

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-15/0388**  
**of 30 September 2015**

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

SPIT FIX Z XTREM torque-controlled expansion anchor

Product family  
to which the construction product belongs

Torque controlled expansion anchor for use in concrete

Manufacturer

SPIT  
ANCHORS & PINS INDUSTRIAL UNIT  
150 route de Lyon  
26501 BOURG LES VALENCE CEDEX  
FRANKREICH

Manufacturing plant

Spit

This European Technical Assessment  
contains

19 pages including 3 annexes

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 SPIT FIX Z XTREM torque controlled expansion anchor 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 and displacements	See Annex C1 – C3
Characteristic resistance for seismic performance category C1	See Annex C4 – C5
Characteristic resistance for seismic performance category C2 and displacements	See Annex C6 – C7

**3.2 Safety in case of fire (BWR 2)**

Essential characteristic	Performance
Reaction to fire	Anchorage 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

English translation prepared by DIBt

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

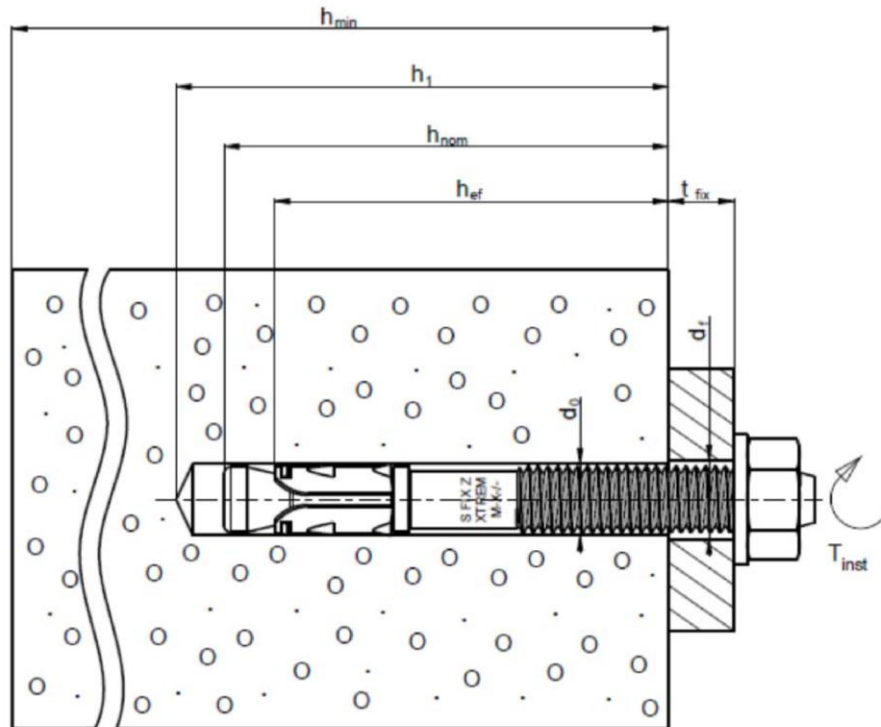
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 30 September 2015 by Deutsches Institut für Bautechnik

