

**CSTB**

le futur en construction

**Centre Scientifique et  
Technique du Bâtiment**

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**European Technical  
Assessment**

**ETA-14/0215  
dated 20/09/2017**

*English translation prepared by CSTB - Original version in French language*

**General Part**

Nom commercial  
*Trade name*

**TB1-PLUS**

Famille de produit  
*Product family*

**Cheville métallique à expansion par vissage à couple contrôlé, de fixation dans le béton fissuré et non fissuré diamètres M8, M10, M12 et M16**

***Torque-controlled expansion anchor for use in cracked and uncracked concrete: sizes M8, M10, M12 and M16***

Titulaire  
*Manufacturer*

Sympafix BV  
Fluorietweg 25E  
1812RR Alkmaar  
The Netherlands

Usine de fabrication  
*Manufacturing plants*

Plant 4MT

Cette évaluation contient:  
*This Assessment contains*

13 pages incluant 10 pages d'annexes qui font partie intégrante de cette évaluation  
*13 pages including 10 pages of annexes which form an integral part of this assessment*

Base de l'ETE  
*Basis of ETA*

EAD 330232-00-0601, "Ancrages mécaniques dans le béton"  
*EAD 330232-00-0601, "Mechanical fasteners for use in concrete"*

Cette évaluation remplace:  
*This Assessment replaces*

ETE-14/0215 délivrée le 03/08/2016  
*ETA-14/0215 issued on 03/08/2016*

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## Specific Part

### 1 Technical description of the product

The TB1-PLUS anchor is an anchor made of zinc electroplated steel which is placed into a drilled hole and anchored by torque-controlled expansion.

The anchor is placed into a drilled hole and anchored by torque-controlled expansion.

The illustration and the description of the product are given in Annexes A.

### 2 Specification of the intended use

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

The provisions made in this European technical assessment are based on an assumed working life of the anchor of 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

#### 3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic tension resistance	See Annex C1
Characteristic shear resistance	See Annex C2
Displacements	See Annex C5
Characteristic resistance under seismic action	See Annex C6

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

Essential characteristic	Performance
Reaction to fire	Anchorage satisfy requirements for Class A1
Characteristic tension resistance under fire	See Annex C3
Characteristic shear resistance under fire	See Annex C4

#### 3.3 Hygiene, health and the environment (BWR 3)

Regarding dangerous substances contained in this European technical approval, there may be requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

#### 3.4 Safety in use (BWR 4)

For Basic requirement Safety in use the same criteria are valid as for Basic Requirement Mechanical resistance and stability.

#### 3.5 Protection against noise (BWR 5)

Not relevant.

#### 3.6 Energy economy and heat retention (BWR 6)

Not relevant.

#### 3.7 Sustainable use of natural resources (BWR 7)

For the sustainable use of natural resources no performance was determined for this product.

### 3.8 General aspects relating to fitness for use

Durability and Serviceability are only ensured if the specifications of intended use according to Annex B1 are kept.

## 4 Assessment and verification of constancy of performance (AVCP)

According to the Decision 96/582/EC of the European Commission<sup>1</sup>, as amended, the system of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) given in the following table apply.

Product	Intended use	Level or class	System
Metal anchors for use in concrete	For fixing and/or supporting to concrete, structural elements (which contributes to the stability of the works) or heavy units	—	1

## 5 Technical details necessary for the implementation of the AVCP system

Technical details necessary for the implementation of the Assessment and verification of constancy of performance (AVCP) system are laid down in the control plan deposited at Centre Scientifique et Technique du Bâtiment.

The manufacturer shall, on the basis of a contract, involve a notified body approved in the field of anchors for issuing the certificate of conformity CE based on the control plan.

**The original French version is signed by**

Charles Baloche  
Technical Director

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<sup>1</sup> Official Journal of the European Communities L 254 of 08.10.1996

**Hex head version:**



**Marking on the bolt:**

MX/L, where:

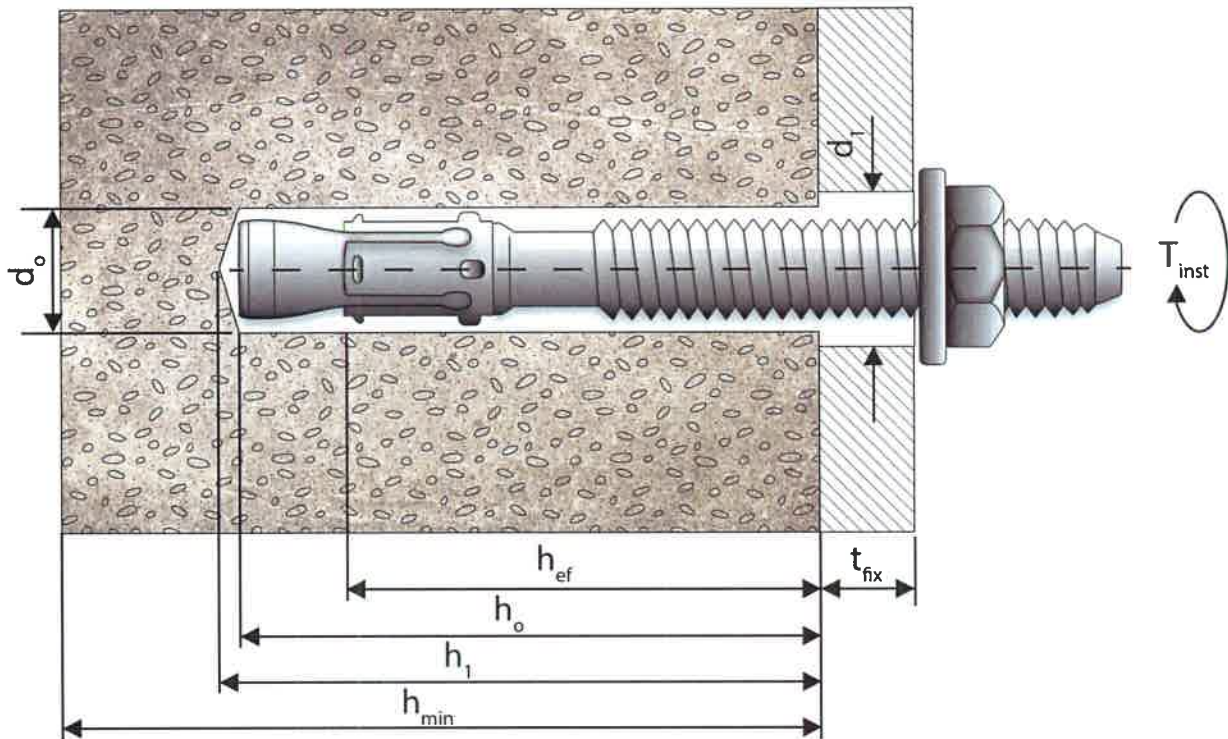
MX = thread diameter

L = total length

**Marking on the clip:**

SX TB1

**Intended use:**



Intended use:

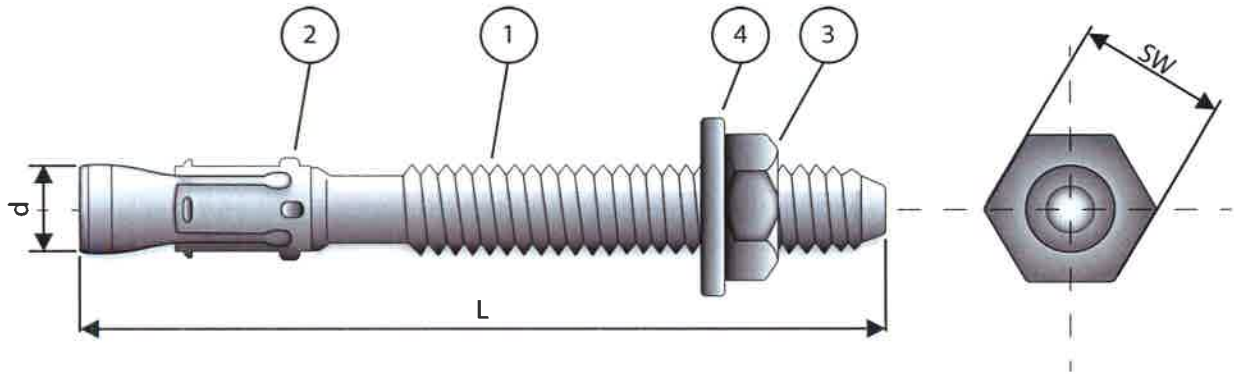
**Use in cracked or uncracked concrete in dry internal conditions**

TB1-PLUS

Product description  
Installation conditions

Annex A1

**Different parts of the anchor:**



**Table 1: Materials**

Part	Designation	Material	Protection
1	Thread bolt	Coldform steel, grade C-1035	Zinc plated 5 $\mu\text{m}$
2	Expansion clip	Stainless steel	-
3	Washer	DIN 125 or EN ISO 7089 DIN 9021 or DIN 440 or D IN EN ISO 7093	Zinc plated
4	Hexagonal nut	DIN 934 Grade 8 acc. to DIN 267-4	Zinc plated

TB1-PLUS

Product description  
 Material

Annex A2

## Specifications of intended use

### Anchorage subject to:

- Static, quasi-static and fire.

