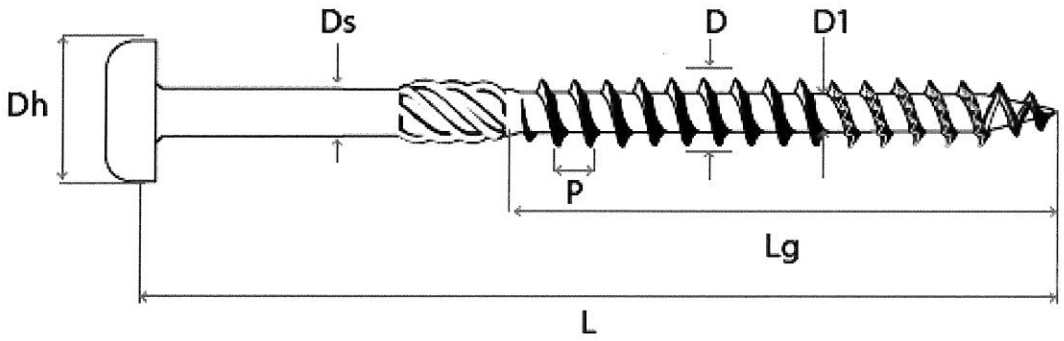


Table 8 Dimensions of Dynaplus universal screw

Dynaplus universal screw PZ FH						
Nominal size	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**6.0**
l (min)	16	16	20	20	25	40
l (max)	50	50	70	80	120	200
*L*g (min)	-	-	35	35	35	35
*L*g (max)	-	-	42	42	70	80
*D*1	1.85	2.35	2.6	2.9	3.2	3.95
D	2.9 – 3.1	3.4 – 3.6	3.9 – 4.1	4.4 – 4.6	4.8 – 5.1	5.8 – 6.1
*D*s	2.1	2.6	2.9	3.25	3.5	4.3
*D*h	5.6 – 5.9	6.4 – 6.7	7.4 – 7.7	8.3 – 8.7	9.2 – 9.6	11.0 – 11.5
p	1.7	2.1	2.3	2.6	2.9	3.4

Figure 7 Dynaplus universal screw

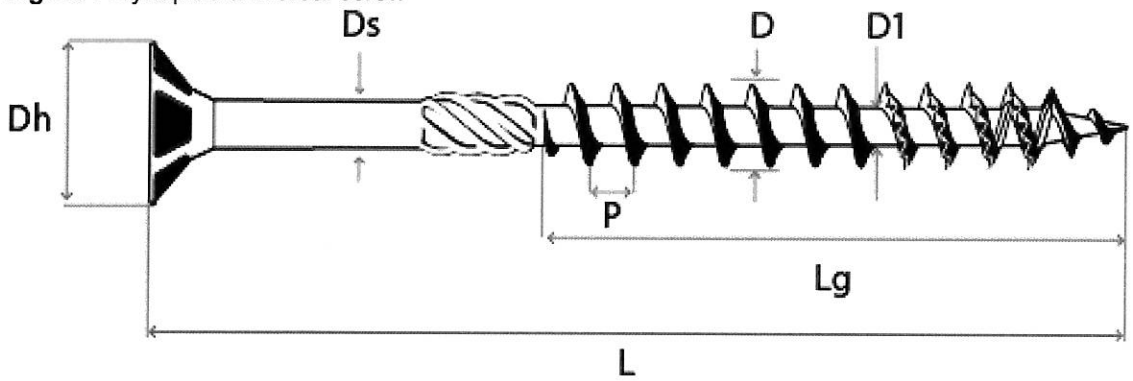


Table 9 Dimensions of Dynaplus universal screw

Dynaplus universal screw TX FH							
Nominal size	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**	**6.0**	**8.0**
l (min)	16	16	20	20	25	40	80
l (max)	40	50	80	100	140	200	280
*L*g (min)	-	24	18	24	24	24	42
*L*g (max)	-	30	42	55	70	80	100
*D*1	1.85	2.35	2.6	2.9	3.2	3.95	5.5
D	2.9 – 3.1	3.4 – 3.6	3.9 – 4.1	4.4 – 4.6	4.8 – 5.1	5.8 – 6.1	7.8 - 8.1
*D*s	2.1	2.6	2.9	3.25	3.5	4.3	5.8
*D*h	5.6 – 5.9	6.4 – 6.7	7.4 – 7.7	8.3 – 8.7	9.2 – 9.6	11.0 – 11.5	14-15
p	1.7	2.1	2.3	2.6	2.9	3.4	5

