

Declaration of Performance n. 1020-CPR-010-048515 
According to the Regulation EU No 305/2011

HXE
Concrete screw

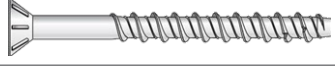
Name/DOC number:
1020-CPR-010-048515

Revision n. 2.00
Dated 11/06/2025



1 - General product information

Identification code of the product type:	HXE01 - HXE41 - HXE85 - HXE39 - HXE02 - HXE42 - HXE12 - HXE40 - HXE03 - HXE43 - HXE05 - HXE45 - HXE06 - HXE46 - HXE07 - HXE47 - HXE49 - HXE87 - HXE48
The batch or serial number:	Printed on the label
Product category:	Mechanical fasteners for use in concrete
Declared uses of the product:	The intended use of HXE concrete screws is for indoor and dry applications under static, quasi-static, and seismic loads (categories C1 and C2) in the following base materials: - Ordinary concrete, reinforced or unreinforced, in accordance with EN 206:2013+A2:2021. - Cracked and uncracked concrete with strength classes from C20/25 to C50/60, in accordance with EN 206:2013+A2:2021. The anchor can be used within the following temperature range [-40°C ; +80°C] and under fire exposure conditions. The performances indicated in Point 8 are valid only if the anchoring is used in accordance with the specifications and conditions outlined in Point 7
Nominal dimensions or grading of the product:	For codes and nominal dimensions, see Table 1.1. Concrete screws made of carbon steel, either zinc-coated or with a special protective coating called Tecfi Steel Saver 1000h - ZL, both characterized by a nominal characteristic steel yield strength $f_{yk} = 640$ MPa and a nominal characteristic steel ultimate strength $f_{uk} = 750$ MPa.

		HXE 01	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Hexagonal flanged washer head screw
		HXE 41	Tecfi Steel Saver 1000h - ZL coating	
		HXE 85	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Dual thread screw with hexagonal shank
		HXE 39	Tecfi Steel Saver 1000h - ZL coating	
		HXE 02	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Dual thread screw with hexagonal shank, nut and washer according to ISO 7089
		HXE 42	Tecfi Steel Saver 1000h - ZL coating	
		HXE 12	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Dual thread screw with hexagonal shank, nut and washer according to ISO 7093
		HXE 40	Tecfi Steel Saver 1000h - ZL coating	
		HXE 03	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Flat countersunk head with ribs screw
		HXE 43	Tecfi Steel Saver 1000h - ZL coating	
		HXE 05	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Pan head screw
		HXE 45	Tecfi Steel Saver 1000h - ZL coating	
		HXE 06	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Pan washer head screw
		HXE 46	Tecfi Steel Saver 1000h - ZL coating	
		HXE 07	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Dual thread (with collar) screw assembled with metric hexagonal coupling nut
		HXE 48	Screw: Tecfi Steel Saver 1000h - ZL coating Coupling nut: zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	
		HXE 49	Tecfi Steel Saver 1000h - ZL coating	
		HXE 87	Zinc plated $\geq 5\mu\text{m}$ according to ISO 4042	Dual thread with collar screw
		HXE 47	Tecfi Steel Saver 1000h - ZL coating	

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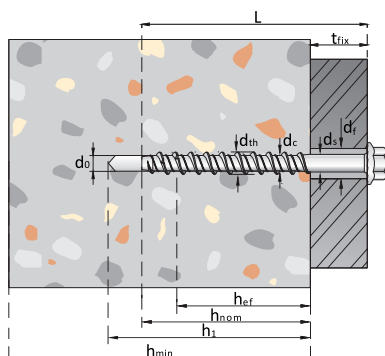
Durability:

As specified in EAD 330232-01-0601

Variants, if any, and their descriptions:

HXE01 - HXE41 - HXE85 - HXE39 - HXE02 - HXE42 - HXE12 - HXE40 - HXE03 - HXE43 - HXE05 - HXE45 - HXE06 - HXE46 - HXE07 - HXE47 - HXE49 - HXE87 - HXE48

Tab. 1.1 - Codes and nominal dimensions



d_0	Nominal drill hole diameter
d_{th}	Nominal external thread diameter
d_c	Core diameter
d_s	Shaft diameter
d_{cut}	Maximum cutting diameter of the drill bit *See Point 7
d_f	Diameter of the clearance hole in the fixture
h_{nom}	Overall fastener embedment depth
h_{ef}	Effective embedment depth
h_1	Drill hole depth
h_{min}	Minimum thickness of concrete member
t_{fix}	Thickness of the fixtures
L	Length of the screw

Item code HXE 01	Core diameter (<i>d_c</i>) <i>(mm)</i>	Nominal external thread diameter (<i>d_{th}</i>) <i>(mm)</i>	Length of the screw (<i>L</i>) <i>(mm)</i>	Thickness of the fixtures (<i>mm</i>)	
				<i>t_{fix,std}</i>	<i>t_{fix,red1}</i>
Wrench size (SW) 10				<i>h_{nom}</i> (<i>mm</i>): 60	45
HXE 01 08 065	5,8	8	65	5	20
HXE 01 08 080	5,8	8	80	20	35
HXE 01 08 100	5,8	8	100	40	55
HXE 01 08 120	5,8	8	120	60	75
HXE 01 08 140	5,8	8	140	80	95
Wrench size (SW) 13				<i>h_{nom}</i> (<i>mm</i>): 70	45
HXE 01 10 050	7,5	10	50	-	5
HXE 01 10 060	7,5	10	60	-	15
HXE 01 10 080	7,5	10	80	10	35
HXE 01 10 100	7,5	10	100	30	55
HXE 01 10 120	7,5	10	120	50	75
HXE 01 10 140	7,5	10	140	70	95
HXE 01 10 160	7,5	10	160	90	115
Wrench size (SW) 15				<i>h_{nom}</i> (<i>mm</i>): 80	55
HXE 01 12 060	9,7	12	60	-	5
HXE 01 12 070	9,7	12	70	-	15
HXE 01 12 090	9,7	12	90	10	35
HXE 01 12 110	9,7	12	110	30	55
HXE 01 12 130	9,7	12	130	50	75
HXE 01 12 150	9,7	12	150	70	95
HXE 01 12 190	9,7	12	190	110	135
HXE 01 12 210	9,7	12	210	130	155
HXE 01 12 250	9,7	12	250	170	195
HXE 01 12 290	9,7	12	290	210	235
Wrench size (SW) 21				<i>h_{nom}</i> (<i>mm</i>): 110	65
HXE 01 16 075	12,7	16	75	-	10
HXE 01 16 090	12,7	16	90	-	25
HXE 01 16 115	12,7	16	115	5	50
HXE 01 16 130	12,7	16	130	20	65
HXE 01 16 150	12,7	16	150	40	85
HXE 01 16 180	12,7	16	180	70	115

