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-22/0551 of 24 October 2022

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	Concrete Screw BSZ2
Product family to which the construction product belongs	Mechanical fasteners for use in concrete
Manufacturer	MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach DEUTSCHLAND
Manufacturing plant	MKT Werk 5, D
This European Technical Assessment contains	17 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 330232-01-0601, Edition 05/2021

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Specific Part

1 Technical description of the product

The concrete screw BSZ2 is an anchor in size 6, 8 and 10 mm made of stainless steel. 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.

Product and product description are 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 to the assumption of a 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 B2 and C1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C2
Displacements (static and quasi-static loading)	See Annex C5
Characteristic resistance and displacements for seismic performance categorie C1	See Annex C3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C4

3.3 Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

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

In accordance with European Assessment Document EAD No. 330232-01-0601 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 24 October 2022 by Deutsches Institut für Bautechnik

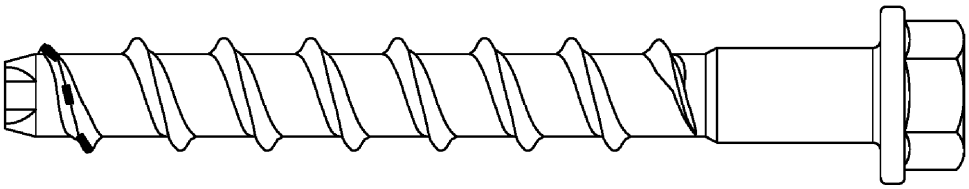
Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt

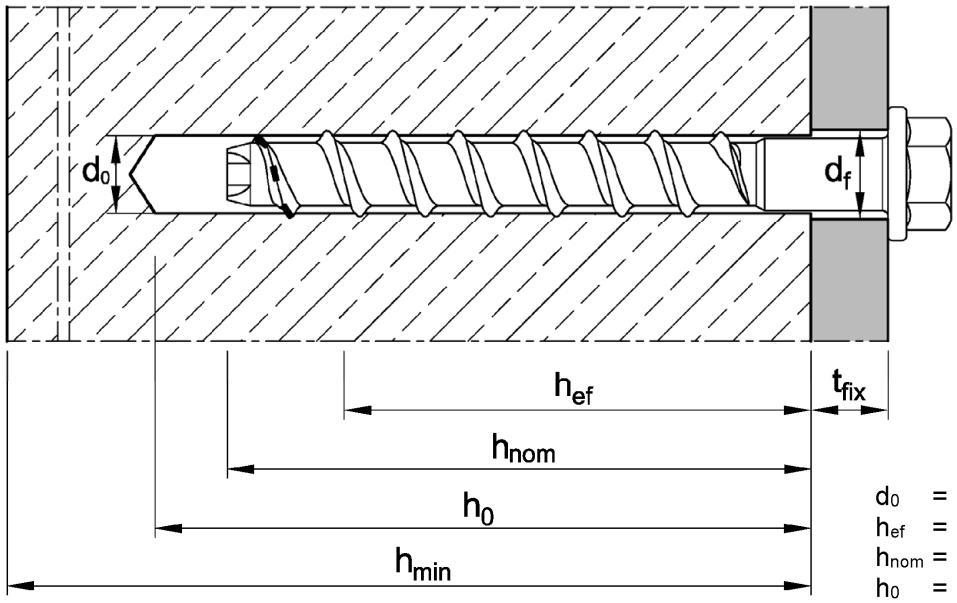
Concrete Screw BSZ2

- stainless steel A4
- high corrosion resistant steel HCR



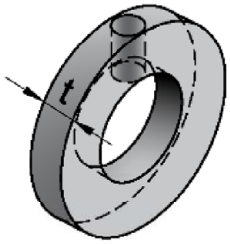
e.g. Concrete Screw BSZ2 with hexagon head and pressed-on washer

