Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-18/0279 of 7 June 2018

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the European Technical Assessment:	Deutsches Institut für Bautechnik
Trade name of the construction product	Ratto Concrete Screw M3CE
Product family to which the construction product belongs	Mechanical fasteners for use in concrete
Manufacturer	Viteria Ratto s.a.s Via Seminella 50H 16012 BUSALLA (GE) ITALIEN
Manufacturing plant	Viteria Ratto Plant 1
This European Technical Assessment contains	15 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 330232-00-0601

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Specific Part

1 Technical description of the product

The Ratto Concrete Screw M3CE is made of galvanised steel of sizes 8, 10, 12 or 16 mm. The anchor may be provided with different head configurations according to Annex A2. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The performances given in Section 3 are only valid if the concrete screw is used in compliance with the specifications and conditions given in Annex B.

The verifications and assessment methods on which this European Technical Assessment is based lead the assumption of working life of the concrete screw of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

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

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading)	see Annex C 1
Characteristic resistance to shear load (static and quasi-static loading)	see Annex C 2
Displacements (static and quasi-static loading)	see Annex C 5
Characteristic resistance and displacements for seismic performance categories C1 and C2	see Annex C 1, C 2 and C 5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	see Annex C 3 and C 4

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

In accordance with European Assessment Documents EAD No. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 7 June 2018 by Deutsches Institut für Bautechnik

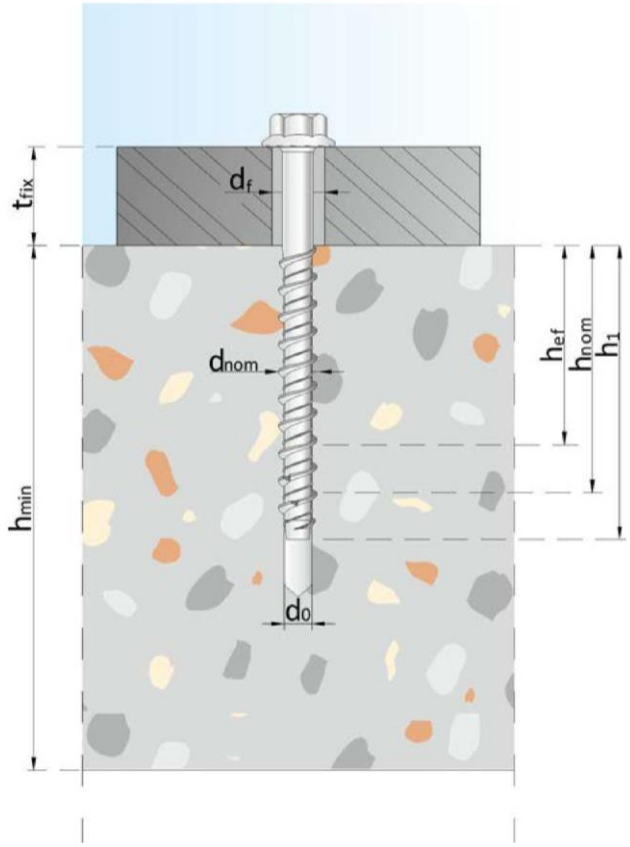
Dr.-Ing. Lars Eckfeldt
p.p. Head of Department

beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt

Installed conditions

Installation for static, quasi-static and seismic performance category C1 and C2



Designation

d_{nom}	Outside diameter of the anchor
d_{cut}	Maximum cutting diameter of the drill bit
t_{fix}	Thickness of the fixtures
d_0	Diameter of the drill hole
d_f	Diameter of the clearance hole in the fixture
h_{min}	Minimum thickness of the concrete member
h_{nom}	Overall anchor embedment depth
h_{ef}	Anchorage depth