Item code HXE xx (HXE 85 - HXE 39)	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Lenght of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
AF 5					
HXE xx 08 090	5,8	8	90	-	-
HXE xx 08 120	5,8	8	120	-	-
HXE xx 08 160	5,8	8	160	-	-
AF 7					
HXE xx 10 105	7,5	10	105	-	-
HXE xx 10 125	7,5	10	125	-	-
HXE xx 10 195	7,5	10	195	-	-
AF 8					
HXE xx 12 118	9,7	12	118	-	-
HXE xx 12 138	9,7	12	138	-	-
HXE xx 12 208	9,7	12	208	-	-
HXE xx 12 248	9,7	12	248	-	-

Item code HXE xx (HXE 02 - HXE 42)	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Lenght of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
AF 5/ SW 13				h _{nom} (mm): 60 45	
HXE xx 08 090	5,8	8	90	6 - 16	20 - 29
HXE xx 08 120	5,8	8	120	6 - 46	20 - 59
HXE xx 08 160	5,8	8	160	6 - 86	20 - 99
AF 7/ SW 17				h _{nom} (mm): 70 45	
HXE xx 10 105	7,5	10	105	6 - 17	30 - 41
HXE xx 10 125	7,5	10	125	6 - 37	30 - 61
HXE xx 10 195	7,5	10	195	6 - 107	30 - 131
AF 8/ SW 19				h _{nom} (mm): 80 55	
HXE xx 12 118	9,7	12	118	6 - 16	29 - 39
HXE xx 12 138	9,7	12	138	6 - 36	29 - 59
HXE xx 12 208	9,7	12	208	6 - 106	29 - 129
HXE xx 12 248	9,7	12	248	6 - 146	29 - 169

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Item code HXE 41	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Length of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
Wrench size (SW) 10				h _{nom} (mm): 60 45	
HXE 41 08 065	5,8	8	65	5	20
HXE 41 08 080	5,8	8	80	20	35
HXE 41 08 100	5,8	8	100	40	55
HXE 41 08 120	5,8	8	120	60	75
HXE 41 08 140	5,8	8	140	80	95
Wrench size (SW) 13				h _{nom} (mm): 70 45	
HXE 41 10 050	7,5	10	50	-	5
HXE 41 10 060	7,5	10	60	-	15
HXE 41 10 080	7,5	10	80	10	35
HXE 41 10 100	7,5	10	100	30	55
HXE 41 10 120	7,5	10	120	50	75
HXE 41 10 140	7,5	10	140	70	95
Wrench size (SW) 15				h _{nom} (mm): 80 55	
HXE 41 12 060	9,7	12	60	-	5
HXE 41 12 070	9,7	12	70	-	15
HXE 41 12 090	9,7	12	90	10	35
HXE 41 12 110	9,7	12	110	30	55
HXE 41 12 130	9,7	12	130	50	75
Wrench size (SW) 21				h _{nom} (mm): 110 65	
HXE 41 16 075	12,7	16	75	-	10
HXE 41 16 090	12,7	16	90	-	25
HXE 41 16 115	12,7	16	115	5	50
HXE 41 16 130	12,7	16	130	20	65
HXE 41 16 150	12,7	16	150	40	85

Item code HXE 43	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Lenght of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
T-30 / Ø screw head: 16 mm				h _{nom} (mm): 60 55	
HXE 43 08 070	5,8	8	70	10	25
HXE 43 08 100	5,8	8	100	40	55
HXE 43 08 140	5,8	8	140	80	95
T-40 / Ø screw head: 20 mm				h _{nom} (mm): 70 45	
HXE 43 10 055	7,5	10	55	-	10
HXE 43 10 065	7,5	10	65	-	20
HXE 43 10 080	7,5	10	80	10	35
HXE 43 10 100	7,5	10	100	30	55
HXE 43 10 120	7,5	10	120	50	75
HXE 43 10 160	7,5	10	160	90	115
T-50 / Ø screw head: 24 mm				h _{nom} (mm): 80 55	
HXE 43 12 065	9,7	12	65	-	10
HXE 43 12 080	9,7	12	80	-	25
HXE 43 12 090	9,7	12	90	10	35
HXE 43 12 100	9,7	12	100	20	45
HXE 43 12 120	9,7	12	120	40	65

Item code HXE xx (HXE 12 - HXE 40)	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Lenght of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
AF 5/ SW 13				h _{nom} (mm): 60 45	
HXE xx 08 090	5,8	8	90	6 - 15	20 - 29
HXE xx 08 120	5,8	8	120	6 - 45	20 - 59
HXE xx 08 160	5,8	8	160	6 - 85	20 - 99
AF 7/ SW 17				h _{nom} (mm): 70 45	
HXE xx 10 105	7,5	10	105	6 - 16	30 - 40
HXE xx 10 125	7,5	10	125	6 - 36	30 - 60
HXE xx 10 195	7,5	10	195	6 - 106	30 - 130
AF 8/ SW 19				h _{nom} (mm): 80 55	
HXE xx 12 118	9,7	12	118	6 - 15	29 - 38
HXE xx 12 138	9,7	12	138	6 - 35	29 - 58
HXE xx 12 208	9,7	12	208	6 - 105	29 - 128
HXE xx 12 248	9,7	12	248	6 - 145	29 - 168