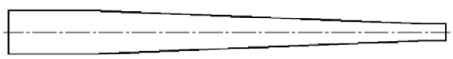
Installation condition



d_0 = nominal drill bit diameter
h_{ef} = effective anchorage depth
h_{nom} = nominal embedment depth
h_0 = depth of the drill hole
h_{min} = minimum thickness of member
t_{fix} = thickness of fixture
d_f = diameter of clearance hole in the fixture

Filling washer and reducing adapter (optional)
for filling the annular gap between concrete screw and fixture





Concrete Screw BSZ2	Annex A1
Product description Product and installation condition	

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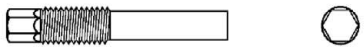
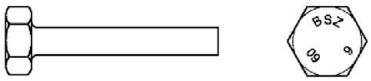
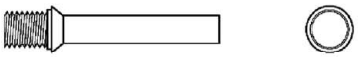
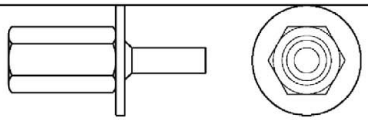
Table A1: Anchor types

Type		Description
B		Anchor version with metric connection thread and hexagon drive e.g.: BSZ2-B 10x140 A4
S		Anchor version with hexagon head, pressed-on washer and TORX drive e.g.: BSZ2-SU 10x140 A4 TX
		Anchor version with hexagon head and pressed-on washer e.g.: BSZ2-SU 10x140 A4
		Anchor version with hexagon head e.g.: BSZ2-S 10x140 A4
SK		Anchor version with countersunk head and TORX drive e.g.: BSZ2-SK 10x140 A4
LK		Anchor version with pan head and TORX drive e.g.: BSZ2-LK 10x140 A4
		Anchor version with large pan head and TORX drive e.g.: BSZ2-GLK 10x140 A4
BS		Anchor version with countersunk head and metric connection thread e.g.: BSZ2-BSK 10x140 A4
		Anchor version with hexagon drive and metric connection thread e.g.: BSZ2-BS 10x140 A4
M		Anchor version with internal thread and hexagon drive e.g.: BSZ2-M 10x140 A4

Concrete Screw BSZ2

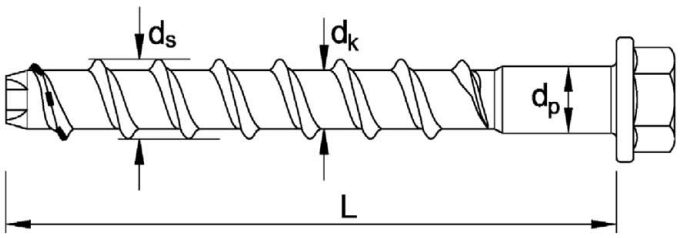
Product description
Anchor types

Annex A2

Table A2: Dimensions

Screw size			BSZ2 6			BSZ2 8			BSZ2 10		
Nominal embedment depth	h_{nom}	[mm]	35[1)]	45	55	45	55	65	55	75	85
Length of the anchor	L ≤	[mm]	500								
Core diameter	d_k	[mm]	5,1			7,2			9,2		
Outside diameter	d_s	[mm]	7,6			10,5			12,5		
Thickness of filling washer	t	[mm]	5			5			5		

[1)] Only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, in dry internal conditions.



Marking e.g.: ◇ BSZ 10 100
or TSM 10 100

◇ BSZ *or* TSM — Trade name (optional with manufacturer identification ◇)
10 — Anchor size
100 — Length of anchor

additional marking:
A4 — stainless steel, or
HCR — high corrosion resistant steel

Table A3: Materials

Version		Stainless steel BSZ2 A4	High corrosion resistant steel BSZ2 HCR
Material numbers		1.4401, 1.4404, 1.4571, 1.4578	1.4529
Characteristic yield strength	f_{yk}	560 N/mm²	
Characteristic ultimate strength	f_{uk}	700 N/mm²	
Fracture elongation	A_5	≤ 8%	

