



Title: Screws: laboratory test within the framework of the CE mark

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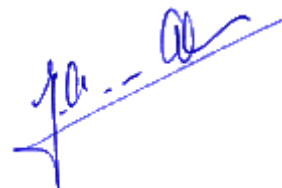
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Summary

Hoenderdaal Fasteners would like to mark their screws with the CE-mark. It is confirmed by means of the CE-mark that the performances indicated by Hoenderdaal Fasteners, tested by means of random sampling and tested in accordance with the EN 14592, have been actually realised. The values of the test results are given in this report.

1 Introduction

Hoenderdaal Fasteners has indicated that they wish to apply the CE-mark on their DynaPlus screws.

The tests executed are described in EN 14592 and have been executed in accordance therewith.

2 Material and method

2.1 Material

The following screws have been received from Hoenderdaal Fasteners.

Table 1 DynaPlus sizes in mm

3,0x16	4,0x16	4,5x20	5,0x20	6,0x40	8,0x90
3,0x20	4,0x20	4,5x25	5,0x25	6,0x40 PT	8,0x100
3,0x25	4,0x25	4,5x30	5,0x30	6,0x45	8,0x120
3,0x30	4,0x30	4,5x35	5,0x35	6,0x50	8,0x150 PT/SR
3,5x16	4,0x40	4,5x45	5,0x40	6,0x60 PT	8,0x180
3,5x20	4,0x40 PT	4,5x50	5,0x45	6,0x70 PT/SR	8,0x200
3,5x25	4,0x45	4,5x50 PT	5,0x50	6,0x80 PT/SR	8,0x280
3,5x30	4,0x50	4,5x60 PT	5,0x60	6,0x90 PT/SR	
3,5x35 PT	4,0x70 PT	4,5x80 PT	5,0x70 PT	6,0x110 PT	
3,5x40			5,0x80 PT	6,0x120 PT/SR	
3,5x45			5,0x80 PT/SR	6,0x130 PT	
3,5x50			5,0x90 PT/SR	6,0x140 PT	
			5,0x100 PT/SR	6,0x150 PT	
			5,0x100 PT/SR	6,0x160 PT	
			5,0x120 PT	6,0x180 PT	
				6,0x200 PT	

The following screws are selected for the Initial Type Testing on mechanical properties:

Table 2

DynaPlus 4,0 mm X 40 mm
DynaPlus 4,5 mm X 45 mm
DynaPlus 5,0 mm X 70 mm

All others were used to determine their dimensions.

2.2 Method

The test methods are described in EN 14592. This consists the following seven tests:

- determination of the withdrawal resistance;
- determination of the pull through resistance;
- determination of the torsional resistance;
- determination of the torsional ratio;
- determination of the yield moment;
- determination of the tensile capacity;
- determination of the geometry.

All characteristic values are calculated according to the method described in EN 14358.

2.3 Apparatus used

Electric moisture meter	SHR/133
Universal test bench type Zwick	SHR/205
Recorder of yield moment	SHR/442
Balance	SHR/023
Calliper 600 mm	SHR/005
Calliper 250 mm	SHR/328
Torque wrench	SHR/480
Rotary torque sensor	SHR/417

2.4 Period of testing

The testing has taken place from week 40 to 43 of 2011.

3 Results

3.1 Determination of the characteristic withdrawal resistance

Measured in Spruce 450 kg/m³ WMC 13%

4,0mm X 40mm	4,5mm X 45mm	5,0mm X 70mm
$F_{ax,k}(\text{Nmm}^2)$	$F_{ax,k}(\text{Nmm}^2)$	$F_{ax,k}(\text{Nmm}^2)$
18,5	19,8	18,0

3.2 Determination of the characteristic pull through resistance

Measured in Okoume plywood, 18mm, 525 kg/m³, EN 314 class 3

4,0mm X 40mm	4,5mm X 45mm	5,0mm X 70mm
$F_{head,k}(\text{Nmm}^2)$	$F_{head,k}(\text{Nmm}^2)$	$F_{head,k}(\text{Nmm}^2)$
42,5	38,4	28,9

3.3 Determination of the characteristic torsional resistance

Measured in Spruce 450 kg/m³ WMC 13%

4,0mm X 40mm	4,5mm X 45mm	5,0mm X 70mm
$R_{tor,k}(\text{Nm})$	$R_{tor,k}(\text{Nm})$	$R_{tor,k}(\text{Nm})$
0,5	0,8	1,3