Uwe Bender  
Head of Department

*beglaubigt:*  
Lange

**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

**SPIT FIX Z XTREM torque-controlled expansion anchor**

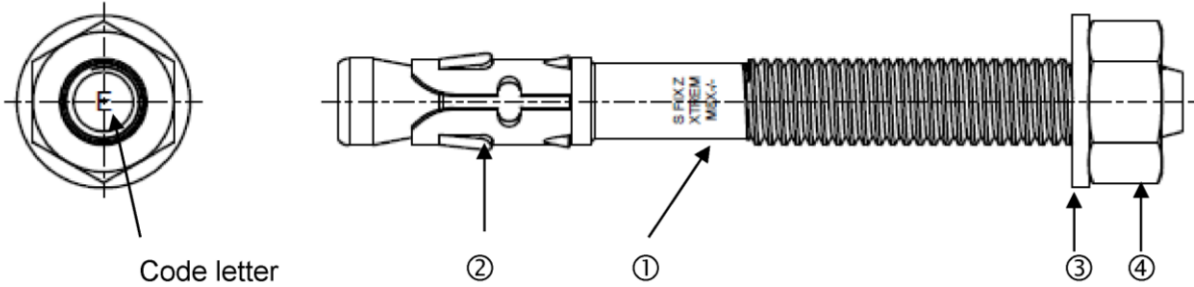
**Product description**

Installed condition

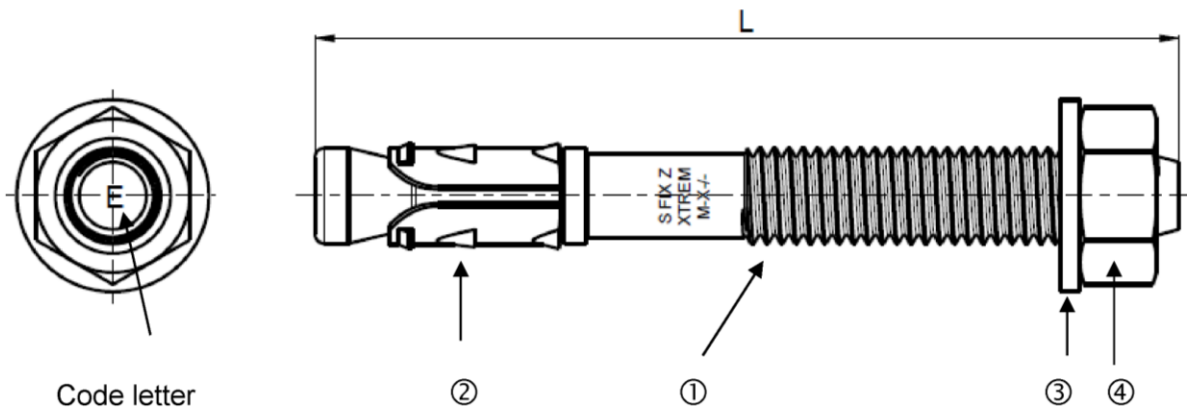
**Annex A1**

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

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Product description**  
Product and marking

**Annex A2**

**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 <sub>1</sub> [mm] inner Ø	8,4	10,5	13	17	21
Washer type	Narrow (standard version)	d <sub>2</sub> [mm] outer Ø	16	20	24	30	36
	Broad	d <sub>2</sub> [mm] outer Ø	18	22	32	40	50
	X-broad	d <sub>2</sub> [mm] outer Ø	22	27	40	50	60

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Product description**

Material, Washer dimensions

**Annex A3**

## Specifications of intended use

### **Anchorage 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 positioned 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.

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Intended used  
Specifications**

**Annex B1**



**Table B1: Anchor dimensions and Installation parameters**

Spit FIX Z XTREM	L [mm]	Code letter	$t_{\text{fix,max}}$ [mm]	$d_f$ [mm]	$h_{\text{min}}$ [mm]	$h_{\text{nom}}$ [mm]	$h_{\text{ef}}$ [mm]	$d_0$ [mm]	$h_1$ [mm]	$T_{\text{inst}}$ [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,  $t_{\text{fix,max}}$  [mm]

(2) Diameter of clearance hole in the fixture,  $d_f$  [mm]

(3) Minimum thickness of concrete member,  $h_{\text{min}}$  [mm]

(4) Minimum installation depth,  $h_{\text{nom}}$  [mm]

(5) Effective anchorage depth,  $h_{\text{ef}}$  [mm]

(6) Diameter of drilled hole,  $d_0$  [mm]

(7) Depth of drilled hole to deepest point,  $h_1$  [mm]

(8) Required torque moment,  $T_{\text{inst}}$  [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 $h_{\text{min}}$	[mm]	100	120	140	170	200
<b>Cracked concrete</b>						
Minimum spacing	$S_{\text{min}}$	50	55	60	90	100
	for $C \geq$	65	70	100	100	120
Minimum edge distance	$C_{\text{min}}$	50	55	60	80	100
	for $S \geq$	75	90	145	110	130
<b>Non-cracked concrete</b>						
Minimum spacing	$S_{\text{min}}$	50	55	60	90	130
	for $C \geq$	90	70	100	105	120
Minimum edge distance	$C_{\text{min}}$	50	60	60	90	100
	for $S \geq$	75	120	145	140	160

**SPIT FIX Z XTREM torque-controlled expansion anchor**



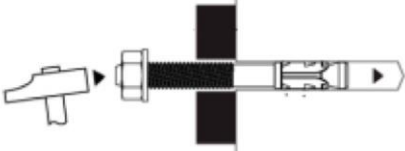
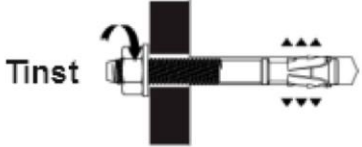
**Intended use**

Anchor dimensions and Installation parameters

Minimum member thickness, spacing and edge distance

**Annex B2**

### Installation instruction

	<p>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.</p>
	<p>Blow out dust</p>
	<p>Drive in anchor, such that <math>h_{ef}</math> 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.</p>
	<p>Apply installation torque <math>T_{inst}</math> by using calibrated torque wrench.</p>

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Intended use**  
Installation instructions

**Annex B3**

**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
<b>Steel failure</b>							
Characteristic resistance	$N_{Rk,s}$	[kN]	22,1	29,3	38,2	64,7	99,1
Partial safety factor	$\gamma_{Ms}$ <sup>1)</sup>	-	1,4	1,48	1,48	1,48	1,5
<b>Pull-out failure</b>							
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 $N_{Rk,p}$	$\psi_c$ <sup>3)</sup>	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
<b>Concrete cone failure and splitting failure<sup>4)</sup></b>							
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  $f_{ck,cube}=60N/mm^2$ ,

4) To give proof of splitting failure due to loading use the smaller value of  $N_{Rk,p}$  and  $N_{Rk,c}^0$