Item code HXE xx (HXE 05 - HXE 45)	Core diameter	Nominal external thread diameter	Lenght of the screw	Thickness of the fixtures (mm)	
				tfix,std	tfix,red1
	d _c (mm)	d _{th} (mm)	L (mm)	h _{nom} (mm):	
T-30 / Ø screw head: 13mm				60	45
HXE xx 08 065	5,8	8	65	5	20
HXE xx 08 080	5,8	8	80	20	35
HXE xx 08 100	5,8	8	100	40	55
HXE xx 08 120	5,8	8	120	60	75
HXE xx 08 140	5,8	8	140	80	95

Item code HXE xx (HXE 06 - HXE 46)	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Lenght of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
				T-30 / Ø screw head: 15,5mm	
				<i>h_{nom}</i> 60	(mm): 45
HXE xx 08 065	5,8	8	65	5	20
HXE xx 08 080	5,8	8	80	20	35
HXE xx 08 100	5,8	8	100	40	55
HXE xx 08 120	5,8	8	120	60	75
HXE xx 08 140	5,8	8	140	80	95

Item code HXE xx (HXE 87 - HXE 47)	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Length of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
HXE xx 08 06 062	5,8	8	62	-	-
HXE xx 08 08 062	5,8	8	62	-	-
HXE xx 08 10 062	5,8	8	62	-	-
HXE xx 88 10 062	5,8	8	62	-	-
HXE xx 10 08 074	7,5	10	74	-	-
HXE xx 10 10 074	7,5	10	74	-	-
HXE xx 10 12 074	7,5	10	74	-	-

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Item code HXE 03	Core diameter d _c (mm)	Nominal external thread diameter d _{th} (mm)	Lenght of the screw L (mm)	Thickness of the fixtures (mm)	
				t _{fix,std}	t _{fix,red1}
T-30 / Ø screw head: 16 mm				h _{nom} (mm): 60 45	
HXE 03 08 070	5,8	8	70	10	25
HXE 03 08 100	5,8	8	100	40	55
HXE 03 08 140	5,8	8	140	80	95
T-40 / Ø screw head: 20 mm				h _{nom} (mm): 70 45	
HXE 03 10 055	7,5	10	55	-	10
HXE 03 10 065	7,5	10	65	-	20
HXE 03 10 080	7,5	10	80	10	35
HXE 03 10 100	7,5	10	100	30	55
HXE 03 10 120	7,5	10	120	50	75
HXE 03 10 160	7,5	10	160	90	115
T-50 / Ø screw head:24 mm				h _{nom} (mm): 80 55	
HXE 03 12 065	9,7	12	65	-	10
HXE 03 12 080	9,7	12	80	-	25
HXE 03 12 090	9,7	12	90	10	35
HXE 03 12 100	9,7	12	100	20	45
HXE 03 12 120	9,7	12	120	40	65
HXE 03 12 180	9,7	12	180	100	125

Item code HXE xx (HXE 07 - HXE 48 HXE 49)	Core diameter <i>d_c</i> (mm)	Nominal external thread diameter <i>d_{th}</i> (mm)	Length of the screw <i>L</i> (mm)	Size of the coupling nut <i>M out</i> <i>SW x h</i> (mm)		Thickness of the fixtures (mm)	
						<i>t_{fix,std}</i>	<i>t_{fix,red1}</i>
HXE xx 08 06 062	5,8	8	62	M6	13x30	-	-
HXE xx 08 08 062	5,8	8	62	M8	13x24	-	-
HXE xx 08 10 062	5,8	8	62	M10	13x24	-	-
HXE xx 88 10 062	5,8	8	62	M8/M10	13x30	-	-
HXE xx 10 08 074	7,5	10	74	M8	13x24	-	-
HXE xx 10 10 074	7,5	10	74	M10	17x30	-	-
HXE xx 10 12 074	7,5	10	74	M12	17x30	-	-

2 - Manufacturer

Name:	Tecfi
Registered trade name:	Tecfi S.p.A.
Registered place of business and postal address:	Registered office: Via A. D'Isernia, 59, 80122 - Napoli - Italia Administrative office: S.S. Appia, km 193, 81050 - Pastorano (CE), Italia Production site: Viale delle Industrie e del Commercio, 30, 81050 - Pastorano (CE) - Italia
Telephone:	(+39) 0823-88-33-38
Email address:	Info@tecfi.it
Website:	www.tecfi.it

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3 - Notified body or bodies, where applicable

Name:	TZUS - Technický a Zkušební Ústav Stavební Praha, s.p.
Identification number:	1020
Registered trade name, where available:	-
Registered place of business and postal address:	Proseckà 76, 190 00 - Praha 9 - Czech Republic
Telephone:	(+420) 543-420-854
Email address:	eota@tzus.cz
Website:	www.tzus.eu

4 - Technical Assessment Body, where applicable

Name:	ETA-Danmark A/S
Identification number:	-
Registered trade name, where available:	-
Registered place of business and postal address:	Göteborg Plads 1, DK-2150 - Nordhavn - Denmark
Telephone:	(+45) 7224 5900 (+45) 7224 5904
Email address:	tb@etadanmark.dk
Website:	www.etadanmark.dk

5 - Reference to certificates or validation reports issued by notified bodies and TABs, Assessment and verification system

Certificate of Conformity of Factory Production Control: No. 1020 - CPR - 010-048515

Assessment and verification system: 1

6 - Technical reference documents (Harmonised technical specifications/EAD e ETA)

EAD 330232-01-0601, issued in December 2019

ETA-24/0741, issued on 10/09/2024 by ETA-Danmark A/S

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7 - Installation

- Hole drilling by rotary plus hammer mode only;
- The installation of the fastener must be carried out by professional personnel and under the supervision of the technical site manager;
- In case of aborted hole: new hole must be drilled at a minimum distance away of twice the depth of the aborted hole, or a smaller distance may be chosen if the aborted hole is filled with high strength mortar and if the aborted hole is not in the direction of the load application under shear or under oblique tension load;
- No further screw turns are permitted after installation. The screw head must be fully positioned on the fixture and must not show any damage.