Concrete Screw BSZ2

Product description
Dimensions, marking and materials

Annex A3

Specifications of Intended use

Concrete screw BSZ		BSZ2 6			BSZ2 8			BSZ2 10		
Nominal embedment depth h_{nom} [mm]		h_{nom1} [1] 35	h_{nom2} 45	h_{nom3} 55	h_{nom1} 45	h_{nom2} 55	h_{nom3} 65	h_{nom1} 55	h_{nom2} 75	h_{nom3} 85
Anchorages subject to	Static or quasi-static action	✓								
	Fire exposure	✓								
	Seismic action, performance category C1	Tension load: all anchor types Shear load: anchor types B, S, SK, LK								
		[2]	✓	✓	✓	[2]	✓	✓	[2]	✓
Base material	Cracked or uncracked concrete	✓								
	Compacted, reinforced or unreinforced concrete without fibres acc. to EN 206:2013+A1:2016	✓								
	Strength classes according to EN 206:2013+A1:2016, C20/25 to C50/60	✓								

[1] Only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, in dry internal conditions.
[2] no performance assessed

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions: all screw types
- For all other conditions corresponding to corrosion resistance classes CRC according to EN 1993-1-4:2006 +A1:2015:
  - stainless steel A4, according to Annex A3, Table A3: CRC III
  - high corrosion resistant steel HCR, according to Annex A3, Table A3: CRC V

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 method of anchorages according to EN 1992-4:2018 (if required in connection with EOTA Technical Report TR 055, version February 2018)

Installation:

- Making of drill hole by hammer drilling (all sizes) or vacuum drilling (BSZ 8 und BSZ 10). When using a vacuum drill bit no drill hole cleaning is required.
- Anchor installation carried out by appropriately qualified personal and under the responsibility of the person responsible for technical matters on site.
- After installation further turning of the anchor is not possible. The head of the anchor is supported on the fixture and is not damaged.
- The borehole may be filled with the Injection System VME plus.
- Adjustment according to Annex B4 (except for anchorages with filled borehole and anchorages with seismic action).

Concrete Screw BSZ2	Annex B1
Intended Use Specifications	

Table B1: Installation parameters

Screw size			BSZ2 6			BSZ2 8			BSZ2 10		
Nominal embedment depth	h_{nom}	[mm]	35[1)]	45	55	45	55	65	55	75	85
Nominal drill bit diameter	d_0	[mm]	6			8			10		
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40			8,45			10,45		
Depth of drill hole	$h_0 \geq$	[mm]	40	50	60	55	65	75	65	85	95
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	8			12			14		
Max. installation torque for screws with metric connection thread	$T_{inst} \leq$	[Nm]	10			20			40		
Tangential impact screw driver [2)]	$T_{imp,max}$	[Nm]	160			300			450		

[1)] Only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, in dry internal conditions.

[2)] Installation with tangential impact screw driver, with maximum torque $T_{imp,max}$ acc. to manufacturer's instructions is possible.