Figure 8 Dynaplus universal screw

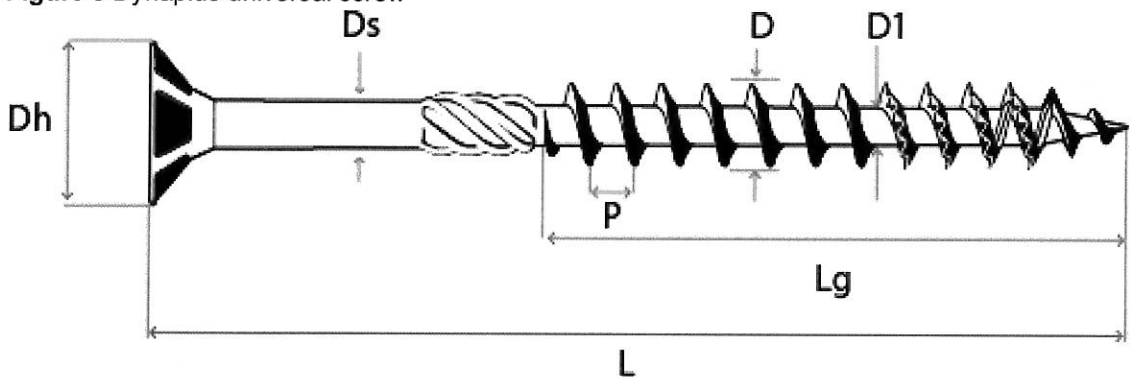


Table 10 Dimensions of Proftec wood screw

Proftec wood screw TX- saw					
Nominal size	**3.5**	**4.0**	**4.5**	**5.0**	**6.0**
l (min)	16	20	25	30	50
l (max)	50	70	80	120	200
*L*g (min)	24	18	24	24	30
*L*g (max)	30	42	50	70	80
*D*1	2.15 - 2.3	2.45 - 2.6	2.5 - 2.7	2.9 - 3.1	3.5 - 3.7
D	3.4 - 3.6	3.9 - 4.1	4.4 - 4.6	4.8 - 5.1	5.8 - 6.1
*D*s	2.6	2.9	3.15	3.55	4.3
*D*h	6.4 - 6.7	7.4 - 7.7	8.3 - 8.7	9.2 - 9.6	11.3 - 11.7
p	2.1	2.3	2.6	2.9	3.4

Figure 9 Proftec wood screw

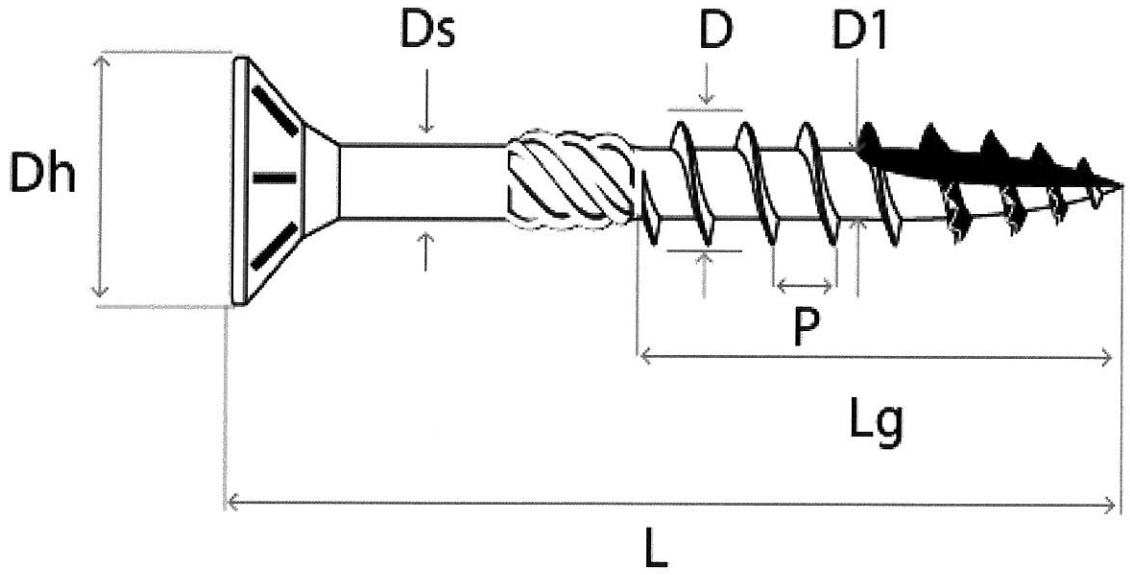
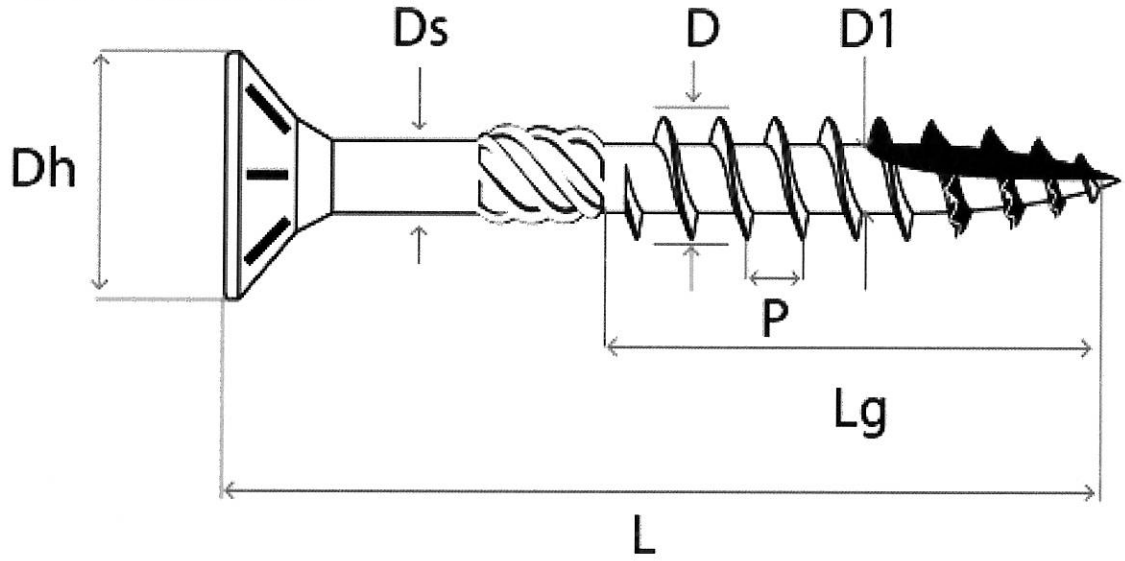