3.4 Determination of the characteristic torsional ratio

4,0mm X 40mm	4,5mm X 45mm	5,0mm X 70mm
$F_{tor,k}(\text{Nm})$	$F_{tor,k}(\text{Nm})$	$F_{tor,k}(\text{Nm})$
3,6	5,2	6,5

3.5 Determination of the characteristic yield moment

4,0mm X 40mm	4,5mm X 45mm	5,0mm X 70mm
$M_{y,k}(\text{Nmm})$	$M_{y,k}(\text{Nmm})$	$M_{y,k}(\text{Nmm})$
4704	5544	6840

3.6 Determination of the characteristic tensile capacity

4,0mm X 40mm	4,5mm X 45mm	5,0mm X 70mm
$F_{tens,k}(\text{Nmm}^2)$	$F_{tens,k}(\text{Nmm}^2)$	$F_{tens,k}(\text{Nmm}^2)$
385,7	407,8	385,2

3.7 Determination of the geometry

All dimensions in mm at 20°C.

PT; Partly Threaded, SR; Shaft Ribs.

D_{nom} · D_{inner} Inner diameter must be between 60% and 90% of the nominal diameter

size	length	thread	D_{nom}	D_{inner}	D_{head}	D_{nom} · D_{inner}
3,0X16	15,9	13,0	3,1	2,0	5,8	passed
3,0X20	18,9	15,9	3,0	2,0	5,8	passed
3,0X25	24,5	21,4	3,0	2,0	5,8	passed
3,0X30	29,2	26,0	3,0	2,1	5,7	passed

size	length	thread	D_{nom}	D_{inner}	D_{head}	D_{nom} · D_{inner}
3,5X16	14,7	11,4	3,4	2,3	6,4	passed
3,5X20	19,3	16,4	3,4	2,4	6,5	passed
3,5X25	24,1	21,7	3,5	2,4	6,6	passed
3,5X30	29,4	26,4	3,5	2,4	6,6	passed
3,5X35 PT	34,4	23,7	3,5	2,4	6,5	passed
3,5X40	39,6	36,3	3,5	2,4	6,7	passed
3,5X45	44,3	41,6	3,4	2,5	6,5	passed
3,5X50	49,2	46,0	3,5	2,5	6,6	passed

size	length	thread	D_{nom}	D_{inner}	D_{head}	D_{nom} · D_{inner}
4,0X16	15,5	11,7	3,8	2,5	7,6	passed
4,0X20	20,0	15,6	3,9	2,6	7,7	passed
4,0X25	24,5	19,7	3,9	2,7	7,5	passed
4,0X30	29,5	25,0	4,0	2,7	7,5	passed
4,0X40	39,2	35,3	4,0	2,7	7,6	passed
4,0X40 PT	39,7	24,9	4,0	2,7	7,6	passed
4,0X45	45,1	40,5	4,0	2,7	7,5	passed
4,0X50	49,4	45,1	3,9	2,7	7,6	passed
4,0X70 PT	69,3	43,2	4,0	2,6	7,6	passed

size	length	thread	D_{nom}	D_{inner}	D_{head}	D_{nom} · D_{inner}
4,5X20	20,3	15,5	4,3	2,9	8,5	passed
4,5X25	25,2	19,9	4,4	3,0	8,4	passed
4,5X30	30,1	24,5	4,4	3,0	8,5	passed
4,5X35	34,6	29,4	4,4	3,0	8,6	passed
4,5X45	44,3	38,6	4,3	3,0	8,6	passed
4,5X50	49,0	44,4	4,4	3,0	8,6	passed
4,5X50 PT	49,3	30,0	4,5	2,9	8,6	passed
4,5X60 PT	59,8	36,2	4,4	3,0	8,5	passed
4,5X80 PT	78,9	49,4	4,4	3,0	8,5	passed