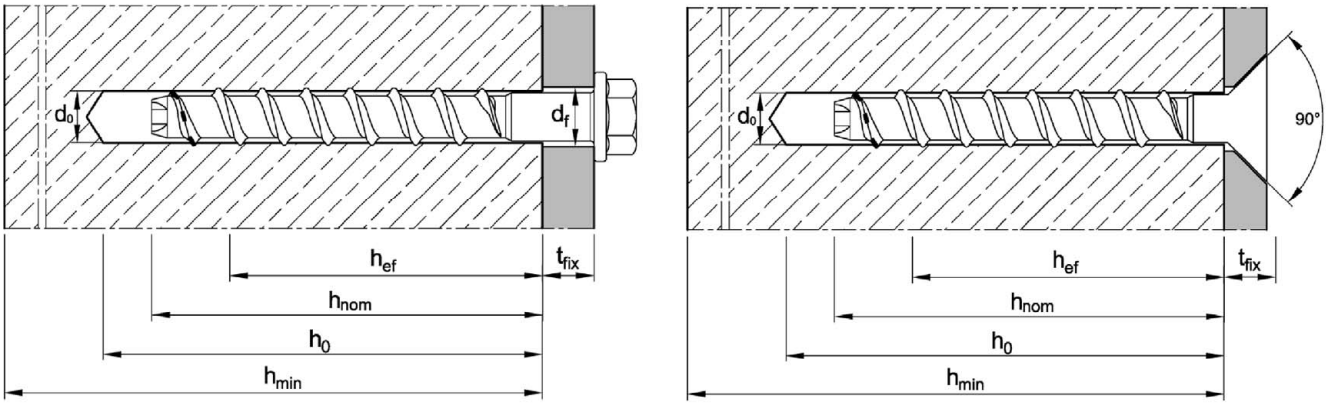


Table B2: Minimum thickness of member, minimum edge distance and minimum spacing

Screw size			BSZ2 6			BSZ2 8			BSZ2 10		
Nominal embedment depth	h_{nom}	[mm]	35[1)]	45	55	45	55	65	55	75	85
Minimum thickness of member	h_{min}	[mm]	80	80	100	80	100	120	100	130	130
Minimum spacing	s_{min}	[mm]	35			35			40		
Minimum edge distance	c_{min}	[mm]	35			35			40		

[1)] Only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, in dry internal conditions.

Concrete Screw BSZ2

Intended Use
Installation parameters / Minimum thickness of concrete member, minimum spacing and edge distance

Annex B2

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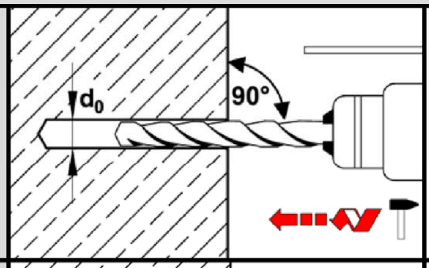
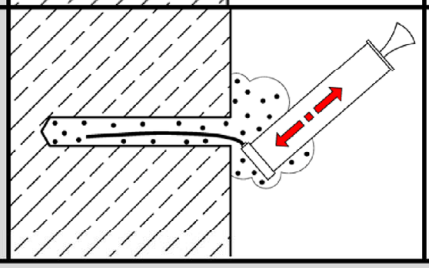
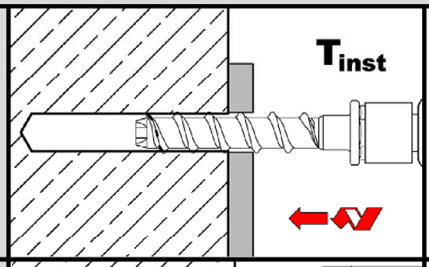
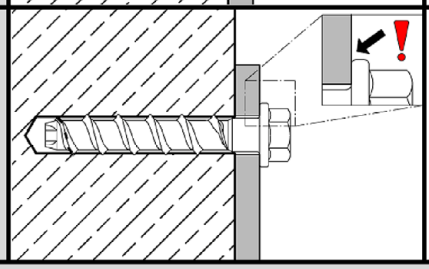
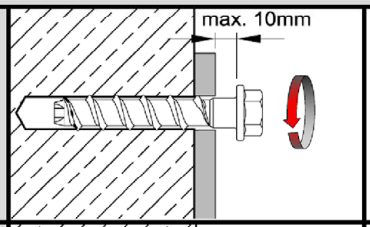
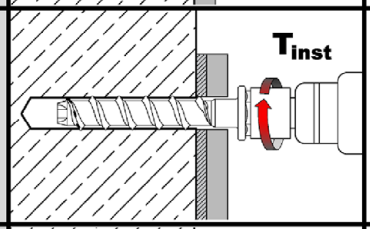
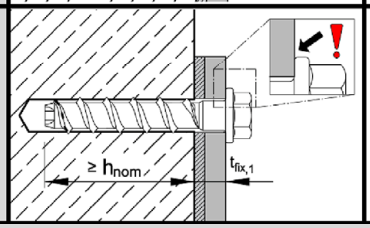
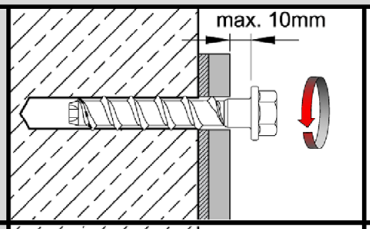
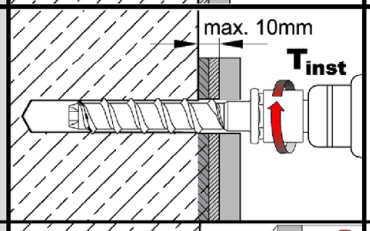
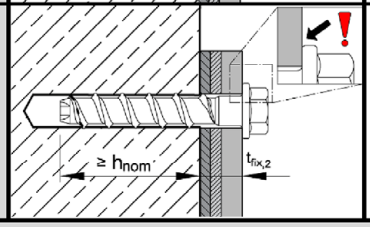
Installation instructions