Ratto Concrete Screw M3CE

Product description
Installed condition

Annex A 1

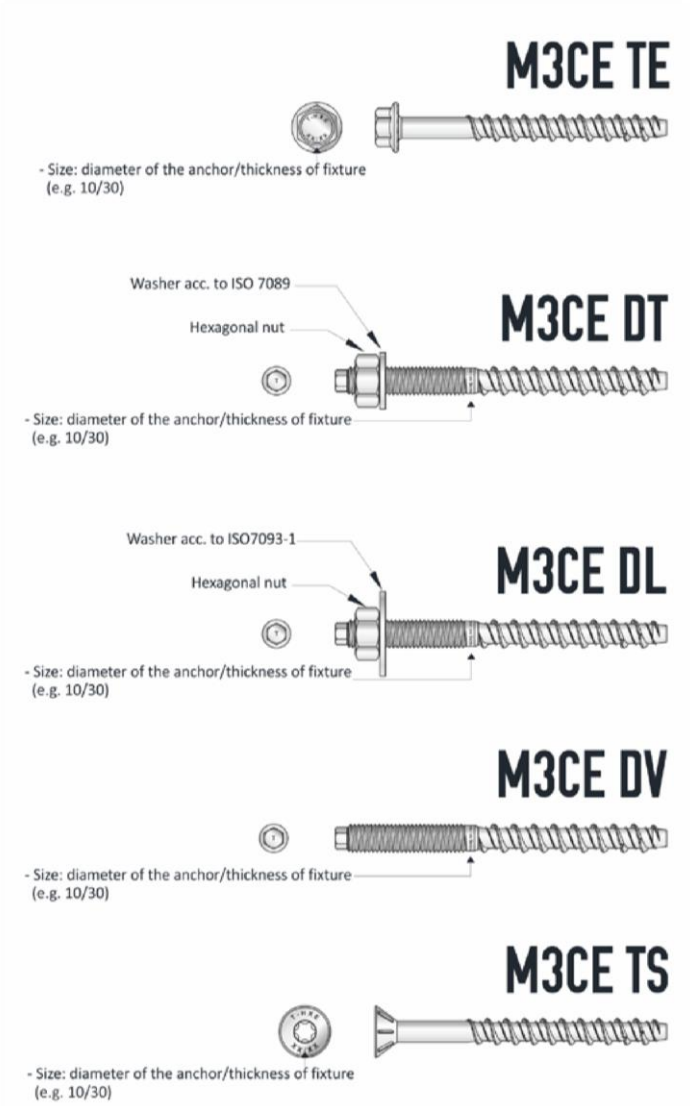


Table A1: Materials

ITEM	Description	f_y [Mpa]	f_u [Mpa]	Finishing
M3CE	Hexagonal flanged washer head screw	640	750	Materials galvanised ≥ 5µm according to ISO 4042:1999
M3CE DT	Dual thread screw with hexagonal shank			
M3CE DV	Dual thread screw with hexagonal shank, nut and washer according to ISO 7089:2000			
M3CE DL	Dual thread screw with hexagonal shank, nut and washer according to ISO 7093:2000			
M3CE TS	Flat countersunk head with ribs screw			

Ratto Concrete Screw M3CE

Product description
Anchor types and Materials

Annex A 2

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Specifications of intended use

Anchorages subject to:
- Static and quasi-static loads: All anchor types, all sizes
- Seismic action for Performance Category C1 and C2: Ø 16 and Ø 12
- Seismic action for Performance Category C1: Ø 10
- Fire exposure: all sizes

Base materials:
- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Cracked or uncracked concrete.

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions

Design:
- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.).
- Design for fastenings in accordance to FprEN 1992-4:2016 and EOTA Technical Report TR 055

Installation:
- Hole drilling by rotary plus hammer mode only
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the anchor is not possible. The head of the anchor is supported on the fixture and is not damaged.

Ratto Concrete Screw M3CE	Annex B 1
Intended Use Specifications	

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Table B1: M3CE TE, installation details

Denomination		M3CE Ø8/6[1]	M3CE Ø10/8[2]	M3CE Ø12/10[3]	M3CE Ø16/14[4]
Nominal drill hole diameter	d_o = [mm]	6	8	10	14
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	6.40	8.45	10.45	14.50
Effective anchorage depth	h_{ef} = [mm]	48	56	64	85
Depth of drill hole	h_1 = [mm]	75	85	100	140
Diameter of clearance in the fixture	d_f = [mm]	9	12	14	18
Overall anchor embedment depth in the concrete	h_{nom}=[mm]	60	70	80	110
Minimum thickness of concrete member	h_{min} = [mm]	100	110	130	170
Outside diameter of anchor	d_{nom} = [mm]	8	10	12	16
Wrench size M3CE TE	SW = [mm]	10	13	15	21
Minimum thickness of fixture	t_{fix}=[mm]	≥5	≥5	≥5	≥5
Minimum length of the anchor M3CE TE	L=[mm]	≥65	≥75	≥85	≥115
Minimum edge distance	c_{min} = [mm]	45	50	60	80
Minimum spacing	s_{min} = [mm]	45	50	60	80