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

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

**Annex C1**

**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
<b>Steel failure without lever arm</b>							
Characteristic resistance	$V_{Rk,s}$	[kN]	13,7	16	23	45	61
Partial safety factor	$\gamma_{Ms}^{1)}$	-	1,5	1,27	1,27	1,25	1,50
<b>Steel failure with lever arm</b>							
Characteristic resistance	$M_{Rk,s}^0$	[N,m]	28	52,8	91,3	194,0	315,7
Partial safety factor	$\gamma_{Ms}^{1)}$	-	1,5	1,27	1,27	1,25	1,50
<b>Concrete pry-out failure</b>							
k Factor	$k = k_3$	-	1	2	2	2	2
Partial safety factor	$\gamma_2 = \gamma_{inst}$	-	1,0				
<b>Concrete edge failure</b>							
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				

<sup>1)</sup> In absence of other national regulation,

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

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

**Annex C2**

**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	$\delta_{N0}$	[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	$\delta_{N0}$	[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	$\delta_{V0}$	[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

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

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

**Annex C3**

**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.

Anchor size			M8	M10	M12	M16	M20
<b>Steel failure</b>							
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
<b>Pull-out failure</b>							
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				
<b>Concrete cone failure <sup>2)</sup></b>							
Partial safety factor	$\gamma_{2,C1}$	-	1,0				
<b>Splitting failure <sup>2)</sup></b>							
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

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

Characteristic tension resistance for seismic loading, performance category C1

**Annex C4**

**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
<b>Steel failure</b>							
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
<b>Concrete pryout failure <sup>2)</sup></b>							
Partial safety factor	$\gamma_{2,C1}$	-	1,0				
<b>Concrete edge failure <sup>2)</sup></b>							
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

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

Characteristic shear resistance for seismic loading, performance category C1

**Annex C5**

**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
<b>Steel failure</b>						
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
<b>Pull-out failure</b>						
Characteristic resistance	$N_{Rk,p,C2}$	[kN]	2,8	6,0	18,0	25,6
Partial safety factor	$\gamma_{2,C2}$	-	1,0			
<b>Concrete cone failure <sup>2)</sup></b>						
Partial safety factor	$\gamma_{2,C2}$	-	1,0			
<b>Splitting failure <sup>2)</sup></b>						
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

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

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

**Annex C6**



**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
<b>Steel failure</b>						
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
<b>Concrete pryout failure <sup>2)</sup></b>						
Partial safety factor	$\gamma_{2,C2}$	-	1,0			
<b>Concrete edge failure <sup>2)</sup></b>						
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

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

Characteristic shear resistance for seismic loading, performance category C2

**Annex C7**

**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
<b>Steel failure</b>								
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,9	0,9	1,7	3,1	4,9
	R60	$N_{Rk,s,fi}$	[kN]	0,7	0,8	1,3	2,4	3,7
	R90	$N_{Rk,s,fi}$	[kN]	0,5	0,6	1,1	2,0	3,2
	R120	$N_{Rk,s,fi}$	[kN]	0,4	0,5	0,8	1,6	2,5
<b>Pullout failure</b>								
Characteristic resistance in concrete $\geq C20/25$	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
<b>Concrete cone failure</b>								
Characteristic resistance in concrete $\geq C20/25$	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 x $h_{ef}$				
	-	$s_{min}$	[mm]	50	55	100	90	100
Edge distance	-	$c_{cr,N}$	[mm]	2 x $h_{ef}$				
	-	$c_{min}$	[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 x $h_{ef}$				

In absence of other national regulations the partial safety factor for resistance under fire exposure  $\gamma_{M,fi} = 1,0$  is recommended

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

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

**Annex C8**

**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
<b>Steel failure without level arm</b>								
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0.9	0,9	1,7	3,1	4,9
	R60	$V_{Rk,s,fi}$	[kN]	0.7	0,8	1,3	2,4	3,7
	R90	$V_{Rk,s,fi}$	[kN]	0.5	0,6	1,1	2,0	3,2
	R120	$V_{Rk,s,fi}$	[kN]	0.4	0,5	0,8	1,6	2,5
<b>Steel failure with level arm</b>								
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0.9	1,1	2,6	6,7	13
	R60	$M^0_{Rk,s,fi}$	[Nm]	0.7	1,0	2,0	5,0	9,7
	R90	$M^0_{Rk,s,fi}$	[Nm]	0.5	0,7	1,7	4,3	8,4
	R120	$M^0_{Rk,s,fi}$	[Nm]	0.4	0,6	1,3	3,3	6,5
<b>Concrete pryout failure</b>								
k- Factor	$k = k_3$	-	1	2	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								
<b>Concrete edge failure</b>								
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.								

In absence of other national regulations the partial safety factor for resistance under fire exposure  $\gamma_{M,fi} = 1,0$  is recommended

**SPIT FIX Z XTREM torque-controlled expansion anchor**

**Performances**

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

**Annex C9**