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-15/0893 of 16 March 2016

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	RAMSET TRUBOLT XTREM torque-controlled expansion anchor
Product family to which the construction product belongs	Torque controlled expansion anchor for use in concrete
Manufacturer	ITW Australia (Ramset) 1 Ramset Drive Chirnside Park VIC 3116 AUSTRALIEN
Manufacturing plant	Plant 1
This European Technical Assessment contains	19 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	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 2: "Torque controlled expansion anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The RAMSET TRUBOLT XTREM is a torque controlled expansion anchor. It is made of galvanised steel of sizes M8, M10, M12, M16 and M20 which is placed into a drilled hole and anchored by torque-controlled expansion.

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 anchor 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 to the assumption of a working life of the anchor 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 for static and quasi static action, displacements	See Annex C1 – C3
Characteristic resistance for seismic performance category C1	See Annex C4 – C5
Characteristic resistance for seismic performance category C2, displacements	See Annex C6 – C7

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C8 – C9

3.3 Safety in use (BWR 4)

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 001, April 2013 used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011 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 with Deutsches Institut für Bautechnik.

Issued in Berlin on 16 March 2016 by Deutsches Institut für Bautechnik

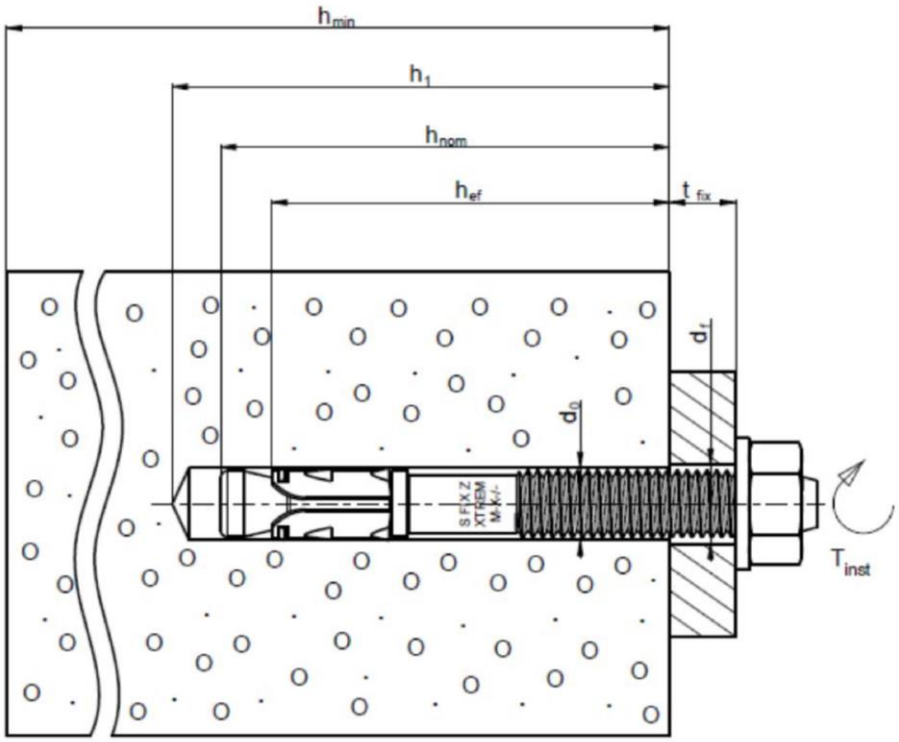
Uwe Bender
Head of Department

beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik

DIBt

Installed condition



h_{min} : Minimum thickness of concrete member
h_1 : Depth of drilled hole to deepest point
h_{nom} : Installation depth
h_{ef} : Effective anchorage depth
t_{fix} : thickness of fixture
T_{inst} : Installation torque
d_0 : Diameter of drilled hole
d_f : Diameter of clearance hole in the fixture