Table B2: M3CE DT, M3CE DL and M3CE DV, installation details

Denomination		M3CE Ø8/6[1]	M3CE Ø10/8[2]	M3CE Ø12/10[3]
Nominal drill hole diameter	d_o = [mm]	6	8	10
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	6.40	8.45	10.45
Effective anchorage depth	h_{ef} = [mm]	48	56	64
Depth of drill hole	h_1 = [mm]	75	90	100
Diameter of clearance in the fixture	d_f = [mm]	9	12	14
Overall anchor embedment depth in the concrete	h_{nom}=[mm]	60	70	80
Minimum thickness of concrete member	h_{min} = [mm]	100	110	130
Outside diameter of anchor	d_{nom} = [mm]	8	10	12
Wrench size M3CE DT and M3CE DL	SW = [mm]	13	17	19
Maximum tightening torque of the nut	T = [Nm]	20	50	80
Hexagonal shank size	AF = [mm]	5	7	8
Minimum thickness of fixture	t_{fix}=[mm]	≥5	≥5	≥5
Minimum length of the anchor	L=[mm]	≥85	≥100	≥113
Minimum edge distance	c_{min} = [mm]	45	50	60
Minimum spacing	s_{min} = [mm]	45	50	60

Table B3: M3CE TS, installation details

Denomination		M3CE Ø8/6[1]	M3CE Ø10/8[2]	M3CE Ø12/10[3]
Nominal drill hole diameter	d_o = [mm]	6	8	10
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	6.40	8.45	10.45
Effective anchorage depth	h_{ef} = [mm]	48	56	64
Depth of drill hole	h_1 = [mm]	75	90	100
Diameter of clearance in the fixture	d_f = [mm]	9	12	14
Overall anchor embedment depth in the concrete	h_{nom}=[mm]	60	70	80
Minimum thickness of concrete member	h_{min} = [mm]	100	110	130
Outside diameter of anchor	d_{nom} = [mm]	8	10	12
Six lobe recess M3CE TS	T	T30	T40	T50
Minimum thickness of fixture	t_{fix}=[mm]	≥5	≥5	≥5
Minimum length of the anchor M3CE TS	L=[mm]	≥65	≥75	≥85
Minimum edge distance	c_{min} = [mm]	45	50	60
Minimum spacing	s_{min} = [mm]	45	50	60

[1] Setting requires an impact wrench with maximum 20 Nm torque
[2] Setting requires an impact wrench with maximum 50 Nm torque
[3] Setting requires an impact wrench with maximum 80 Nm torque
[4] Setting requires an impact wrench with maximum 160 Nm torque

Ratto Concrete Screw M3CE

Intended Use
Installation parameters

Annex B 2

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Drill bit

	M3CE anchor size	Drill bit item code
	Ø 8	PUNT SDS
	Ø 10	
	Ø 12	
	Ø 16	

Blowing pump

Item code: M3 PPFO

Ratto Concrete Screw M3CE

Intended Use
Cleaning and setting tools

Annex B 3

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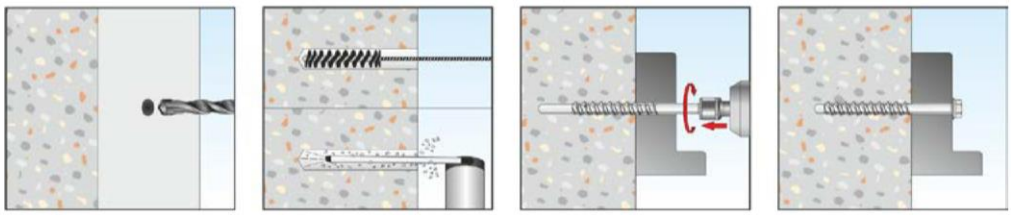
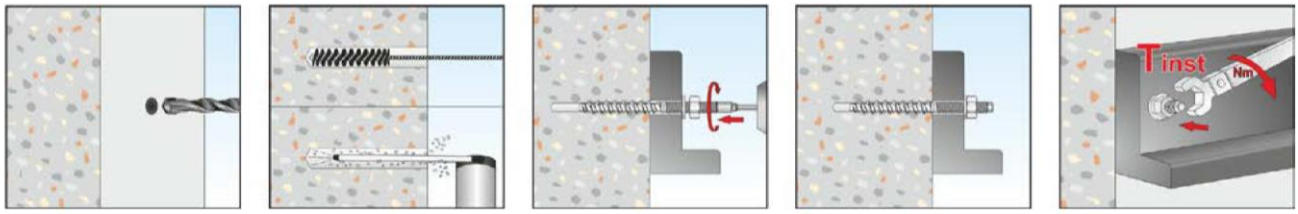
Installation instructions M3CE