Table 11 Dimensions of Chipboard screw

HF Chipboard screw TX					
Nominal size	**3.5**	**4.0**	**4.5**	**5.0**	**6.0**
l (min)	16	20	40	40	60
l (max)	40	60	60	120	140
*L*g (min)	18	18	24	24	35
*L*g (max)	24	35	35	70	70
*D*1	2.15 - 2.3	2.45 - 2.6	2.5 - 2.7	2.9 - 3.1	3.5 - 3.7
D	3.4 - 3.6	3.9 - 4.1	4.4 - 4.6	4.8 - 5.1	5.8 - 6.1
*D*s	2.6	2.9	3.25	6.6	4.3
*D*h	6.4 - 6.7	7.4 -7.7	8.3 - 8.7	9.2 - 9.6	11.3 - 11.7
p	1.6	1.8	2	2.2	2.6

Figure 10 Chipboard screw



Annex 2 Essential characteristics of screws Dynaplus, Proftec, Rotadrill, Hoenderdaal, PM, Fastec

Mechanical resistance and stability (BWR 1)

Table 12 Dynaplus universal screw ø 3.0 mm, ZP, FH, PH, PZ-1

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	3.0	2.98		
d_1 (mm)	3.0	2.10		
d_h (mm)	3.0	5.59		
d_s (mm)	3.0	--		
p pitch thread (mm)	3.0	1.68		
l_g (mm)	3.0	35.35		
l (mm)	3.0	39.50		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section	
	3.0	1 576	--	
3.1.3	Characteristic withdrawal parameter			
	ø [mm]			
$f_{ax,90,k}$ (N/mm²)	3.0	17.87 (*)		
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)	ø [mm]	Flat head	Pan head	
	3.0	27.18 (*)	34.49 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)	ø [mm]			
	3.0	4.32		
3.1.6	Characteristic yield strength			
	ø [mm]			
R_m (MPa)	3.0	1 379.3		
$R_{p0.2}$ (MPa)	3.0	1 338.4		
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 40 mm	length 25 mm	
	3.0	1.97/0.48=4.08 (**)	1.89/0.65=2.90 (**)	
3.1.9	Bending angle			
Bending angle (°)	ø [mm]			
	3.0	> $(45/d^{0.7} + 20)$		
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)	ø [mm]			
	3.0	8.7		

* density of timber 350 kg/m³

** density of timber 480 kg/m³

Table 13 Dynaplus universal screw ø 3.5 mm, ZP, FH, PH, PZ-2

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	3.5	3.50		
d_1 (mm)	3.5	2.45		
d_h (mm)	3.5	6.62		
d_s (mm)	3.5	--		
p pitch thread (mm)	3.5	2.12		
l_g (mm)	3.5	45.07		
l (mm)	3.5	49.49		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		3.5	2 879	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		3.5	17.20 (*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	Pan head
		3.5	26.17 (*)	31.26 (*)
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		3.5	5.84	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		3.5	1 375.0	
$R_{p0.2}$ (MPa)		3.5	1 301.3	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 50 mm	length 30 mm
		3.5	3.06/0.68=4.50 (**)	3.09/0.83=3.73 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		3.5	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		3.5	8.9	

* density of timber 350 kg/m³

** density of timber 480 kg/m³

Table 14 Dynaplus universal screw ø 4.0 mm, ZP, FH, PH, PZ-2

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.0	4.03		
d_1 (mm)	4.0	2.64		
d_h (mm)	4.0	7.54		
d_s (mm)	4.0	2.91		
p pitch thread (mm)	4.0	2.32		
l_g (mm)	4.0	42.50		
l (mm)	4.0	69.77		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		4.0	3 517	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		4.0	16.56 (*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	Pan head
		4.0	24.55 (*)	28.53 (*)
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		4.0	6.72	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		4.0	1 368.2	
$R_{p0.2}$ (MPa)		4.0	1 333.1	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 80/42 mm	length 50 mm
		4.0	3.82/1.01=3.79 (**)	3.92/1.35=2.90 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		4.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		4.0	8.5	