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Annex A1

Product description

Installed condition

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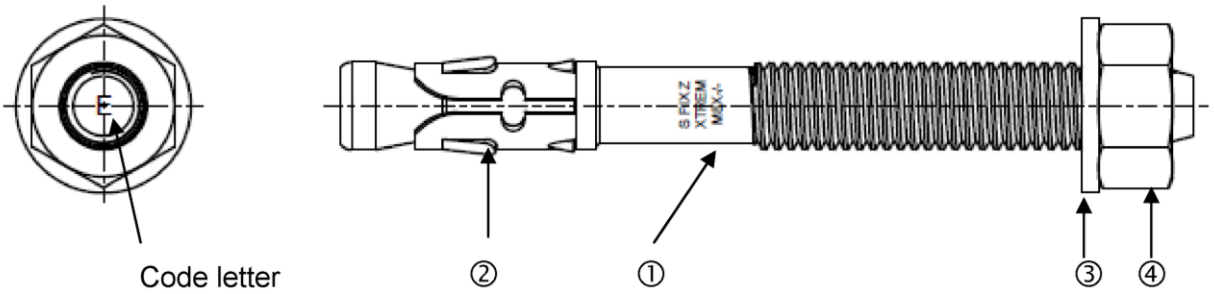
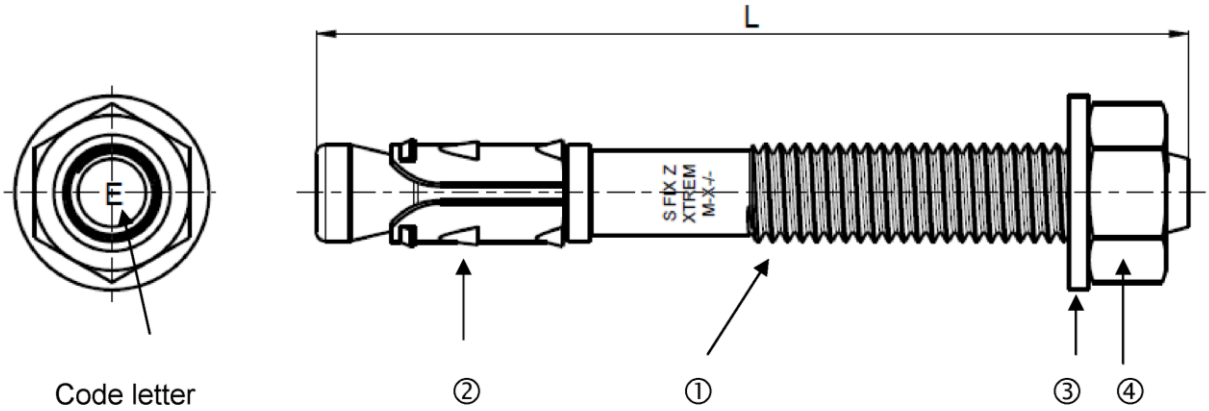
Different parts of the anchor:

- Size M8



- Size M10 to M20



Designation of ① to ④, see Table 1, Annex A3.

Marking e.g.: S FIX Z XTREM M12x115/20

S FIX Z XTREM	Trade name
M12 :	Size of anchor
115 :	Length of the bolt
20 :	Maximum thickness of the fixture

RAMSET TRUBOLT XTREM torque-controlled expansion anchor	
Product description Product and marking	**Annex A2**

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Table A1: Materials

Part (see Annex 2)	Designation	Material	Protection
①	Bolt	Carbon steel	M8 : Zinc electroplated (>5µm) EN ISO 4042:1999
			M10 –M20 : Zinc electroplated (>5µm) + anti-friction coating
②	Clip	M8 : Stainless steel (1.4404)	Scouring
		M10 – M20 : Carbon steel	Zinc electroplated (>5µm) EN ISO 4042:1999
③	Washer	M8 : NF E 25514	Zinc electroplated (>5µm) EN ISO 4042:1999
		M10-M20 : EN 10025:2004 or EN 10088-2:2005	
④	Nut	Steel , strength class 8 DIN 267 or ISO 898-2:2012	M8 - M10 : Zinc electroplated (>5µm) EN ISO 4042:1999
			M12 –M20 : Zinc electroplated (>5µm) + anti-friction coating