Step 1	Drill a hole into the concrete in rotary plus hammer mode. The hole must be 2 [mm] less than the outside diameter of the anchor
Step 2	Remove the dust into the hole using 2 times a brush and 2 times a blowing pump
Step 3	Place the fixture
Step 4	Install the anchor using an impact screwdriver

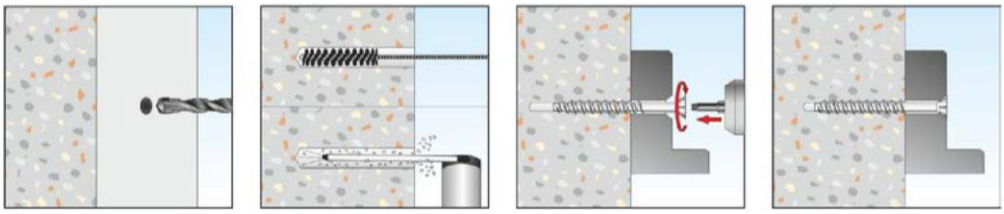
Installation instructions M3CE DT, M3CE DL and M3CE DV



Step 1	Drill a hole into the concrete in rotary plus hammer mode. The hole must have a diameter 2 [mm] less than the outside diameter of the anchor
Step 2	Remove the dust into the hole using a 2 times brush and a 2 times blowing pump
Step 3 [1)]	Place the fixture
Step 4	Install the anchor using an impact screwdriver
Step 5	Tight the nut applying the required torque moment

[1)] Through fixing is allowed (place the fixture before placing the anchor)

Installation instructions M3CE TS



Step 1	Drill a hole into the concrete in rotary plus hammer mode. The hole must be 2 [mm] less than the outside diameter of the anchor
Step 2	Remove the dust into the hole using a 2 times brush and a 2 times blowing pump
Step 3	Place the fixture
Step 4	Install the anchor using an impact screwdriver

Ratto Concrete Screw M3CE

Intended Use
Installation instructions

Annex B 4

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Table C1: Performances for design, tension

Type of anchor / Size			M3CE Ø8/6	M3CE Ø10/8	M3CE Ø12/10	M3CE Ø16/14
Steel failure						
Characteristic Resistance	$N_{Rk,s}$ $N_{Rk,s,eq,C1}$ $N_{Rk,s,eq,C2}$	[kN]	20	35	50	95
Partial factor	γ_{Ms} [1)]	[-]	1,5			
Pull-out failure						
Effective embedment depth	h_{ef}	[mm]	48	56	64	85
Characteristic Resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	16	20	25	40
Characteristic Resistance in cracked concrete C20/25			4	7,5	9	16
Characteristic resistance in seismic performance category C1	$N_{Rk,p,eq}$	[kN]	NPD	6,0	6,3	16
Characteristic resistance in seismic performance category C2	$N_{Rk,p,eq}$		NPD	NPD	2,7	7,2
Increasing factors for $N_{Rk,p}$ for cracked and uncracked concrete	Ψ_c	C30/37	1,22			
		C40/50	1,41			
		C50/60	1,58			
Installation factor	γ_{inst}	[-]	1,4	1,2	1,4	
Concrete cone failure and splitting failure						
Effective embedment depth	h_{ef}	[mm]	48	56	64	85
Factor for k_1	$k_{ucr,N}$	[-]	11,0			
Factor for k_1	$k_{cr,N}$	[-]	7,7			
Spacing	$s_{cr,N}$	[mm]	3 x h_{ef}			
Edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}			
Spacing (splitting)	$s_{cr,sp}$	[mm]	160	175	195	255
Edge distance (splitting)	$c_{cr,sp}$	[mm]	80	85	95	130
Installation factor	γ_{inst}	[-]	1,4	1,2	1,4	

[1)] In absence of other national regulations.