7.1 - Installation details

Denomination			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
Nominal drill hole diameter	d _o	[mm]	6		8		10		14	
Nominal external thread diameter	d _{th}		8		10		12		16	
Core diameter	d _c		5,8		7,5		9,7		12,7	
Shaft diameter	d _s		6		8		10		13,5	
Maximum cutting diameter of the drill bit	d _{cut} ≤		6,4		8,45		10,45		14,5	
Diameter of clearance in the fixture	d _f		9		12		14		18	
Overall anchor embedment depth in the concrete	h _{nom}		45	60	45	70	55	80	65	110
Effective anchorage depth	h _{ef}		36	49	33	56	43	64	53	85
Depth of drill hole	h ₁		60	75	60	85	70	95	80	125
Minimum thickness of concrete member	h _{min}		80	100	90	110	100	130	110	170
Minimum edge distance	c _{min}	[mm]	35	35	40	40	40	40	60	60
Minimum spacing	s _{min}		35	35	40	40	40	40	60	60
Required output of the impact wrench	-	[Nm]	200		200		200		305	

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7.2 - Head related installation details

Denomination		d _o (d _{th})			
		6(8)	8(10)	10(12)	14(16)
Wrench Size HXE 01 - HXE 41	SW	10	13	15	21
Wrench Size (shank/nut) HXE 85 - HXE 39 - HXE 02 - HXE 42 - HXE 12 - HXE 40	AF/SW	5/13	7/17	8/19	-
Hexalobular recess size HXE 03 - HXE 43	T	30	40	50	-
Hexalobular recess size HXE 05 - HXE 45	T	30	30	-	-
Hexalobular recess size HXE 06 - HXE 46	T	30	30	-	-
Wrench size of the coupling nut HXE 07 - HXE 48 - HXE 49 - HXE 87 - HXE 47	SW	13	17 (13 for thread size M8)	-	-

7.3 - Installation instructions

HXE01 HXE41					
	Step 1	Drill a hole into the concrete in rotary plus hammer mode with a hole diameter as specified in Tab. 7.1			
	Step 2	Remove dust from the hole using a brush and a blowing pump			
	Step 3	Place the fixture			
	Step 4	Install the fastener using an impact screw driver as specified in Tab. 7.1			
HXE02 HXE12 HXE40 HXE42					
	Step 1	Drill a hole into the concrete in rotary plus hammer mode with a hole diameter as specified in Tab. 7.1			
	Step 2	Remove dust from the hole using a brush and a blowing pump			
	Step 3	Place the fixture			
	Step 4	Install the fastener using an impact screw driver			
Step 5	Tighten the nut on the screw thread				

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HXE03 HXE43					
Step 1	Drill a hole into the concrete in rotary plus hammer mode with a hole diameter as specified in Tab. 7.1				
Step 2	Remove dust from the hole using a brush and a blowing pump				
Step 3	Place the fixture				
Step 4	Install the fastener using an impact screw driver with insert suitable for the screw				
HXE05 HXE06 HXE45 HXE46					
Step 1	Drill a hole into the concrete in rotary plus hammer mode with a hole diameter as specified in Tab. 7.1				
Step 2	Remove dust from the hole using a brush and a blowing pump				
Step 3	Place the fixture				
Step 4	Install the fastener using an impact screw driver with insert suitable for the screw				
HXE07 HXE47 HXE48 HXE49 HXE87					
Step 1	Drill a hole into the concrete in rotary plus hammer mode with a hole diameter as specified in Tab. 7.1				
Step 2	Remove dust from the hole using a brush and a blowing pump				
Step 3	Install the fastener using an impact screw driver				
Step 4	Place the fixture				

7.4 - Accessories for installation

Drill bit			Blowing pump
	HXE size	Tip item code	 Item Code: DW 01 00 001
		EO 01 06 210	
	d _{th} 8	EOX 01 06 210	
		EO 01 08 210	
	d _{th} 10	EOX 01 08 210	
		EO 01 10 210	
	d _{th} 12	EOX 01 10 210	
		EO 01 14 210	
	d _{th} 16	EOX 01 14 210	
		EOX 01 14 210	

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8 - Declared performances

Essential characteristics	Performance	Harmonised technical specifications/EAD
Resistance to steel failure – $N_{Rk,s}$ [kN]:	See from Tab. 8.1 to 8.12	EAD 330232-01-0601
Resistance to pull-out failure – $N_{Rk,p}$ [kN], ψ_c [-]:		
Resistance to concrete cone failure - $k_{cr,N}$, $k_{ucr,N}$ [-], h_{ef} , $C_{cr,N}$ [mm]:		
Robustness – γ_{inst} [-]:		
Minimum edge distance and spacing – c_{min} , s_{min} , h_{min} [mm]:		
Edge distance to prevent splitting under load – $N^0_{Rk,sp}$ [kN], $C_{cr,sp}$ [mm]:		
Resistance to steel failure under shear load – $V^0_{Rk,s}$ [kN], $M^0_{Rk,s}$ [Nm], k_7 [-]:		
Resistance to pry-out failure – k_8 [-]:		
Displacements under static and quasi-static loading - δ_{N0} , $\delta_{N\infty}$, δ_{V0} , $\delta_{V\infty}$ [mm]:		
Characteristic resistance and displacements for seismic performance categories C1 and C2:		
Resistance to tension load, displacements	C1 – $N_{Rk,s,C1}$, $N_{Rk,p,C1}$ [kN] C2 – $N_{Rk,s,C2}$, $N_{Rk,p,C2}$ [kN], $\delta_{N,C2}$ [mm]	
Resistance to tension shear, displacements:	C1 – $V_{Rk,s,C1}$ [kN] C2 – $V_{Rk,s,C2}$ [kN], $\delta_{V,C2}$ [mm]	
Factor for annular gap - α_{gap} [-]:	NPD	
Reaction to fire:	A1	
Fire resistance to steel failure (tension load) - $N_{Rk,s,fi}$ [kN]:	See from Tab. 8.1 to 8.12	
Fire resistance to pull-out failure (tension load) - $N_{Rk,p,fi}$ [kN]:		
Fire resistance to steel failure (shear load) - $V_{Rk,s,fi}$ [kN], $M^0_{Rk,s,fi}$ [Nm]:		
Durability:	NPD	