* density of timber 350 kg/m³

** density of timber 480 kg/m³

Table 15 Dynaplus universal screw ø 4.5 mm, ZP, FH, PH, TX-25

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.5	4.52		
d_1 (mm)	4.5	2.96		
d_h (mm)	4.5	8.47		
d_s (mm)	4.5	3.24		
p pitch thread (mm)	4.5	2.56		
l_g (mm)	4.5	56.43		
l (mm)	4.5	99.70		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		4.5	5 429	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		4.5	16.68 (*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	Pan head
		4.5	23.10 (*)	26.80 (*)
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		4.5	7.85	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		4.5	1 279.3	
$R_{p0.2}$ (MPa)		4.5	1 270.1	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 100/55 mm	length 40 mm
		4.5	5.06/1.45=3.49 (**)	4.88/1.60=3.05 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		4.5	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		4.5	9.2	

* density of timber 350 kg/m³

** density of timber 480 kg/m³

Table 16 Dynaplus universal screw ø 5.0 mm, ZP, FH, PH, TX-25

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	5.0	5.00		
d_1 (mm)	5.0	3.22		
d_h (mm)	5.0	9.39		
d_s (mm)	5.0	3.54		
p pitch thread (mm)	5.0	2.89		
l_g (mm)	5.0	71.96		
l (mm)	5.0	139.721		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		5.0	6 973	9 905
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		5.0	16.43 (*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	Pan head
		5.0	23.02 (*)	25.82 (*)
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		5.0	10.04	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		5.0	1 360.9	
$R_{p0.2}$ (MPa)		5.0	1 311.1	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 140/70 mm	length 70/42 mm
		5.0	7.34/2.30=3.20 (**)	7.29/2.12=3.44 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		5.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		5.0	9.7	

* density of timber 350 kg/m³

** density of timber 480 kg/m³

Table 17 Dynaplus universal screw ø 6.0 mm, ZP, FH, PH, PZ-3

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	6,0	6.00		
d_1 (mm)	6.0	3.90		
d_h (mm)	6.0	11.33		
d_s (mm)	6.0	4.30		
p pitch thread (mm)	6.0	3.37		
l_g (mm)	6.0	56.97		
l (mm)	6.0	99.43		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section	
	6.0	11 473	--	
3.1.3	Characteristic withdrawal parameter			
	ø [mm]			
$f_{ax,90,k}$ (N/mm²)	6.0	16.03 (*)		
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)	ø [mm]	Flat head	Pan head	
	6.0	22.81 (*)	25.30 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)	ø [mm]			
	6.0	15.18		
3.1.6	Characteristic yield strength			
	ø [mm]			
R_m (MPa)	6.0	1 416.8		
$R_{p0.2}$ (MPa)	6.0	1 365.2		
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 100/55 mm	length 200/80 mm	
	6.0	12.18/3.15=3.87 (**)	12.34/3.73=3.31 (**)	
3.1.9	Bending angle			
Bending angle (°)	ø [mm]			
	6.0	> $(45/d^{0.7} + 20)$		
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)	ø [mm]			
	6.0	7.9		

* density of timber 350 kg/m³

** density of timber 480 kg

Table 18 Dynaplus construction screw ø 6.0 mm, ZP, FH, PT-17, TX-30

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	6,0	5.95		
d_1 (mm)	6.0	3.95		
d_h (mm)	6.0	11.31		
d_s (mm)	6.0	4.29		
p pitch thread (mm)	6.0	3.41		
l_g (mm)	6.0	56.03		
l (mm)	6.0	99.84		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		6.0	10 762	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		6.0	16.06 (*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	
		6.0	22.97 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		6.0	15.16	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		6.0	1 370.1	
$R_{p0.2}$ (MPa)		6.0	1 285.0	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 100/55 mm	length 200/80 mm
		6.0	12.87/3.85=3.35 (**)	12.30/3.89=3.16 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		6.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		6.0	11.4	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 19 Dynaplus construction screw ø 8.0 mm, ZP, FH, PT-17, TX-40

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	8.0	7.93		
d_1 (mm)	8.0	5.30		
d_h (mm)	8.0	21.20		
d_s (mm)	8.0	5.78		
p pitch thread (mm)	8.0	5.26		
l_g (mm)	8.0	56.60		
l (mm)	8.0	99.84		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		8.0	22 569	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		v	14.46 (*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	
		8.0	23.35 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		8.0	28.37	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		8.0	1 428.8	
$R_{p0.2}$ (MPa)		8.0	1 365.6	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 100/55 mm	length 280/80 mm
		8.0	30.53/6.93=4.41 (**)	32.24/7.43=4.34 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		8.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		8.0	10.7	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 20 Dynaplus washerhead screw ø 4.0 mm, ZP, WH, PT-17, TX-20