Ratto Concrete Screw M3CE

Performances
Characteristic resistance to tension loads

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Performances for design, shear

Type of anchor / Size			M3CE Ø8/6	M3CE Ø10/8	M3CE Ø12/10	M3CE Ø16/14
Steel failure without level arm						
Characteristic Resistance for static and quasi-static action	$V^0_{Rk,s}$	[kN]	9,4	20,1	32,4	56,9
Characteristic Resistance for seismic action in Performance category C1	$V_{Rk,s,eq}$	[kN]	NPD	12,1	19,1	39,8
Characteristic Resistance for seismic action in Performance category C2	$V_{Rk,s,eq}$	[kN]	NPD	NPD	17,7	39,8
Partial factor	γ_{Ms} [1)]	[-]	1,5			
Steel failure with level arm						
Characteristic bending moment	$M^0_{Rk,s}$	[Nm]	19	44	83	216
Ductility factor	k_7	[-]	0,8			
Partial factor	γ_{Ms} [1)]	[-]	1,5			
Concrete pryout failure						
Effective embedment depth	h_{ef}	[mm]	48	56	64	85
Factor for pryout failure	k_8	[-]	1,0		2,0	
Installation factor	γ_{inst}	[-]	1,4	1,2	1,4	
Concrete edge failure						
Effective anchorage length	l_{ef}	[mm]	48	56	64	85
Effective diameter of the anchor	d_{nom}	[mm]	6	8	10	14
Installation factor	γ_{inst}	[-]	1,4	1,2	1,4	
Factor for annular gap	α_{gap}	[-]	0,5			

[1)] In absence of other national regulations.

Ratto Concrete Screw M3CE

Performances
Characteristic resistance to shear loads

Annex C 2

Deutsches Institut für Bautechnik DIBt

Table C3: Performances under fire exposure in concrete C20/25 to C50/60 (tension)

Type of anchor / Size			M3CE Ø8/6	M3CE Ø10/8	M3CE Ø12/10	M3CE Ø16/14
Duration of fire resistance = 30min						
Steel Failure						
Characteristic Resistance	$N_{Rk,s,fi,30}$	[kN]	0,28	0,73	1,51	2,85
Pull-out failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,p,fi,30}$	[kN]	1,00	1,87	2,25	4,0
Concrete cone failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,c,fi,30}$	[kN]	2,87	4,23	5,90	12,0
Duration of fire resistance = 60min						
Steel Failure						
Characteristic Resistance	$N_{Rk,s,fi,60}$	[kN]	0,25	0,64	1,13	2,14
Pull-out failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,p,fi,60}$	[kN]	1,00	1,87	2,25	4,0
Concrete cone failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,c,fi,60}$	[kN]	2,87	4,22	5,90	12,0
Duration of fire resistance = 90min						
Steel Failure						
Characteristic Resistance	$N_{Rk,s,fi,90}$	[kN]	0,19	0,49	0,98	1,85
Pull-out failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,p,fi,90}$	[kN]	1,00	1,87	2,25	4,0
Concrete cone failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,c,fi,90}$	[kN]	2,87	4,22	5,90	12,0
Duration of fire resistance =120min						
Steel Failure						
Characteristic Resistance	$N_{Rk,s,fi,120}$	[kN]	0,14	0,39	0,75	1,43
Pull-out failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,p,fi,120}$	[kN]	0,8	1,5	1,8	3,20
Concrete cone failure						
Characteristic Resistance in concrete C20/25 to C50/60	$N_{Rk,c,fi,120}$	[kN]	2,30	3,38	4,72	9,59
Spacing	$s_{cr,N}$	[mm]	**4 x h_{ef}**			
	s_{min}		45	50	60	80
Edge distance	$c_{cr,N}$	[mm]	**2 x h_{ef}**			
	c_{min}		c_{min} = 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}			