### Base materials:

- Cracked concrete and non-cracked concrete
- Reinforced or unreinforced normal weight concrete of strength classes C 20/25 at least to C50/60 at most according to EN 206: 2000-12.

### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions.

### Design:

- The anchorages are designed in accordance with the ETAG001 Annex C "Design Method for Anchorages" or CEN/TS 1992-4-4 "Design of fastenings for use in concrete" under the responsibility of an engineer experienced in anchorages and concrete work.
- For application with resistance under fire exposure the anchorages are designed in accordance with method given in TR020 "Evaluation of Anchorage in Concrete concerning Resistance to Fire".
- 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.

### Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging the components of an anchor.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Effective anchorage depth, edge distances and spacing not less than the specified values without minus tolerances.
- Hole drilling by hammer drill.
- Cleaning of the hole of drilling dust.
- Application of specified torque moment using a calibrated torque wrench.
- In case of aborted hole, drilling of new hole at a minimum distance of twice the depth of the aborted hole, or smaller distance provided the aborted drill hole is filled with high strength mortar and no shear or oblique tension loads in the direction of aborted hole.

TB1-PLUS

Intended Use  
Specifications

Annex B1

Table 2: Anchor dimensions

			M8	M10	M12	M16	
Length of the anchor	Min.	L	[mm]	60	85	90	115
	Max.		[mm]	240	220	220	220
Fixture thickness	Min.	$t_{fix}$	[mm]	1	1	1	1
	Max.		[mm]	185	140	130	100
Length expansion sleeve		$l_{clip}$	[mm]	14	18	22	26
Width torque wrench		SW	[mm]	13	17	19	24

Table 3: Installation data

			M8	M10	M12	M16
Drill hole diameter	$d_{cut}$	[mm]	≤ 8,45	≤ 10,45	≤ 12,5	≤ 16,5
Drill hole depth	$h_1$	[mm]	55	75	75	100
Embedment depth	$h_{ef}$	[mm]	40	60	60	80
Installation torque	$T_{inst}$	[Nm]	30	50	70	130
Diameter through hole fixture	$d_f$	[mm]	9	12	14	18
Min. member thickness	$h_{min}$	[mm]	100	120	120	160
Minimum edge distance	$c_{min}$	[mm]	65	60	80	85
Minimum spacing	$s_{min}$	[mm]	65	150	80	85

TB1-PLUS

Annex B2

Intended Use  
 Installation parameters

**Table 4: Characteristic values for tension loads in case of static and quasi static loading for design method A**

			M8	M10	M12	M16	
<b>Steel failure</b>							
Char. resistance	$N_{RK,s}$	[kN]	22,2	31,6	43,4	75,4	
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,88				
<b>Pullout failure <math>N_{RK,p} = \Psi_c \times N^0_{RK,p}</math></b>							
Char. resistance in concrete C20/25	cracked	$N^0_{RK,p}$	[kN]	3	9	12	12
	non-cracked	$N^0_{RK,p}$	[kN]	6	12	12	35
Partial safety factor for cracked or non-cracked concrete	$\gamma_2 = \gamma_{inst}$	[-]	1,2		1,4		
Increasing factor for $N_{RK}$	concrete C30/37	$\Psi_c$	[-]	1,22			
	concrete C40/50		[-]	1,41			
	concrete C50/60		[-]	1,55			
<b>Concrete cone failure and splitting failure</b>							
Effective embedment depth	$h_{ef}$	[mm]	40	60	60	80	
Factor for determination of the resistance to concrete cone failure	$k_1 = k_{cr}$	[-]	Values are given in TR055 depending of the design guide				
	$k_1 = k_{ucr}$	[-]					
Partial safety factor for cracked or non-cracked concrete	$\gamma_2 = \gamma_{inst}$	[-]	1,2		1,4		
Increasing factor for $N_{RK}$	concrete C30/37	$\Psi_c$	[-]	1,22			
	concrete C40/50		[-]	1,41			
	concrete C50/60		[-]	1,55			
Char. spacing	concrete cone failure	$S_{cr,N}$	[mm]	120	180	180	240
	splitting failure	$S_{cr,sp}$	[mm]	200	300	360	400
Char. edge distance	concrete cone failure	$C_{cr,N}$	[mm]	60	90	90	120
	splitting failure	$C_{cr,sp}$	[mm]	100	150	180	200