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Tab. 8.1 - Performances for design method A, tension, static and quasi static loads in concrete C20/25 to C50/60 for zinc plated carbon steel

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
STEEL FAILURE										
Characteristic Resistance - tension	N _{Rk,s}	[kN]	21,2		37,7		58,9		107,4	
Partial safety factor ¹ - tension	γ _{Ms}	[-]	1,41							
PULL-OUT FAILURE										
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Characteristic Resistance in uncracked concrete C20/25	N _{Rk,p}	[kN]	6,5	16	9	20	13	25	19	29
Characteristic Resistance in uncracked concrete C20/25 (HXE 06)	N _{Rk,p}	[kN]	6,5	11	-	-	-	-	-	-
Characteristic Resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	2	4	3	10	9	12	10	20
Partial safety factor accounting for sensitivity to installation	γ _{inst}	[-]	1,2	1,4	1,2		1,2		1,2	
Increasing factors for N _{Rk,p} for uncracked concrete	ψ _c	C30/37	1,18	1,06	1,09	1,22	1,11	1,22	1,06	1,18
		C40/50	1,32	1,11	1,16	1,41	1,19	1,41	1,11	1,32
		C50/60	1,44	1,15	1,22	1,58	1,26	1,58	1,15	1,44
Increasing factors for N _{Rk,p} for cracked concrete	ψ _c	C30/37	1	1,11	1,22	1,13	1,22	1,13	1	1
		C40/50	1	1,19	1,41	1,23	1,41	1,23	1	1
		C50/60	1	1,26	1,58	1,32	1,58	1,32	1	1
CONCRETE CONE FAILURE AND SPLITTING FAILURE										
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Factor for uncracked concrete cone failure	k _{ucr}	[-]	11							
Factor for cracked concrete cone failure	k _{cr}	[-]	7,7							
Characteristic spacing	s _{cr,N}	[mm]	3 x h _{ef}							
Characteristic edge distance	c _{cr,N}	[mm]	1,5 x h _{ef}							
Characteristic spacing (Splitting)	s _{cr,sp}	[mm]	150	160	160	175	240	195	200	255
Characteristic edge distance (Splitting)	c _{cr,sp}	[mm]	75	80	80	85	120	95	100	130

¹ In absence of other national regulations

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Tab. 8.2 - Performances for design method A, shear, static and quasi static loads in concrete C20/25 to C50/60 for zinc plated carbon steel

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
STEEL FAILURE WITHOUT LEVEL ARM										
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Characteristic Resistance	V ⁰ _{Rk,s}	[kN]	8,7		20,4	22,8	29,1	37,2	53,9	75,8
Ductility factor ¹	k ₇	[-]	0,8		0,8		0,8		0,74	0,79
Partial safety factor ²	γ _{Ms}	[-]	1,5							
STEEL FAILURE WITH LEVEL ARM										
Characteristic Resistance	M ⁰ _{Rk,s}	[Nm]	19		45		88		217	
Partial safety factor ²	γ _{Ms}	[-]	1,5							
CONCRETE PRYOUT FAILURE										
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Factor for prout	k ₈	[-]	1	1	1	1	1	2	1	2
CONCRETE EDGE FAILURE										
Nominal diameter of the screw	d _{nom}	[mm]	6		8		10		14	
Effective length of the fastener in concrete	l _f	[mm]	36	49	33	56	43	64	53	85

¹ The diameter of the clearance hole does not meet the values given in EN 1992-4, Table 6.1. However, the group resistance under shear loading has been verified in the assessment through testing and accounted for in the factor k_7

² In absence of other national regulations

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Tab. 8.3 - Performances for design method A, tension, static and quasi static loads in concrete C20/25 to C50/60 for carbon steel with Steel Saver coating

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
STEEL FAILURE										
Characteristic Resistance - tension	N _{Rk,s}	[kN]	21,2		37,7		58,9		107,4	
Partial safety factor ¹	γ _{Ms}	-	1,41							
PULL-OUT FAILURE										
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Characteristic Resistance in uncracked concrete C20/25	N _{Rk,p}	[kN]	6,5	16	9	20	13	25	19	29
Characteristic Resistance in uncracked concrete C20/25 (HXE 06)	N _{Rk,p}	[kN]	6,5	11	-	-	-	-	-	-
Characteristic Resistance in cracked concrete C20/25	N _{Rk,p}	[kN]	2	4	1,5	7,5	9	11	10	20
Partial safety factor accounting for sensitivity to installation	γ _{inst}	[-]	1,2	1,4	1,2		1,2		1,2	
Increasing factors for N _{Rk,p} for uncracked concrete	ψ _c	C30/37	1,18	1,06	1,09	1,22	1,11	1,22	1,06	1,18
		C40/50	1,32	1,11	1,16	1,41	1,19	1,41	1,11	1,32
		C50/60	1,44	1,15	1,22	1,58	1,26	1,58	1,15	1,44
Increasing factors for N _{Rk,p} for cracked concrete	ψ _c	C30/37	1	1,11	1,22	1,13	1,22	1,13	1	1
		C40/50	1	1,19	1,41	1,23	1,41	1,23	1	1
		C50/60	1	1,26	1,58	1,32	1,58	1,32	1	1
CONCRETE CONE FAILURE AND SPLITTING FAILURE										
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Factor for uncracked concrete cone failure	k _{ucr}	[-]	11							
Factor for cracked concrete cone failure	k _{cr}	[-]	7,7							
Characteristic spacing	s _{cr,N}	[mm]	3 x h _{ef}							
Characteristic edge distance	c _{cr,N}	[mm]	1,5 x h _{ef}							
Characteristic spacing (Splitting)	s _{cr,sp}	[mm]	150	160	160	175	240	195	200	255
Characteristic edge distance (Splitting)	c _{cr,sp}	[mm]	75	80	80	85	120	95	100	130