Ratto Concrete Screw M3CE

Performances
Characteristic values for fire exposure under tension loads

Annex C 3

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Table C4: Performances under fire exposure in concrete C20/25 to C50/60 (shear)

Type of anchor / Size			M3CE Ø8/6	M3CE Ø10/8	M3CE Ø12/10	M3CE Ø16/14
Duration of fire resistance = 30min						
Characteristic resistance	$V_{Rk,s,fi,30}$	[kN]	0,28	0,73	1,51	2,85
Characteristic bending resistance	$M^0_{Rk,s,fi,30}$	[Nm]	0,24	0,87	2,22	5,76
Duration of fire resistance = 60min						
Characteristic resistance	$V_{Rk,s,fi,60}$	[kN]	0,25	0,64	1,13	2,14
Characteristic bending resistance	$M^0_{Rk,s,fi,60}$	[Nm]	0,22	0,75	1,66	4,32
Duration of fire resistance = 90min						
Characteristic resistance	$V_{Rk,s,fi,90}$	[kN]	0,19	0,49	0,98	1,85
Characteristic bending resistance	$M^0_{Rk,s,fi,90}$	[Nm]	0,17	0,58	1,44	3,74
Duration of fire resistance = 120min						
Characteristic resistance	$V_{Rk,s,fi,120}$	[kN]	0,14	0,39	0,75	1,43
Characteristic bending resistance	$M^0_{Rk,s,fi,120}$	[Nm]	0,12	0,46	1,11	2,88
Concrete pryout failure						
The characteristic resistance $V_{rk,cp,fi,Ri}$ in concrete C20/25 to C50/60 is determined by: $\mathbf{V_{Rk,c,fi(90)} = k_8 \times N_{Rk,c,fi(90)}}$ (≤ R90) and $\mathbf{V_{Rk,c,fi(120)} = k \times N_{Rk,c,fi(120)}}$ (up to R120)						
Factor k	k_8	[-]	1	1	2	2
Concrete edge failure						
The characteristic resistance $V_{rk,cp,fi,Ri}$ in concrete C20/25 to C50/60 is determined by $\mathbf{V^0_{Rk,c,fi(90)} = 0,25 \times V^0_{Rk,c}}$ (R30, R60, R90) and $\mathbf{V^0_{Rk,c,fi(120)} = 0,20 \times V^0_{Rk,c}}$ (R120) with $V^0_{Rk,c}$ as an initial value of the characteristic resistance of a single anchor in cracked concrete C20/25						

Ratto Concrete Screw M3CE

Performances
Characteristic values for fire exposure under shear loads

Annex C 4

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Table C5: Displacements

Tension loads in cracked and uncracked concrete			**M3CE Ø8/6**	**M3CE Ø10/8**	**M3CE Ø12/10**	**M3CE Ø16/14**
Service tension load in uncracked concrete C20/25	N_{ucr}	[kN]	7,62	8,89	11,90	13,61
Displacements	$\delta_{N0,ucr}$	[mm]	0,76	0,74	0,63	0,74
	$\delta_{N\infty,ucr}$	[mm]	0,29	0,34	0,23	0,41
Service tension load in cracked concrete C20/25	N_{cr}	[kN]	1,90	4,17	4,29	5,44
Displacements	$\delta_{N0,cr}$	[mm]	0,27	0,39	0,45	0,79
	$\delta_{N\infty,cr}$	[mm]	0,53	0,77	0,97	1,05
Shear loads in cracked and uncracked concrete						
Service shear load in cracked and uncracked concrete C20/25	V	[kN]	4,50	9,60	15,40	27,10
Displacements	δ_{V0}	[mm]	0,94	1,47	1,87	3,00
	$\delta_{V\infty}$	[mm]	1,41	2,20	2,81	4,50
Seismic performance category C2						
Damage limit state						
Tension load	$\delta_{N,eq(DLS)}$	[mm]	NPD	NPD	0,16	0,56
Shear load	$\delta_{V,eq(DLS)}$	[mm]	NPD	NPD	5,65	5,54
Ultimate limit state						
Tension load	$\delta_{N,eq(ULS)}$	[mm]	NPD	NPD	1,02	2,23
Shear load	$\delta_{V,eq(ULS)}$	[mm]	NPD	NPD	10,08	8,78

Ratto Concrete Screw M3CE

Performances
Displacements

Annex C 5