Table A2: Washers dimensions

Anchor size			M8	M10	M12	M16	M20
Washer sizes		d_1 [mm] inner Ø	8,4	10,5	13	17	21
Washer type	Narrow (standard version)	d_2 [mm] outer Ø	16	20	24	30	36
	Broad	d_2 [mm] outer Ø	18	22	32	40	50
	X-broad	d_2 [mm] outer Ø	22	27	40	50	60

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Product description
Material, Washer dimensions

Annex A3

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads: M8 to M20
- Seismic action for performance category C1: M8 to M20
- Seismic action for performance category C2: M10 to M20
- Fire exposure: M8 to M20

Base materials:

- Reinforced or unreinforced normal weight concrete to EN 206-1:2000.
- Strength classes C20/25 to C50/60 according to EN 206-1:2000.
- Cracked and non-cracked concrete

Use conditions (Environmental conditions):

- Structures subject to dry indoor 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.).
- Anchorages under static or quasi-static actions are designed in accordance with:
  - ETAG 001, Annex C, design method A, Edition August 2010 or
  - CEN/TS 1992-4:2009, design method A
- Anchorages under seismic action are designed in accordance with:
  - EOTA Technical Report TR 045, Edition February 2013 (Seismic performance category C1).
  - Anchorages shall be positions outside of critical regions (e.g. plastic hinges) of the concrete structure.
- Fastenings in stand-off installation or with a grout layer are not allowed.
- Anchorages under fire exposure are designed in accordance with:
  - ETAG 001, Annex C, design method A, Edition August 2010 and EOTA Technical Report TR 020, Edition May 2004 or
  - CEN/TS 1992-4:2009, Annex D
  - In case of requirements to resistance to fire local spalling of the concrete cover must be avoided.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Hole drilling by hammer drill mode
- 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.

RAMSET TRUBOLT XTREM **torque-controlled expansion anchor**	
Intended used Specifications	**Annex B1**

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Table B1: Anchor dimensions and Installation parameters

RAMSET TRUBOLT XTREM	L [mm]	Code letter	$t_{fix,max}$ [mm]	d_f [mm]	h_{min} [mm]	h_{nom} [mm]	h_{ef} [mm]	d_0 [mm]	h_1 [mm]	T_{inst} [Nm]
	(0)		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
8x65/5	68	B	5	9	100	55	46	8	65	20
8x75/15	78	D	15							
8x90/30	93	E	30							
8x120/60	123	G	60							
8x130/70	133	H	70							
8x140/80	143	I	80							
10x85/5	85	D	5	12	120	68	60	10	75	45
10x90/10	90	E	10							
10x100/20	100	F	20							
10x120/40	120	G	40							
10x140/60	140	I	60							
10x160/80	160	-	80							
12x100/5	100	E	5	14	140	80	70	12	90	60
12x105/10	105	F	10							
12x115/20	115	G	20							
12x135/40	135	I	40							
12x155/60	155	J	60							
12x180/84	180	L	85							
16x145/25	142.5	I	25	18	170	98	85	16	110	110
16x170/50	167.5	K	50							
16x180/60	177.5	L	60							
20x170/30	168	K	30	22	200	113	100	20	130	160
20x200/60	198	M	60							
20x220/80	218	O	80							

(0) Total length of the bolt [mm]
(1) Maximum thickness of the fixture, $t_{fix,max}$ [mm]
(2) Diameter of clearance hole in the fixture, d_f [mm]
(3) Minimum thickness of concrete member, h_{min} [mm]
(4) Minimum installation depth, h_{nom} [mm]
(5) Effective anchorage depth, h_{ef} [mm]
(6) Diameter of drilled hole, d_0 [mm]
(7) Depth of drilled hole to deepest point, h_1 [mm]
(8) Required torque moment, T_{inst} [Nm]