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.0	3.97		
d_1 (mm)	4.0	2.65		
d_h (mm)	4.0	6.47		
d_s (mm)	4.0	2.89		
p pitch thread (mm)	4.0	2.16		
l_g (mm)	4.0	34.00		
l (mm)	4.0	60.12		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		4.0	2 895	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		4.0	17.06(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Washer head	
		4.0	23.77 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		4.0	6.65	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		4.0	1 339.2	
$R_{p0.2}$ (MPa)		4.0	1 286.3	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 60 mm	
		4.0	4.17/0.84=4.96 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		4.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		4.0	9.3	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 21 Dynaplus washerhead screw ø 5.0 mm, ZP, WH, PT-17, TX-25

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	5.0	4.99		
d_1 (mm)	5.0	3.20		
d_h (mm)	5.0	12.24		
d_s (mm)	5.0	3.55		
p pitch thread (mm)	5.0	2.89		
l_g (mm)	5.0	54.71		
l (mm)	5.0	100.21		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		5.0	6 745	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		5.0	16.73(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Washer head	
		5.0	26.50 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		5.0	10.43	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		5.0	1 440.1	
$R_{p0.2}$ (MPa)		5.0	1 370.9	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 100/55 mm	
		5.0	7.35/1.53=4.82 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		5.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		5.0	11.4	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 22 Dynaplus washerhead screw ø 6.0 mm, ZP, WH, PT-17, TX-30

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	6.0	5.99		
d_1 (mm)	6.0	3.89		
d_h (mm)	6.0	14.29		
d_s (mm)	6.0	4.29		
p pitch thread (mm)	6.0	3.50		
l_g (mm)	6.0	70.45		
l (mm)	6.0	119.34		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		6.0	11 166	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		6.0	16.08(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Washer head	
		6.0	25.24 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		6.0	14.84	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		6.0	1 379.5	
$R_{p0.2}$ (MPa)		6.0	1 324.8	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 120/70 mm	length 280/100 mm
		6.0	12.22/3.09=3.95 (**)	11.35/3.71=3.06 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		6.0	> (45/$d^{0.7}$ + 20)	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		6.0	11.4	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 23 Dynaplus washerhead screw ø 8.0 mm, ZP, WH, PT-17, TX-40

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	8.0	8.06		
d_1 (mm)	8.0	5.64		
d_h (mm)	8.0	14.61		
d_s (mm)	8.0	5.96		
p pitch thread (mm)	8.0	5.06		
l_g (mm)	8.0	54.37		
l (mm)	8.0	99.60		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section	
	8.0	26 927	--	
3.1.3	Characteristic withdrawal parameter			
	ø [mm]			
$f_{ax,90,k}$ (N/mm²)	8.0	14.78(*)		
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)	ø [mm]	Washer head		
	8.0	24.94 (*)		
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)	ø [mm]			
	8.0	29.20		
3.1.6	Characteristic yield strength			
	ø [mm]			
R_m (MPa)	8.0	1 304.2		
$R_{p0.2}$ (MPa)	8.0	1 170.6		
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 100/55 mm	length 400/100 mm	
	8.0	35.32/8.89=3.97 (**)	26.99/6.80=3.97 (**)	
3.1.9	Bending angle			
Bending angle (°)	ø [mm]			
	8.0	> (45/$d^{0.7}$ + 20)		
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)	ø [mm]			
	8.0	11.7		

* density of timber 350 kg/m³

** density of timber 480 kg

Table 24 Dynaplus washerhead screw ø 10.0 mm, ZP, WH, PT-17, TX-40

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	10.0	9.73		
d_1 (mm)	10.0	6.29		
d_h (mm)	10.0	25.11		
d_s (mm)	10.0	7.04		
p pitch thread (mm)	10.0	5.45		
l_g (mm)	10.0	54.42		
l (mm)	10.0	98.59		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section	
	10.0	33 413	--	
3.1.3	Characteristic withdrawal parameter			
	ø [mm]			
$f_{ax,90,k}$ (N/mm²)	10.0	13.14(*)		
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)	ø [mm]	Washer head		
	10.0	21.43 (*)		
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)	ø [mm]			
	10.0	35.28		
3.1.6	Characteristic yield strength			
	ø [mm]			
R_m (MPa)	10.0	1 259.6		
$R_{p0.2}$ (MPa)	10.0	1 162.0		
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 100/55 mm	length 400/100 mm	
	10.0	48.89/17.01=2.87 (**)	47.75/9.59=4.98 (**)	
3.1.9	Bending angle			
Bending angle (°)	ø [mm]			
	10.0	> (45/d$^{0.7}$ + 20)		
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)	ø [mm]			
	10.0	10.5		

* density of timber 350 kg/m³

** density of timber 480 kg

Table 25 Chipboard screw ø 3.5 mm, double flat head, zinc plated, Torx T20, with 6 nibs, Type 17 Point

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	3.5	3.53		
d_1 (mm)	3.5	2.39		
d_h (mm)	3.5	6.72		
d_s (mm)	3.5	--		
p pitch thread (mm)	3.5	2.17		
l_g (mm)	3.5	30.02		
l (mm)	3.5	34.13		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		3.5	3 054	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		3.5	17.27(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Double flat head	
		3.5	26.84 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		3.5	5.73	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		3.5	1 424.9	
$R_{p0.2}$ (MPa)		3.5	1 398.3	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 35 mm	length 50/30 mm
		3.5	3.11/0.83=3.76 (**)	2.70/1.07=2.52 (**)
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		3.5	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		3.5	13.3	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 26 Chipboard screw ø 4.0 mm, double flat head, zinc plated, Torx T20, with 6 nibs, Type 17 Point