Drill hole preparation and cleaning		
1		Drill hole perpendicular to concrete surface. Using a vacuum drill, continue with step 3.
2		Blow out dust or alternatively vacuum clean down to the bottom of the hole.
Installation concrete screw		
3		Screw in, e.g. with tangential impact screw driver or torque wrench.
4		After installation, the head of the anchor is supported on the fixture and must be undamaged.
For screw size BSZ2 6 with h_{nom} = 35 mm, installation only with impact screw drivers.		

Concrete Screw BSZ2	**Annex B3**
Intended Use Installation instructions	

Deutsches Institut für Bautechnik DIBt

Installation instructions - Adjustment

1. Adjustment		
5		Screw may be untightened maximum 10 mm.
6		After adjustment, screw in the concrete screw with tangential impact screw driver or torque wrench.
7		After installation, the head of the anchor is supported on the fixture must be undamaged.
2. Adjustment		
8		Screw may be untightened maximum 10 mm.
9		After adjustment, screw in the concrete screw with tangential impact screw driver or torque wrench.
10		After installation, the head of the anchor is supported on the fixture and must be undamaged.
Note: The concrete screw may be adjusted max. 2 times. The fastener must not be screwed back by more than 10 mm in each case. The relining carried out during adjustment must not exceed 10 mm in total. Nominal embedment depth h_{nom} must still be maintained after the adjustment.		

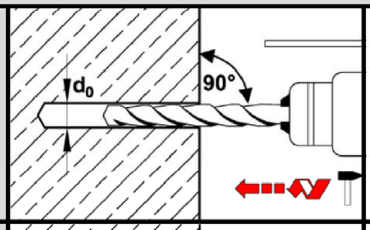
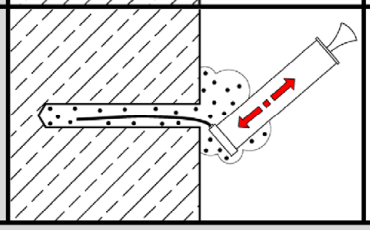
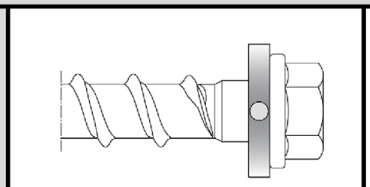
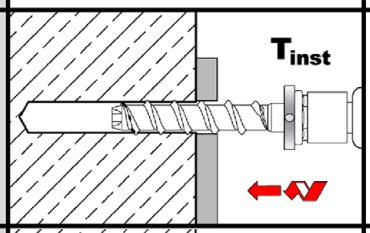
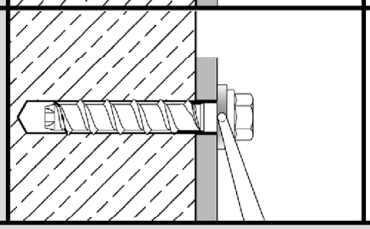
Concrete Screw BSZ2