Dimensions illustrated in Annex A1:Installation

Table B2: Minimum member thickness, spacing and edge distance

Anchor size			M8	M10	M12	M16	M20
Minimum thickness of concrete member h_{min}		[mm]	**100**	**120**	**140**	**170**	**200**
Cracked concrete							
Minimum spacing	S_{min}	[mm]	50	55	60	90	100
	for C ≥	[mm]	65	70	100	100	120
Minimum edge distance	C_{min}	[mm]	50	55	60	80	100
	for S ≥	[mm]	75	90	145	110	130
Non-cracked concrete							
Minimum spacing	S_{min}	[mm]	50	55	60	90	130
	for C ≥	[mm]	90	70	100	105	120
Minimum edge distance	C_{min}	[mm]	50	60	60	90	100
	for S ≥	[mm]	75	120	145	140	160

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Intended use
Anchor dimensions and Installation parameters
Minimum member thickness, spacing and edge distance

Annex B2

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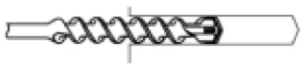
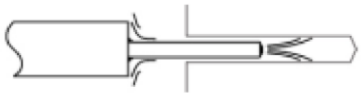
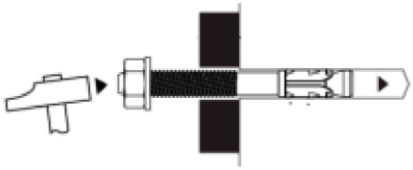
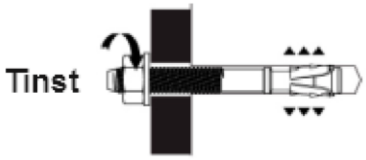
Installation instruction

	Drill hole perpendicular to concrete surface, positioning of the drill holes without damaging the reinforcement. 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 drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of the load application.
	Blow out dust
	Drive in anchor, such that h_{ef} is met. This is ensured, if the thickness of fixture is not greater than the maximum thickness of fixture marked on the anchor according to Annex B2.
	Apply installation torque T_{inst} by using calibrated torque wrench.

RAMSET TRUBOLT XTREM **torque-controlled expansion anchor**	
Intended use Installation instructions	**Annex B3**

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Table C1: Characteristic values of tension resistance for static and quasi-static actions: Design according to ETAG001, Annex C or CEN/TS 1992-4

Anchor size			M8	M10	M12	M16	M20
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	22,1	29,3	38,2	64,7	99,1
Partial safety factor	γ_{Ms} 1)	-	1,4	1,48	1,48	1,48	1,5
Pull-out failure							
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	9	20	30	40	2)
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	20	30
Partial safety factor	$\gamma_2 = \gamma_{inst}$	-	1,0				
Increasing factor for $N_{Rk,p}$	ψ_c 3)	C25/30	1,10	1,04	1,04	1,07	1,10
		C30/37	1,22	1,08	1,08	1,15	1,22
		C35/45	1,34	1,12	1,12	1,23	1,34
		C40/50	1,41	1,15	1,15	1,27	1,41
		C45/55	1,48	1,17	1,17	1,32	1,48
		C50/60	1,55	1,19	1,19	1,36	1,55
Concrete cone failure and splitting failure 4)							
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100
Factor for non-cracked concrete	k_{ucr}	-	10,1				
Factor for cracked concrete	k_{cr}	-	7,2				
Spacing	$s_{cr,N}$	[mm]	138	180	210	255	300
	$s_{cr,sp}$	[mm]	276	226	252	306	370
Edge distance	$c_{cr,N}$	[mm]	69	90	105	127,5	150
	$c_{cr,sp}$	[mm]	138	113	126	153	185
Partial safety factor	$\gamma_2 = \gamma_{inst}$	-	1,0				