¹ In absence of other national regulations

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Tab. 8.4 - Performances for design method A, shear, static and quasi static loads in concrete C20/25 to C50/60 for carbon steel with Steel Saver coating

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
STEEL FAILURE WITHOUT LEVEL ARM										
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Characteristic Resistance	V ⁰ _{Rk,s}	[kN]	8,7		20,4	22,8	29,1	37,2	53,9	75,8
Ductility factor ¹	k ₇	[-]	0,8		0,8		0,8		0,74	0,79
Partial safety factor ²	γ _{Ms}	[-]	1,5							
STEEL FAILURE WITH LEVEL ARM										
Characteristic Resistance	M ⁰ _{Rk,s}	[Nm]	19		45		88		217	
Partial safety factor ²	γ _{Ms}	[-]	1,5							
CONCRETE PRYOUT FAILURE										
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Factor for prout	k ₈	[-]	1	1	1	1	1	2	1	2
CONCRETE EDGE FAILURE										
Nominal diameter of the screw	d _{nom}	[mm]	6		8		10		14	
Effective length of the fastener in concrete	l _f	[mm]	36	49	33	56	43	64	53	85

¹ The diameter of the clearance hole does not meet the values given in EN 1992-4, Table 6.1. However, the group resistance under shear loading has been verified in the assessment through testing and accounted for in the factor k₇

² In absence of other national regulations

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Tab. 8.5 - Performances for design method A, seismic performance category C1 in concrete C20/25 to C50/60 for zinc plated carbon steel

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
STEEL FAILURE										
Characteristic Resistance - tension	N _{Rk,s,C1}	[mm]	21,2		37,7		58,9		107,4	
Partial safety factor ¹ - tension	γ _{Ms}	[kN]	1,41							
Characteristic Resistance - shear	V _{Rk,s,C1}	[-]	NPD	8,7	18,4	20,6	24,7	31,6	43,1	60,7
Partial safety factor ¹ - shear	γ _{Ms}	[-]	1,5							
PULL-OUT FAILURE										
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Characteristic Resistance in uncracked concrete C20/25	N _{Rk,p,C1}	[kN]	NPD	2,1	2,3	7	6,3	8,3	7	13,5
Partial safety factor accounting for sensitivity to installation	γ _{inst}	[-]	NPD	1,4	1,2		1,2		1,2	
Increasing factors for N _{Rk,p} for cracked concrete	ψ _c	C30/37	NPD	1,11	1,22	1,13	1,22	1,13	1	1
		C40/50	NPD	1,19	1,41	1,23	1,41	1,23	1	1
		C50/60	NPD	1,26	1,58	1,32	1,58	1,32	1	1

¹ In absence of other national regulations

Tab. 8.6 - Performances for design method A, seismic performance category C1 in concrete C20/25 to C50/60 for carbon steel with Steel Saver coating

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
STEEL FAILURE										
Characteristic Resistance - tension	N _{Rk,s,C1}	[kN]	21,2		37,7		58,9		107,4	
Partial safety factor ¹ - tension	γ _{Ms}	[-]	1,41							
Characteristic Resistance - shear	V _{Rk,s,C1}	[kN]	NPD	8,7	18,4	20,6	24,7	31,6	43,1	60,7
Partial safety factor ¹ - shear	γ _{Ms}	[-]	1,5							
PULL-OUT FAILURE										
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
Characteristic Resistance in uncracked concrete C20/25	N _{Rk,p,C1}	[kN]	NPD	2,1	0,9	5,3	6,3	7,6	7	13,5
Partial safety factor accounting for sensitivity to installation	γ _{inst}	[-]	NPD	1,4	1,2		1,2		1,2	
Increasing factors for N _{Rk,p} for cracked concrete	ψ _c	C30/37	NPD	1,11	1,22	1,13	1,22	1,13	1	1
		C40/50	NPD	1,19	1,41	1,23	1,41	1,23	1	1
		C50/60	NPD	1,26	1,58	1,32	1,58	1,32	1	1

¹ In absence of other national regulations

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Tab. 8.7 - Performances for design method A, seismic performance category C2 in concrete C20/25 to C50/60 for zinc plated carbon steel

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
STEEL FAILURE										
Characteristic Resistance - tension	N _{Rk,s,C2}	[kN]	NPD		NPD		58,9		107,4	
Partial safety factor ¹ - tension	γ _{Ms}	[-]	1,41							
Characteristic Resistance - shear	V _{Rk,s,C2}	[kN]	NPD	NPD	NPD	NPD	14	17,7	31,8	39,8
Partial safety factor ¹ - shear	γ _{Ms}	[-]	1,5							
PULL-OUT FAILURE										
Overall fastener embedment depth	h _{nom}	[mm]	NPD	NPD	NPD	NPD	55	80	65	110
Effective embedment depth	h _{ef}	[mm]	NPD	NPD	NPD	NPD	43	64	53	85
Characteristic Resistance in uncracked concrete C20/25	N _{Rk,p,C2}	[kN]	NPD	NPD	NPD	NPD	2,7	2,7	3,6	7,2
Partial safety factor accounting for sensitivity to installation	γ _{inst}	[-]	NPD	NPD	NPD	NPD	1,2		1,2	
Increasing factors for N _{Rk,p} for cracked concrete	ψ _c	C30/37	NPD	NPD	NPD	NPD	1,22	1,13	1	1
		C40/50	NPD	NPD	NPD	NPD	1,41	1,23	1	1
		C50/60	NPD	NPD	NPD	NPD	1,58	1,32	1	1

¹ In absence of other national regulations

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Tab. 8.8 - Performances for design method A, tension, fire exposure, in concrete C20/25 to C50/60 for zinc plated carbon steel