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.0	4.03		
d_1 (mm)	4.0	2.62		
d_h (mm)	4.0	7.61		
d_s (mm)	4.0	2.89		
p pitch thread (mm)	4.0	2.16		
l_g (mm)	4.0	40.85		
l (mm)	4.0	68.64		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		4.0	3 411	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		4.0	17.02(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Double flat head	
		4.0	25.76 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		4.0	6.38	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		4.0	1 314.4	
$R_{p0.2}$ (MPa)		4.0	1 307.0	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 70/42 mm	
		4,0	3.77/0.97=3.90 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		4.0	> (45/$d^{0.7}$ + 20)	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		4.0	10.1	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 27 Chipboard screw ø 4.5 mm, double flat head, zinc plated, Torx T20, with 6 nibs, Type 17 Point

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.5	4.51		
d_1 (mm)	4.5	2.89		
d_h (mm)	4.5	8.46		
d_s (mm)	4.5	3.20		
p pitch thread (mm)	4.5	2.70		
l_g (mm)	4.5	42.23		
l (mm)	4.5	79.52		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		4.5	4 454	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		4.5	16.80(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Double flat head	
		4.5	23.44 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		4.5	7.50	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		4.5	1 265.2	
$R_{p0.2}$ (MPa)		4.5	1 260.9	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 80/42 mm	
		4.5	6.08/1.53=3.97 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		4.5	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		4.5	9.8	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 28 Chipboard screw ø 5.0 mm, double flat head, zinc plated, Torx T20, with 6 nibs, Type 17 Point

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	5.0	5.00		
d_1 (mm)	5.0	3.22		
d_h (mm)	5.0	9.52		
d_s (mm)	5.0	3.60		
p pitch thread (mm)	5.0	3.01		
l_g (mm)	5.0	68.47		
l (mm)	5.0	118.66		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		5.0	6 804	10 965
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		5.0	16.31(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Double flat head	
		5.0	23.07 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		5.0	9.68	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		5.0	1 332.6	
$R_{p0.2}$ (MPa)		5.0	1 302.9	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 120/70 mm	
		5.0	7.16/1.87=3.82 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		5.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		5.0	10.9	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 29 Chipboard screw ø 6.0 mm, double flat head, zinc plated, Torx T30, with 6 nibs, Type 17 Point

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	6.0	6.02		
d_1 (mm)	6.0	3.98		
d_h (mm)	6.0	11.52		
d_s (mm)	6.0	4.30		
p pitch thread (mm)	6.0	3.52		
l_g (mm)	6.0	79.10		
l (mm)	6.0	199.04		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		6.0	10 703	16 534
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		6.0	15.96(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Double flat head	
		6.0	21.79 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		6.0	14.09	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		6.0	1 257.6	
$R_{p0.2}$ (MPa)		6.0	1 220.1	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 200/80 mm	
		6.0	12.50/3.45=3.62 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		6.0	> (45/d$^{0.7}$ + 20)	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		6.0	11.3	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 30 Dynaplus MDF screw ø 3.5 mm, ZP, FH-75°, TX-15

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	3.5	3.49		
d_1 (mm)	3.5	2.36		
d_h (mm)	3.5	6.08		
d_s (mm)	3.5	2.61		
p pitch thread (mm)	3.5	1.74		
l_g (mm)	3.5	28.18		
l (mm)	3.5	49.56		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		3.5	2 099	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		3.5	16.81(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	
		3.5	26.17 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		3.5	5.19	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		3.5	1 306.5	
$R_{p0.2}$ (MPa)		3.5	1 244.4	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 50/28 mm	
		3.5	2.61/0.74=3.51 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		3.5	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		3.5	10.7	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 31 Dynaplus MDF screw ø 4.0 mm, ZP, FH-75°, TX-15

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.0	4.04		
d_1 (mm)	4.0	2.66		
d_h (mm)	4.0	10.37		
d_s (mm)	4.0	--		
p pitch thread (mm)	4.0	2.31		
l_g (mm)	4.0	58.88		
l (mm)	4.0	60.41		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		4.0	3 697	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		4.0	16.60(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	Flat head	
		4.0	31.31 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		4.0	6.90	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		4.0	1 374.1	
$R_{p0.2}$ (MPa)		4.0	1 268.5	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 60/35 mm	
		4.0	4.04/1.01=4.00 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		4.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		4.0	11.9	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 32 Dynaplus decking screw X-TREME AR-Bronze ø 5.0 mm, FH-60°, PT-17, TX-25