1) In absence of other national regulation,
2) The pull-out failure mode is not decisive for design,
3) Use concrete strength class according to EN 206-1, The maximum concrete strength is limited to $f_{ck,cube}$=60N/mm²,
4) To give proof of splitting failure due to loading use the smaller value of $N_{Rk,p}$ and $N^0_{Rk,c}$

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Performances
Characteristic values of tension resistance for static and quasi-static actions

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values of shear resistance for static and quasi-static actions: Design according to ETAG001, Annex C or CEN/TS 1992-4

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**
Steel failure without lever arm							
Characteristic resistance	$V_{Rk,s}$	[kN]	13,7	16	23	45	61
Partial safety factor	γ_{Ms} [1)]	-	1,5	1,27	1,27	1,25	1,50
Steel failure with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	[N,m]	28	52,8	91,3	194,0	315,7
Partial safety factor	γ_{Ms} [1)]	-	1,5	1,27	1,27	1,25	1,50
Concrete pry-out failure							
k Factor	$k = k_3$	-	1	2	2	2	2
Partial safety factor	$\gamma_2 = \gamma_{inst}$	-	1,0				
Concrete edge failure							
Effective length of anchor under shear loading	l_f	[mm]	46	60	70	85	100
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20
Partial safety factor	$\gamma_2 = \gamma_{inst}$	-	1,0				

[1)] In absence of other national regulation,

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Performances
Characteristic values of shear resistance for static and quasi-static actions

Annex C2

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Table C3: Displacement under tension loads for static and quasi-static actions

Anchor size			M8	M10	M12	M16	M20
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100
Tension load in cracked concrete C20/25	N	[kN]	1,4	4,3	7,6	9,5	14,3
Displacements in cracked concrete under tension	δ_{N0}	[mm]	0,3	0,4	0,4	0,4	0,4
	$\delta_{N\infty}$	[mm]	1,3	1,6	1,7	1,7	1,7
Tension load in non-cracked concrete C20/25	N	[kN]	3,6	9,5	14,3	19,0	23,8
Displacements in non-cracked concrete under tension	δ_{N0}	[mm]	0,1	0,4	0,4	0,4	0,4
	$\delta_{N\infty}$	[mm]	1,3	1,6	1,7	1,7	1,7

Table C4: Displacement under shear loads for static and quasi-static actions

Anchor size			M8	M10	M12	M16	M20
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85	100
Shear load	V	[kN]	6,5	9	12,9	25,4	34,5
Displacements	δ_{V0}	[mm]	2,0	1,5	1,5	1,5	1,5
	$\delta_{V\infty}$	[mm]	3,0	2,3	2,3	2,3	2,3

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Performances
Displacements under tension and shear loads for static and quasi-static actions

Annex C3

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Table C5 : Characteristic tension resistance for seismic loading, performance category C1: Design according to TR045

The definition of seismic performance category C1 is given in TR045 §5.2.

Anchor size			M8	M10	M12	M16	M20
Steel failure							
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	18,5	29,3	38,2	64,7	99,1
Partial safety factor	$\gamma_{Ms,C1}$ [1)]	-	1,4	1,48	1,48	1,48	1,5
Pull-out failure							
Characteristic resistance	$N_{Rk,p,C1}$	[kN]	4,7	7,4	16,0	20,0	30,0
Partial safety factor	$\gamma_{2,C1}$	-	1,0				
Concrete cone failure [2)]							
Partial safety factor	$\gamma_{2,C1}$	-	1,0				
Splitting failure [2)]							
Partial safety factor	$\gamma_{2,C1}$	-	1,0				

1) In absence of other national regulation,
2) For concrete cone failure and splitting failure see TR045 - §5.6.2

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Performances
Characteristic tension resistance for seismic loading, performance category C1

Annex C4

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Table C6 : Characteristic shear resistance for seismic loading, performance category C1: Design according to TR045