size	length	thread	D _{nom}	D _{inner}	D _{head}	D _{nom} :D _{inner}
5,0X20	20,1	15,9	4,7	3,2	9,5	passed
5,0X25	24,4	19,2	4,7	3,2	9,4	passed
5,0X30	29,0	24,2	4,9	3,2	9,3	passed
5,0X35	34,1	28,7	5,0	3,2	9,5	passed
5,0X40	38,9	33,7	4,9	3,1	9,4	passed
5,0X45	44,3	39,0	4,9	3,2	9,4	passed
5,0X50	49,5	43,5	4,9	3,2	9,4	passed
5,0X60	59,7	35,6	5,0	3,2	9,4	passed
5,0X70 PT	45,3	36,1	4,9	3,2	9,4	passed
5,0X80 PT	80,0	50,2	5,0	3,2	9,4	passed
5,0X80 PT/SR	79,8	50,7	5,0	3,2	9,4	passed
5X0X90 PT/SR	89,2	61,5	5,1	3,2	9,4	passed
5,0X100 PT/SR	99,5	60,2	4,9	3,2	9,5	passed
5,0X100 PT/SR	99,3	60,9	5,0	3,2	9,4	passed
5,0X120 PT	119,7	69,9	4,9	3,2	9,4	passed

size	length	thread	D _{nom}	D _{inner}	D _{head}	D _{nom} :D _{inner}
6,0X40	40,5	34,7	5,9	4,0	11,2	passed
6,0X40 PT	40,2	24,8	5,9	4,0	11,2	passed
6,0X45	45,0	39,7	5,9	4,0	11,3	passed
6,0X50	49,5	43,5	6,0	3,9	11,3	passed
6,0X60 PT	60,4	36,1	6,1	4,0	11,3	passed
6,0X70 PT/SR	70,0	43,8	5,9	3,9	11,2	passed
6,0X80 PT/SR	79,7	51,0	5,9	3,9	11,3	passed
6,0X90 PT/SR	89,6	61,4	5,9	3,9	11,1	passed
6,0X110 PT	109,8	70,7	6,1	4,0	11,3	passed
6,0X120 PT/SR	119,7	71,0	6,1	3,9	11,4	passed
6,0X130 PT	130,2	70,1	6,1	4,0	11,3	passed
6,0X140 PT	139,6	70,2	6,0	4,0	11,2	passed
6,0X150 PT	149,3	69,9	6,0	4,0	11,3	passed
6,0X160 PT	159,2	69,6	6,0	3,9	11,3	passed
6,0X180 PT	180,0	69,9	6,0	3,9	11,3	passed
6,0X200 PT	199,4	70,7	6,0	4,0	11,2	passed

size	length	thread	D _{nom}	D _{inner}	D _{head}	D _{nom} :D _{inner}
8.0 * 90	90,226	53,754	7,88	5,48	14,26	passed
8.0 * 100	99,806	71,678	7,996	5,416	14,45	passed
8.0 * 120	119,306	71,304	7,884	5,416	14,436	passed
8.0 * 150	149,824	71,472	7,632	5,486	14,548	passed
8.0 * 180	179,166	71,38	7,928	5,378	14,398	passed
8.0 * 200	198,854	71,662	7,948	5,408	14,328	passed
8.0 * 280	279,522	71,848	7,974	5,47	14,568	passed

4 Conclusions

Based on the test results, it is confirmed that Hoenderdaal Fasteners is qualified to apply the CE-mark on the DynaPlus screws listed in table 1.

Literature

NEN 6762: 1997: "Dowel type fasteners for use in load bearing timber structures"; NEN, Delft, the Netherlands

NEN-EN 409: 2009: "Timber structures – Test methods – Determination of the yield moment of dowel type fasteners" NEN, Delft, the Netherlands

NEN-EN 1382:1999: "Timber structures – Test methods – Withdrawal capacity of timber fasteners" NEN, Delft, the Netherlands

NEN-EN 1383: 1999: "Timber structures – Test methods – Pull through resistance of timber fasteners" NEN, Delft, the Netherlands

NEN-EN 1995-1-1: 2007: "Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings"; NEN, Delft, the Netherlands

EN ISO 10666:1999, 4.2.3 "Drilling screws with tapping screw thread Mechanical and functional properties" NEN, Delft, the Netherlands

NEN-EN 14358: 2007: "Timber structures –Calculation of characteristic 5-percentile values and acceptance criteria for a sample" NEN, Delft, the Netherlands

NEN-EN 14592: 2008 "Timber structures - Dowel-type fasteners –Requirements" NEN, Delft, the Netherlands

NEN-EN 15737:2009: "Timber structures – Test methods – Torsional resistance of driving in screws" NEN, Delft, the Netherlands