1) In absence of other national regulations

TB1-PLUS	Annex C1
Design according to Technical Report TR055 Characteristic resistance under tension loads	



**Table 5: Characteristic values for shear loads in case of static and quasi static loading for design method A**

			<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>
<b>Steel failure without lever arm</b>						
Char. resistance	$V_{Rk,s}$	[kN]	8,1	17,6	24,7	45,9
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,25			
<b>Steel failure with lever arm</b>						
Char. bending resistance	$M^0_{Rk,s}$	[Nm]	22,8	45,5	76,6	194,8
Partial safety factor	$\gamma_{Ms}^{1)}$	[-]	1,25			
<b>Concrete pry-out failure</b>						
Factor for determination of resistance to pry-out failure	$k_3=k_8$	[-]	1,0	2,0	2,0	2,0
Partial safety factor	$\gamma_2 = \gamma_{inst}^{1)}$	[-]	1,0			
<b>Concrete edge failure</b>						
Effective length of anchor under shear loading	$l_f$	[mm]	40	60	60	80
Outside diameter of anchor	$d_{nom}$	[mm]	8	10	12	16
Partial safety factor	$\gamma_2 = \gamma_{inst}^{1)}$	[-]	1,0			

<sup>1)</sup> In absence of other national regulations

TB1-PLUS

Annex C2

Design according to Technical Report TR055  
 Characteristic resistance under shear loads

**Table 6: Characteristic tension resistance in cracked and non-cracked concrete under fire exposure for design method A acc. TR020**

			M8	M10	M12	M16
<b>Steel failure</b>						
Characteristic resistance	R30 $N_{Rk,s,fi}$	[kN]	0,4	0,9	1,7	3,1
	R60 $N_{Rk,s,fi}$	[kN]	0,3	0,8	1,3	2,4
	R90 $N_{Rk,s,fi}$	[kN]	0,3	0,6	1,1	2,0
	R120 $N_{Rk,s,fi}$	[kN]	0,2	0,5	0,8	1,6
<b>Pullout failure (cracked and non-cracked concrete)</b>						
Char. resistance in concrete $\geq$ C20/25	R30 $N_{Rk,p,fi}$	[kN]	0,8	2,3	3,0	4,0
	R60 $N_{Rk,p,fi}$	[kN]	0,8	2,3	3,0	4,0
	R90 $N_{Rk,p,fi}$	[kN]	0,8	2,3	3,0	4,0
	R120 $N_{Rk,p,fi}$	[kN]	0,6	1,8	2,4	3,2
<b>Concrete cone and splitting failure<sup>2)</sup> (cracked and non-cracked concrete)</b>						
Char. resistance in concrete $\geq$ C20/25	R30 $N^0_{Rk,c,fi}$	[kN]	1,8	5,0	5,0	10,3
	R60 $N^0_{Rk,c,fi}$	[kN]	1,8	5,0	5,0	10,3
	R90 $N^0_{Rk,c,fi}$	[kN]	1,8	5,0	5,0	10,3
	R120 $N^0_{Rk,c,fi}$	[kN]	1,5	4,0	4,0	8,2
Characteristic spacing	$s_{cr,N,fi}$	[mm]	160	240	240	320
Characteristic edge distance	$c_{cr,N,fi}$	[mm]	80	120	120	160

<sup>1)</sup> Design under fire exposure is performed according to the design method given in TR 020. Under fire exposure usually cracked concrete is assumed. The design equations are given in TR 020, Section 2.2.1.

<sup>2)</sup> As a rule, splitting failure can be neglected when cracked concrete and reinforcement is assumed.

TR 020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to  $c_{min} \geq 300$  mm and  $\geq 2 \cdot h_{ef}$ .

In absence of national regulation, the partial safety factor  $\gamma_{Ms} = 1,0$  is recommended in fire situation

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Annex C3

Design according to Technical Report TR020  
Characteristic tension resistance under fire exposure

**Table 7: Characteristic shear resistance in cracked and non-cracked concrete under fire exposure for design method A acc. TR020**

			M8	M10	M12	M16
<b>Steel failure without lever arm</b>						
Characteristic resistance	R30 $V_{Rk,s,fi}$	[kN]	0,4	0,9	1,7	3,1
	R60 $V_{Rk,s,fi}$	[kN]	0,3	0,8	1,3	2,4
	R90 $V_{Rk,s,fi}$	[kN]	0,3	0,6	1,1	2,0
	R120 $V_{Rk,s,fi}$	[kN]	0,2	0,5	0,8	1,6