The definition of seismic performance category C1 is given in TR045 §5.2,

Anchor size			**M8**	**M10**	**M12**	**M16**	**M20**
Steel failure							
Characteristic resistance	$V_{Rk,s,C1}$	[kN]	6	16	23	45	61
Partial safety factor	$\gamma_{Ms,C1}$ [1)]	-	1,50	1,27	1,27	1,25	1,50
Concrete pryout failure [2)]							
Partial safety factor	$\gamma_{2,C1}$	-	1,0				
Concrete edge failure [2)]							
Partial safety factor	$\gamma_{2,C1}$	-	1,0				

1) In absence of other national regulation,
2) For pryout failure and concrete edge failure see TR045 - §5.6.2

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Performances
Characteristic shear resistance for seismic loading, performance category C1

Annex C5

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Table C7 : Characteristic tension resistance for seismic loading, performance category C2: Design according to TR045

The definition of seismic performance category C2 is given in TR045 §5.2.

Anchor size			**M10**	**M12**	**M16**	**M20**
Steel failure						
Characteristic resistance	$N_{Rk,s,C2}$	[kN]	29,3	38,2	64,7	99,1
Partial safety factor	$\gamma_{Ms,C2}$ [1)]	-	1,48	1,48	1,48	1,5
Pull-out failure						
Characteristic resistance	$N_{Rk,p,C2}$	[kN]	2,8	6,0	18,0	25,6
Partial safety factor	$\gamma_{2,C2}$	-	1,0			
Concrete cone failure [2)]						
Partial safety factor	$\gamma_{2,C2}$	-	1,0			
Splitting failure [2)]						
Partial safety factor	$\gamma_{2,C2}$	-	1,0			

1) In absence of other national regulation,
2) For concrete cone failure and splitting failure see TR045 - §5.6.2

Table C8 : Displacement under tension loads for seismic loading, performance category C2

Anchor size			M10	M12	M16	M20
Displacement DLS	$\delta_{N,seis\ (DLS)}$	[mm]	3,1	2,1	5,1	4,97
Displacement ULS	$\delta_{N,seis\ (ULS)}$	[mm]	14	7	14	13

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Performances
Characteristic tension resistance,and displacements under tension loads for seismic loading, performance category C2

Annex C6

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Table C9 : Characteristic shear resistance for seismic loading, performance category C2 Design according to TR045

The definition of seismic performance category C2 is given in TR045 §5.2.

Anchor size			**M10**	**M12**	**M16**	**M20**
Steel failure						
Characteristic resistance	$V_{Rk,s,C2}$	[kN]	9,7	14,0	33,9	44,7
Partial safety factor	$\gamma_{Ms,C2}$ [1)]	-	1,27	1,27	1,25	1,50
Concrete pryout failure [2)]						
Partial safety factor	$\gamma_{2,C2}$	-	1,0			
Concrete edge failure [2)]						
Partial safety factor	$\gamma_{2,C2}$	-	1,0			

1) In absence of other national regulation,
2) For concrete pryout failure and concrete edge failure see TR045 - §5.6.2,

Table C10 : Displacement under shear loads for seismic loading, performance category C2

Anchor size			M10	M12	M16	M20
Displacement DLS	$\delta_{V,seis\ (DLS)}$	[mm]	3,8	4,1	4,7	4,9
Displacement ULS	$\delta_{V,seis\ (ULS)}$	[mm]	6,0	6,3	9,0	9,0

RAMSET TRUBOLT XTREM torque-controlled expansion anchor	**Annex C7**
Performances Characteristic shear resistance for seismic loading, performance category C2	

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Table C11 : Characteristic tension resistance under fire exposure in cracked and non-cracked concrete : design according to TR020 and ETAG 001, Annex C or CEN/TS 1992-4 Annex D,