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h _{ef}	[kN]	36	49	33	56	43	64	53	85
FIRE EXPOSURE 30 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,30}	[kN]	0,3	0,3	0,8	0,8	1,6	1,6	2,9	2,9
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,30}	[kN]	0,5	1	0,8	2,5	2,3	3	2,5	5
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,30}	[kN]	1,3	2,9	1,1	4	2,1	5,6	3,5	11,5
FIRE EXPOSURE 60 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,60}	[kN]	0,3	0,3	0,7	0,7	1,2	1,2	2,1	2,1
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,60}	[kN]	0,5	1	0,8	2,5	2,3	3	2,5	5
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,60}	[kN]	1,3	2,9	1,1	4	2,1	5,6	3,5	11,5
FIRE EXPOSURE 90 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,90}	[kN]	0,2	0,2	0,5	0,5	1	1	1,9	1,9
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,90}	[kN]	0,5	1	0,8	2,5	2,3	3	2,5	5
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,90}	[kN]	1,3	2,9	1,1	4	2,1	5,6	3,5	11,5
FIRE EXPOSURE 120 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,120}	[kN]	0,1	0,1	0,4	0,4	0,8	0,8	1,4	1,4
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,120}	[kN]	0,4	0,8	0,6	2	1,8	2,4	2	4
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,120}	[kN]	1,1	2,3	0,9	3,2	1,7	4,5	2,8	9,2
Spacing	S _{cr,N}	[mm]	4 x h _{ef}							
Edge distance	C _{cr,N}	[mm]	2 x h _{ef}							
Partial safety factor accounting for sensitivity to installation (Minimum edge distance)	C _{min}	[mm]	2 x h _{ef} If fire attack comes from more than one side, the edge distance of the anchor has to be ≥ 300 mm or ≥ 2 x h _{ef}							

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Tab. 8.9 - Performances for design method A, shear, fire exposure, in concrete C20/25 to C50/60 for zinc plated carbon steel

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
Overall fastener embedment depth	h_{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h_{ef}	[kN]	36	49	33	56	43	64	53	85
FIRE EXPOSURE 30 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,30}$	[kN]	0,3	0,3	0,8	0,8	1,6	1,6	2,9	2,9
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,30}$	[kN]	0,3	0,3	0,9	0,9	2,4	2,4	5,8	5,8
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,30}$	[kN]	1,3	2,9	1,1	4	2,1	11,3	3,5	22,9
FIRE EXPOSURE 60 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,60}$	[kN]	0,3	0,3	0,7	0,7	1,2	1,2	2,1	2,1
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,60}$	[kN]	0,2	0,2	0,8	0,8	1,8	1,8	4,3	4,3
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,60}$	[kN]	1,3	2,9	1,1	4	2,1	11,3	3,5	22,9
FIRE EXPOSURE 90 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,90}$	[kN]	0,2	0,2	0,5	0,5	1	1	1,9	1,9
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,90}$	[kN]	0,2	0,2	0,6	0,6	1,5	1,5	3,8	3,8
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,90}$	[kN]	1,3	2,9	1,1	4	2,1	11,3	3,5	22,9
FIRE EXPOSURE 120 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,120}$	[kN]	0,1	0,1	0,4	0,4	0,8	0,8	1,4	1,4
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,120}$	[kN]	0,1	0,1	0,5	0,5	1,2	1,2	2,9	2,9
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,120}$	[kN]	1,1	2,3	0,9	3,2	1,7	9	2,8	18,4
Concrete edge failure										

The characteristic resistance $V_{Rk,cp,fi,Ri}$ in concrete C20/25 to C50/60 is determined by:

$V^0_{Rk,c,fi(90)} = 0,25 \times V^0_{Rk,c}$ (R30, R60, R90) and $V^0_{Rk,c,fi(120)} = 0,20 \times V^0_{Rk,c}$ (R120) with $V^0_{Rk,c}$ as an initial value of the characteristic resistance of a single fastener in cracked concrete C20

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Tab. 8.10 - Performances for design method A, tension, fire exposure, in concrete C20/25 to C50/60 for carbon steel with Steel Saver coating

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h _{ef}	[mm]	36	49	33	56	43	64	53	85
FIRE EXPOSURE 30 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,30}	[kN]	0,3	0,3	0,8	0,8	1,6	1,6	2,9	2,9
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,30}	[kN]	0,5	1	0,4	1,9	2,3	2,8	2,5	5
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,30}	[kN]	1,3	2,9	1,1	4	2,1	5,6	3,5	11,5
FIRE EXPOSURE 60 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,60}	[kN]	0,3	0,3	0,7	0,7	1,2	1,2	2,1	2,1
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,60}	[kN]	0,5	1	0,4	1,9	2,3	2,8	2,5	5
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,60}	[kN]	1,3	2,9	1,1	4	2,1	5,6	3,5	11,5
FIRE EXPOSURE 90 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,90}	[kN]	0,2	0,2	0,5	0,5	1	1	1,9	1,9
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,90}	[kN]	0,5	1	0,4	1,9	2,3	2,8	2,5	5
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,90}	[kN]	1,3	2,9	1,1	4	2,1	5,6	3,5	11,5
FIRE EXPOSURE 120 MINUTES										
Steel failure										
Characteristic Resistance - tension	N _{Rk,s,fi,120}	[kN]	0,1	0,1	0,4	0,4	0,8	0,8	1,4	1,4
Pull-out failure										
Characteristic Resistance	N _{Rk,p,fi,120}	[kN]	0,4	0,8	0,3	1,5	1,8	2,2	2	4
Concrete cone failure										
Characteristic Resistance	N _{Rk,c,fi,120}	[kN]	1,1	2,3	0,9	3,2	1,7	4,5	2,8	9,2
Spacing	S _{cr,N}	[mm]	4 x h _{ef}							
Edge distance	C _{cr,N}	[mm]	2 x h _{ef}							
Partial safety factor accounting for sensitivity to installation (Minimum edge distance)	C _{min}	[mm]	2 x h _{ef} If fire attack comes from more than one side, the edge distance of the anchor has to be ≥ 300 mm or ≥ 2 x h _{ef}							

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According to the Regulation EU No 305/2011