<b>Steel failure with lever arm</b>						
Characteristic bending moment	R30 $M^0_{Rk,s,fi}$	[Nm]	0,4	1,1	2,6	6,7
	R60 $M^0_{Rk,s,fi}$	[Nm]	0,3	1,0	2,0	5,0
	R90 $M^0_{Rk,s,fi}$	[Nm]	0,3	0,7	1,7	4,3
	R120 $M^0_{Rk,s,fi}$	[Nm]	0,2	0,6	1,3	3,3

<b>Concrete pry-out failure</b>						
Factor for determination of resistance to pry-out failure	$k_3=k_8$	[-]	1,0	2,0	2,0	2,0
Characteristic resistance	R30 $V_{Rk,cp,fi}$	[kN]	1,8	10,0	10,0	20,6
	R60 $V_{Rk,cp,fi}$	[kN]	1,8	10,0	10,0	20,6
	R90 $V_{Rk,cp,fi}$	[kN]	1,8	10,0	10,0	20,6
	R120 $V_{Rk,cp,fi}$	[kN]	1,5	8,0	8,0	16,5

<b>Concrete edge failure</b>						
Eff. length of anchor under shear loading	$l_f$	[mm]	40	60	60	80
Outside diameter of anchor	$d_{nom}$	[mm]	8	10	12	16

<sup>1)</sup> Design under fire exposure is performed according to the design method given in TR 020. Under fire exposure usually cracked concrete is assumed. The design equations are given in TR 020, Section 2.2.2.

TR 020 covers design for fire exposure from one side. For fire attack from more than one side the edge distance must be increased to  $c_{min} \geq 300 \text{ mm}$  and  $\geq 2 \cdot h_{ef}$ .

TB1-PLUS

Design according to Technical Report TR020  
 Characteristic tension resistance under fire exposure

Annex C4

Table 8: Displacements under tension loading

		M8	M10	M12	M16
<b>Tension load in non-cracked concrete C20/25 [kN]</b>		2,38	4,76	5,44	11,90
Displacement	$\delta_{N0}$ [mm]	0,05	0,10	0,06	0,30
	$\delta_{N\infty}$ [mm]	0,65	1,17	1,53	0,65
<b>Tension load in non-cracked concrete C50/60 [kN]</b>		3,69	9,92	10,20	18,45
Displacement	$\delta_{N0}$ [mm]	0,05	0,24	0,10	0,10
	$\delta_{N\infty}$ [mm]	0,65	1,17	1,53	0,65
<b>Tension load in cracked concrete C20/25 [kN]</b>		1,19	4,76	4,08	4,08
Displacement	$\delta_{N0}$ [mm]	0,05	0,83	1,04	0,40
	$\delta_{N\infty}$ [mm]	1,15	1,17	1,53	1,14
<b>Tension load in cracked concrete C50/60 [kN]</b>		1,85	4,76	10,20	6,33
Displacement	$\delta_{N0}$ [mm]	2,95	0,94	1,89	3,43
	$\delta_{N\infty}$ [mm]	2,95	1,17	1,53	3,43

Tableau 9: Displacements under shear loading

		M8	M10	M12	M16
<b>Shear load in cracked and non-cracked concrete C20/25 to C50/60 [kN]</b>		4,63	9,14	9,52	26,23
Displacement	$\delta_{V0}$ [mm]	5,50	5,26	5,84	3,60
	$\delta_{V\infty}$ [mm]	8,25	7,89	8,76	5,40

Additional displacement due to anular gap between anchor and fixture is to be taken into account.

TB1-PLUS

Displacements

Annex C5

**Table 10: Characteristic values of resistance under tension loads in case of seismic performance category C1 for design acc. to TR045**

			M12	M16
<b>Steel failure</b>				
Char. resistance	$N_{Rk,s,seis}$	[kN]	43,4	75,4
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,88 <sup>1)</sup>	
<b>Pullout failure</b>				
Characteristic resistance	$N_{Rk,p,seis}$	[kN]	12	12
Partial safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,4	

<sup>1)</sup> In absence of other national regulations

**Table 11: Characteristic values of resistance under shear loads in case of seismic performance category C1 for design acc. to TR045**

			M12	M16
<b>Steel failure without lever arm</b>				
Characteristic resistance	$V_{Rk,s,seis}$	[kN]	13,6	24,8
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25 <sup>1)</sup>	

<sup>1)</sup> In absence of other national regulations

TB1-PLUS

**Performances**

Characteristic resistance under seismic actions  
 Design according to TR045

Annex C6