3.1.1	Average value of geometry		
	ø [mm]	Partial thread	
d (mm)	5.0	4.88	
d_1 (mm)	5.0	3.26	
d_h (mm)	5.0	7.17	
d_s (mm)	5.0	3.56	
p pitch thread (mm)	5,0	2.91	
l_g (mm)	5.0	51.15	
l (mm)	5.0	111.84	
3.1.2	Characteristic yield moment		
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section
	5.0	5 942	8 515
3.1.3	Characteristic withdrawal parameter		
	ø [mm]		
$f_{ax,90,k}$ (N/mm²)	5.0	16.22(*)	
3.1.4	Characteristic head pull-through parameter		
$f_{head,k}$ (N/mm²)	ø [mm]	Flat head	
	5.0	19.59 (*)	
3.1.5	Characteristic tensile capacity		
$f_{tens,k}$ (kN)	ø [mm]		
	5.0	9.13	
3.1.6	Characteristic yield strength		
	ø [mm]		
R_m (MPa)	5.0	1 221.9	
$R_{p0.2}$ (MPa)	5.0	1 202.4	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)		
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 110/50 mm	
	5.0	6.46/1.99=3.25 (**)	
3.1.9	Bending angle		
Bending angle (°)	ø [mm]		
	5.0	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)		
Protective layer thickness (µm)	ø [mm]		
	5.0	46.1	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 33 Dynaplus decking screw X-TREME AR-Bronze ø 8.0 mm, FH-60°, PT-17, TX-40

3.1.1	Average value of geometry	
	ø [mm]	Partial thread
d (mm)	8.0	7.95
d_1 (mm)	8.0	5.61
d_h (mm)	8.0	9.20
d_s (mm)	8.0	5.98
p pitch thread (mm)	8.0	5.03
l_g (mm)	8.0	43.60
l (mm)	8.0	79.81

3.1.2	Characteristic yield moment		
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section
	8.0	27 979	--

3.1.3	Characteristic withdrawal parameter	
	ø [mm]	
$f_{ax,90,k}$ (N/mm²)	8.0	12.79(*)

3.1.4	Characteristic head pull-through parameter	
$f_{head,k}$ (N/mm²)	ø [mm]	Flat head
	8.0	24.66 (*)

3.1.5	Characteristic tensile capacity	
$f_{tens,k}$ (kN)	ø [mm]	
	8.0	25.14

3.1.6	Characteristic yield strength	
	ø [mm]	
R_m (MPa)	8.0	1 131.8
$R_{p0.2}$ (MPa)	8.0	1 021.9

3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)	
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 80/42 mm
	8.0	32.59/7.85=4.15 (**)

3.1.9	Bending angle	
Bending angle (°)	ø [mm]	
	8.0	> (45/$d^{0.7}$ + 20)

3.1.10	Average value of durability against corrosion (protective layer thickness)	
Protective layer thickness (µm)	ø [mm]	
	8.0	29.3

* density of timber 350 kg/m³

** density of timber 480 kg

Table 34 Proftec wood screw ø 3.5 mm, countersunk head, partial thread, milling ribs

3.1.1	Average value of geometry		
	ø [mm]	Partial thread	
d (mm)	3.5	3.56	
d_1 (mm)	3.5	2.43	
d_h (mm)	3.5	6.65	
d_s (mm)	3.5	2.63	
p pitch thread (mm)	3.5	1.62	
l_g (mm)	3.5	25.22	
l (mm)	3.5	39.49	
3.1.2	Characteristic yield moment		
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section
	3.5	2 121	--
3.1.3	Characteristic withdrawal parameter		
	ø [mm]		
$f_{ax,90,k}$ (N/mm²)	3.5	17.32(*)	
3.1.4	Characteristic head pull-through parameter		
$f_{head,k}$ (N/mm²)	ø [mm]	CSK head	
	3.5	25.71 (*)	
3.1.5	Characteristic tensile capacity		
$f_{tens,k}$ (kN)	ø [mm]		
	3.5	4.63	
3.1.6	Characteristic yield strength		
	ø [mm]		
R_m (MPa)	3.5	1 118.0	
$R_{p0.2}$ (MPa)	3.5	1 109.8	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)		
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 40 mm	
	3.5	2.26/0.41=5.52 (**)	
3.1.9	Bending angle		
Bending angle (°)	ø [mm]		
	3.5	> $(45/d^{0.7} + 20)$	
3.1.10	Average value of durability against corrosion (protective layer thickness)		
Protective layer thickness (µm)	ø [mm]		
	3.5	33.3	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 35 Proftec wood screw ø 4.0 mm, countersunk head, partial thread, milling ribs

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.0	3.97		
d_1 (mm)	4.0	2.67		
d_h (mm)	4.0	7.58		
d_s (mm)	4.0	2.92		
p pitch thread (mm)	4.0	1.83		
l_g (mm)	4.0	35.78		
l (mm)	4.0	59.76		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section	
	4.0	3 703	--	
3.1.3	Characteristic withdrawal parameter			
	ø [mm]			
$f_{ax,90,k}$ (N/mm²)	4.0	16.74(*)		
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)	ø [mm]	CSK head		
	4.0	24.40 (*)		
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)	ø [mm]			
	4.0	5.86		
3.1.6	Characteristic yield strength			
	ø [mm]			
R_m (MPa)	4.0	1 161.8		
$R_{p0.2}$ (MPa)	4.0	1 149.8		
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 60 mm		
	4.0	3.33/0.76=4.39 (**)		
3.1.9	Bending angle			
Bending angle (°)	ø [mm]			
	4.0	> $(45/d^{0.7} + 20)$		
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)	ø [mm]			
	4.0	28.8		