Intended Use
Installation instructions - Adjustment

Annex B4

Deutsches Institut für Bautechnik DIBt

Installation instructions - filling of annular gap

Drill hole preparation and cleaning		
1		Drill hole perpendicular to concrete surface. Using a vacuum drill, continue with step 3.
2		Blow out dust or alternatively vacuum clean down to the bottom of the hole.
Installation concrete screw with filling washer		
3		Fit the filling washer to the concrete screw or position at the attachment. The thickness of the filling washer must be taken into account with t_{fix}.
4		Screw in, e.g. with tangential impact screw driver or torque wrench.
5		Fill the annular gap between concrete screw and fixture with mortar (compressive strength ≥ 40 N/mm², e.g. Injection mortar VMH, VMZ or VMU plus). Use enclosed reducing adapter. Observe information on processing of the mortar! The annular gap is completely filled, when excess mortar seeps out.
For seismic loading, the application with and without filling of annular gap is permitted (Annex C3).		

Concrete Screw BSZ2	**Annex B5**
Intended Use Installation instructions - filling of annular gap	

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values for **tension load** under **static** or **quasi-static action**

Screw size				**BSZ2 6**			**BSZ2 8**			**BSZ2 10**		
Nominal embedment depth		h_{nom}	[mm]	35[1]	45	55	45	55	65	55	75	85
Installation factor		γ_{inst}	[-]	1,0								
Steel failure												
Characteristic resistance		$N_{Rk,s}$	[kN]	14,0			27,0			45,0		
Partial factor [2]		$\gamma_{Ms,N}$	[-]	1,5								
Pull-out failure (concrete strength class C20/25)												
Characteristic resistance	cracked	$N_{Rk,p,cr}$	[kN]	2,5	1,5	3,0	3,0	5,5	8,0	6,0	13,0	17,0
	uncracked	$N_{Rk,p,ucr}$	[kN]	3,5	4,0	8,5	9,0	12,0	17,0	11,0	19,0	25,0
Exponent m for concrete increasing factor $\Psi_c = \left(\frac{f_{ck}}{20}\right)^m$												
Concrete strength class C25/30 to C50/60				$N_{Rk,p} = \psi_C \bullet N_{Rk,p\ (C20/25)}$								
Exponent m	cracked	m	[-]	0,41	0,35	0,50	0,50	0,50	0,50	0,50	0,39	0,39
	uncracked	m	[-]	0,35	0,50	0,38	0,50	0,50	0,30	0,50	0,50	0,50
Splitting failure												
Case 1	Characteristic resistance	$N^0_{Rk,sp}$	[kN]	min ($N_{Rk,p}$; $N^0_{Rk,c}$)								
	Characteristic edge distance	$c_{cr,sp}$	[mm]	60	80	120	100	120	145	115	140	160
	Characteristic spacing	$s_{cr,sp}$	[mm]	120	160	240	200	240	290	230	280	320
Case 2	Characteristic resistance	$N^0_{Rk,sp}$	[kN]	[3]	2,5	5,5	5,5	8,0	11,0	7,0	15,0	20,0
	Characteristic edge distance	$c_{cr,sp}$	[mm]	[3]	58	84	64	82	98	80	114	130
	Characteristic spacing	$s_{cr,sp}$	[mm]	[3]	116	168	128	164	196	160	224	260
Concrete cone failure												
Effective anchorage depth		h_{ef}	[mm]	25	34	42	32	41	49	40	57	65
Factor	cracked	$k_{cr,N}$	[-]	7,7								
	uncracked	$k_{ucr,N}$	[-]	11,0								
Characteristic edge distance		$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$								
Characteristic spacing		$s_{cr,N}$	[mm]	$3 \cdot h_{ef}$								

[1] Only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, in dry internal conditions.
[2] In absence of other national regulations.
[3] No performance assessed.