HXE

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Tab. 8.11 - Performances for design method A, shear, fire exposure, in concrete C20/25 to C50/60 for carbon steel with Steel Saver coating

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
Overall fastener embedment depth	h_{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h_{ef}	[mm]	36	49	33	56	43	64	53	85
FIRE EXPOSURE 30 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,30}$	[kN]	0,3	0,3	0,8	0,8	1,6	1,6	2,9	2,9
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,30}$	[kN]	0,3	0,3	0,9	0,9	2,4	2,4	5,8	5,8
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,30}$	[kN]	1,3	2,9	1,1	4	2,1	11,3	3,5	22,9
FIRE EXPOSURE 60 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,60}$	[kN]	0,3	0,3	0,7	0,7	1,2	1,2	2,1	2,1
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,60}$	[kN]	0,2	0,2	0,8	0,8	1,8	1,8	4,3	4,3
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,60}$	[kN]	1,3	2,9	1,1	4	2,1	11,3	3,5	22,9
FIRE EXPOSURE 90 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,90}$	[kN]	0,2	0,2	0,5	0,5	1	1	1,9	1,9
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,90}$	[kN]	0,2	0,2	0,6	0,6	1,5	1,5	3,8	3,8
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,90}$	[kN]	1,3	2,9	1,1	4	2,1	11,3	3,5	22,9
FIRE EXPOSURE 120 MINUTES										
Steel failure without level arm										
Characteristic Resistance	$V_{Rk,s,fi,120}$	[kN]	0,1	0,1	0,4	0,4	0,8	0,8	1,4	1,4
Steel failure with level arm										
Characteristic Resistance	$M^0_{Rk,s,fi,120}$	[kN]	0,1	0,1	0,5	0,5	1,2	1,2	2,9	2,9
Pryout failure										
Characteristic Resistance	$V_{Rk,cp,fi,120}$	[kN]	1,1	2,3	0,9	3,2	1,7	9	2,8	18,4
Concrete edge failure										

The characteristic resistance $V_{Rk,cp,fi,Ri}$ in concrete C20/25 to C50/60 is determined by:

$V^0_{Rk,c,fi(90)} = 0,25 \times V^0_{Rk,c}$ (R30, R60, R90) and $V^0_{Rk,c,fi(120)} = 0,20 \times V^0_{Rk,c}$ (R120) with $V^0_{Rk,c}$ as an initial value of the characteristic resistance of a single fastener in cracked concrete C20

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Tab. 8.12 - Performances for design method A, Displacements

			d _o (d _{th})							
			6(8)		8(10)		10(12)		14(16)	
Overall fastener embedment depth	h _{nom}	[mm]	45	60	45	70	55	80	65	110
Effective embedment depth	h _{ef}	[kN]	36	49	33	56	43	64	53	85

TENSION LOADS IN UNCRACKED CONCRETE - ZINC PLATED AND SPECIAL COATING VERSIONS

Service tension load in concrete C20/25	N _{ucr}	[kN]	3,1	7,62	4,29	9,52	6,19	11,9	9,05	13,81
Service tension load in concrete C20/25 HXE 06 version	N _{ucr}	[kN]	3,1	5,24	-	-	-	-	-	-
Displacements	δ _{N0,ucr}	[mm]	0,09	0,15	0,07	0,15	0,1	0,1	0,1	0,15
	δ _{N∞,ucr}	[mm]	0,11	0,54	0,25	0,41	0,4	0,39	0,34	0,67
Displacements HXE 06 version	δ _{N0,ucr}	[mm]	0,09	0,1	-	-	-	-	-	-
	δ _{N∞,ucr}	[mm]	0,11	0,42	-	-	-	-	-	-

TENSION LOADS IN CRACKED CONCRETE - ZINC PLATED VERSION

Service tension load in concrete C20/25	N _{cr}	[kN]	0,95	1,9	1,43	4,76	4,29	5,71	4,76	9,52
Displacements	δ _{N0,cr}	[mm]	0,07	0,27	0,08	0,19	0,18	0,22	0,16	0,25
	δ _{N∞,cr}	[mm]	0,31	0,53	0,43	0,49	0,71	0,72	1,14	1,13

TENSION LOADS IN CRACKED CONCRETE - STEEL SAVER COATING VERSION

Service tension load in concrete C20/25	N _{cr}	[kN]	0,95	1,9	0,71	3,57	4,29	5,24	4,76	9,52
Displacements	δ _{N0,cr}	[mm]	0,07	0,13	0,04	0,14	0,18	0,2	0,16	0,25
	δ _{N∞,cr}	[mm]	0,41	0,78	0,42	0,71	0,95	0,4	0,83	1,27

SHEAR LOADS IN CRACKED AND UNCRACKED CONCRETE - ZINC PLATED AND SPECIAL COATING VERSIONS

Service shear load in concrete C20/25	V _U	[kN]	4,1	9,7	10,9	13,9	17,7	25,6	36,1	
Displacements	δ _{V0}	[mm]	0,52	2,22	1,21	1,7	1,69	4,54	6,29	
	δ _{V∞}	[mm]	0,77	3,33	1,81	2,55	2,53	6,8	9,43	

SEISMIC PERFORMANCE CATEGORY C2 – ZINC PLATED VERSION

Damage limit state										
Tension	δ _{N,seis(DLS)}	[mm]	NPD	NPD	0,21	0,16	0,4	0,56		
Shear	δ _{V,seis(DLS)}	[mm]	NPD	NPD	4,85	5,65	6,22	5,54		
Ultimate limit state										
Tension	δ _{N,seis(ULS)}	[mm]	NPD	NPD	1,04	1,02	2,34	2,23		
Shear	δ _{V,seis(ULS)}	[mm]	NPD	NPD	9,06	10,08	11,64	8,78		



The performance of the product referred to in point 1 complies with the declared performance referred to in point 8. This declaration of performance is issued under the sole responsibility of the manufacturer referred to in point 2.

Signed for and on behalf of the manufacturer by:

Name and fuction	Place and date of issue	Signature
<i>President</i> Antonio Guarino	Pastorano, 17th June 2025	