* density of timber 350 kg/m³

** density of timber 480 kg

Table 36 Proftec wood screw ø 4.5 mm, countersunk head, partial thread, milling ribs

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	4.5	4.50		
d_1 (mm)	4.5	2.96		
d_h (mm)	4.5	8.61		
d_s (mm)	4.5	3.27		
p pitch thread (mm)	4.5	2.04		
l_g (mm)	4.5	35.75		
l (mm)	4.5	59.04		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)		[mm]	Thread section	Smooth section
		4.5	4 834	--
3.1.3	Characteristic withdrawal parameter			
		ø [mm]		
$f_{ax,90,k}$ (N/mm²)		4.5	16.67(*)	
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)		ø [mm]	CSK head	
		4.5	23.34 (*)	
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)		ø [mm]		
		4.5	7.32	
3.1.6	Characteristic yield strength			
		ø [mm]		
R_m (MPa)		4.5	1 189.3	
$R_{p0.2}$ (MPa)		4.5	1 182.7	
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)		ø [mm]	length 60 mm	
		4.5	4.63/1.07=4.35 (**)	
3.1.9	Bending angle			
Bending angle (°)		ø [mm]		
		4.5	> (45/$d^{0.7}$ + 20)	
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)		ø [mm]		
		4.5	28.3	

* density of timber 350 kg/m³

** density of timber 480 kg

Table 37 Proftec wood screw ø 5.0 mm, countersunk head, partial thread, milling ribs

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	5.0	4.99		
d_1 (mm)	5.0	3.22		
d_h (mm)	5.0	9.44		
d_s (mm)	5.0	3.64		
p pitch thread (mm)	5.0	2.24		
l_g (mm)	5.0	70.34		
l (mm)	5.0	120.44		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section	
	5.0	7 303	--	
3.1.3	Characteristic withdrawal parameter			
	ø [mm]			
$f_{ax,90,k}$ (N/mm²)	5.0	15.68(*)		
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)	ø [mm]	CSK head		
	5.0	22.79 (*)		
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)	ø [mm]			
	5.0	8.58		
3.1.6	Characteristic yield strength			
	ø [mm]			
R_m (MPa)	5.0	1 162.6		
$R_{p0.2}$ (MPa)	5.0	1 166.4		
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 120 mm		
	5.0	5.94/1.58=3.75 (**)		
3.1.9	Bending angle			
Bending angle (°)	ø [mm]			
	5.0	> $(45/d^{0.7} + 20)$		
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)	ø [mm]			
	5.0	31.9		

* density of timber 350 kg/m³

** density of timber 480 kg

Table 38 Proftec wood screw ø 6.0 mm, countersunk head, partial thread, milling ribs

3.1.1	Average value of geometry			
	ø [mm]	Partial thread		
d (mm)	6.0	6.01		
d_1 (mm)	6.0	3.85		
d_h (mm)	6.0	11.82		
d_s (mm)	6.0	4.36		
p pitch thread (mm)	6.0	2.65		
l_g (mm)	6.0	70.69		
l (mm)	6.0	139.79		
3.1.2	Characteristic yield moment			
$M_{y,k}$ (Nmm)	[mm]	Thread section	Smooth section	
	6.0	11 027	--	
3.1.3	Characteristic withdrawal parameter			
	ø [mm]			
$f_{ax,90,k}$ (N/mm²)	6.0	15.34(*)		
3.1.4	Characteristic head pull-through parameter			
$f_{head,k}$ (N/mm²)	ø [mm]	CSK head		
	6.0	19.22 (*)		
3.1.5	Characteristic tensile capacity			
$f_{tens,k}$ (kN)	ø [mm]			
	6.0	12.80		
3.1.6	Characteristic yield strength			
	ø [mm]			
R_m (MPa)	6.0	1 227.5		
$R_{p0.2}$ (MPa)	6.0	1 222.0		
3.1.7 3.1.8	Characteristic torsional ratio (Characteristic torsional strength/Characteristic torsional resistance into timber)			
$f_{tor,k}$ / $R_{tor,mean}$ (Nm) / (Nm)	ø [mm]	length 140 mm		
	6.0	10.79/2.88=3.74 (**)		
3.1.9	Bending angle			
Bending angle (°)	ø [mm]			
	6.0	> $(45/d^{0.7} + 20)$		
3.1.10	Average value of durability against corrosion (protective layer thickness)			
Protective layer thickness (µm)	ø [mm]			
	6.0	33.8		

* density of timber 350 kg/m³

** density of timber 480 kg

Annex 3 Reference documents

[1] European Assessment Document EAD 130118-01-0603 Screws and threaded rods for use in timber constructions (edition March 2019)