Anchor size				M8	M10	M12	M16	M20
Steel failure								
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,9	2,8	3,6	6,6	10,4
	R60	$N_{Rk,s,fi}$	[kN]	0,7	2,3	3,1	5,7	9,0
	R90	$N_{Rk,s,fi}$	[kN]	0,5	1,8	2,6	4,9	7,6
	R120	$N_{Rk,s,fi}$	[kN]	0,4	1,6	2,4	4,4	6,9
Pullout failure								
Characteristic resistance in concrete ≥ C20/25	R30	$N_{Rk,p,fi}$	[kN]	1,3	2,3	4,0	5,0	7,5
	R60	$N_{Rk,p,fi}$	[kN]	1,3	2,3	4,0	5,0	7,5
	R90	$N_{Rk,p,fi}$	[kN]	1,3	2,3	4,0	5,0	7,5
	R120	$N_{Rk,p,fi}$	[kN]	1,0	1,8	3,2	4,0	6,0
Concrete cone failure								
Characteristic resistance in concrete ≥ C20/25	R30	$N_{Rkc,fi}$	[kN]	2,6	5,0	7,4	12,0	18,0
	R60	$N_{Rkc,fi}$	[kN]	2,6	5,0	7,4	12,0	18,0
	R90	$N_{Rkc,fi}$	[kN]	2,6	5,0	7,4	12,0	18,0
	R120	$N_{Rkc,fi}$	[kN]	2,1	4,0	5,9	9,6	14,4
Spacing	-	$s_{cr,N}$	[mm]	$4 \times h_{ef}$				
	-	s_{min}	[mm]	50	55	100	90	100
Edge distance	-	$c_{cr,N}$	[mm]	$2 \times h_{ef}$				
	-	c_{min}	[mm]	$c_{min} = 2 \times h_{ef}$. if the fire attack is from more than one side, the edge distance of the anchor has to be 300 mm and $2 \times h_{ef}$				

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Annex C8

Performances
Characteristic tension resistance under fire exposure in cracked and non-cracked concrete

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Table C12 : Characteristic shear resistance under fire exposure in cracked and non-cracked concrete C20/25 to C50/60 : design according to TR020 and ETAG 001, Annex C or CEN/TS 1992-4 Annex D,

Anchor size				M8	M10	M12	M16	M20
Steel failure without level arm								
Characteristic resistance	R30	$V^0_{Rk,s,fi}$	[kN]	0,9	1,4	1,8	3,3	5,2
	R60	$V^0_{Rk,s,fi}$	[kN]	0,7	1,1	1,5	2,9	4,5
	R90	$V^0_{Rk,s,fi}$	[kN]	0,5	0,9	1,3	2,4	3,8
	R120	$V^0_{Rk,s,fi}$	[kN]	0,4	0,8	1,2	2,2	3,4
Steel failure with level arm								
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,9	3,5	5,5	14,1	27,5
	R60	$M^0_{Rk,s,fi}$	[Nm]	0,7	2,9	4,8	12,2	23,8
	R90	$M^0_{Rk,s,fi}$	[Nm]	0,5	2,3	4,0	10,3	20,1
	R120	$M^0_{Rk,s,fi}$	[Nm]	0,4	2,0	3,7	9,3	18,2
Concrete pryout failure								
k- Factor		$k = k_3$	-	1	2	2	2	2
The above values of k factor and the relevant values of $N_{Rk,c,fi}$ given in Annex C8 Table C11 have to be considered in the design								
Concrete edge failure								
The characteristic resistance $V^0_{Rk,c,fi}$ in C20/25 to C50/60 concrete is determined by : $V^0_{Rk,c,fi} = 0,25 \times V^0_{Rk,c}$ ($\leq$R90) and $V^0_{Rk,c,fi} = 0,2 \times V^0_{Rk,c}$ (R120) with $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature according to ETAG 001; Annex C, §5.2.3.4.								

RAMSET TRUBOLT XTREM
torque-controlled expansion anchor

Performances
Characteristic shear resistance under fire exposure in cracked and non-cracked concrete

Annex C9