Concrete Screw BSZ2

Performances
Characteristic values for **tension load**

Annex C1

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Table C2: Characteristic values for **shear load** under **static** or **quasi static action**

Screw size			**BSZ2 6**			**BSZ2 8**			**BSZ2 10**		
Nominal embedment depth	h_{nom}	[mm]	35[1)]	45	55	45	55	65	55	75	85
Installation factor	γ_{inst}	[-]	1,0								
Steel failure <u>without</u> lever arm											
Characteristic resistance	$V^0_{Rk,s}$	[kN]	7,0			13,5		17,0	22,5	34,0	
Partial factor [2)]	$\gamma_{Ms,V}$	[-]	1,25								
Ductility factor	k_7	[-]	0,8								
Steel failure <u>with</u> lever arm											
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	10,9			26,0			56,0		
Concrete pry-out failure											
Pry-out factor	k_8	[-]	1,0	1,6		2,1	2,8		2,5		
Concrete edge failure											
Effective length of fastener in shear loading	$l_f = h_{nom}$	[mm]	35	45	55	45	55	65	55	75	85
Outside diameter of anchor	d_{nom}	[mm]	6			8			10		

[1)] Only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, in dry internal conditions.

[2)] In absence of other national regulations

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Performances
Characteristic values for **shear load**

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Table C3: Characteristic values for **seismic loading**, performance category **C1**

Screw size			**BSZ2 6**		**BSZ2 8**		**BSZ2 10**	
Nominal embedment depth	h_{nom}	[mm]	45	55	45	65	55	85
Installation factor	γ_{inst}	[-]	1,0					
Tension load	(all types)							
Steel failure								
Characteristic resistance	$N_{Rk,s,C1}$	[kN]	14,0		27,0		45,0	
Partial factor [1]	$\gamma_{Ms,N}$	[-]	1,5					
Pull-out failure								
Characteristic resistance	$N_{Rk,p,C1}$	[kN]	1,5	3,0	3,0	8,5	6,0	17,0
Concrete cone failure								
Effective anchorage depth	h_{ef}	[mm]	34	42	32	49	40	65
Edge distance	$c_{cr,N}$	[mm]	$1,5 \cdot h_{ef}$					
Spacing	$s_{cr,N}$	[mm]	$3 \cdot h_{ef}$					
Shear load	(Type : B, S, SK, LK)							
Steel failure without lever arm								
Characteristic resistance Type B, S, LK	$V_{Rk,s,C1}$	[kN]	3,5	4,0	8,0	10,0	14,0	16,0
Characteristic resistance Type SK	$V_{Rk,s,C1}$	[kN]	2,5	[2]	4,5	7,0	14,0	10,0
Partial factor [1]	$\gamma_{Ms,V}$	[-]	1,25					
with filling of annular gap	α_{gap}	[-]	1,0					
without filling of annular gap	α_{gap}	[-]	0,5					
Concrete pry-out failure								
Pry-out factor	k_8	[-]	1,6		2,1	2,8	2,5	
Concrete edge failure								
Effective length of anchor	$l_f = h_{nom}$	[mm]	45	55	45	65	55	85
Outside diameter of anchor	d_{nom}	[mm]	6		8		10	

[1] In absence of other national regulations
[2] No performance assessed

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Performances
Characteristic values for **seismic loading**

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Table C4: Characteristic values under **fire exposure**

Screw size				**BSZ2 6**			**BSZ2 8**			**BSZ2 10**		
Nominal anchorage depth		h_{nom}	[mm]	35[1)]	45	55	45	55	65	55	75	85
Steel failure (tension and shear resistance)												
Characteristic resistance	R30	$N_{Rk,s,fi} = V_{Rk,s,fi}$	[kN]	0,9			2,4			4,4		
	R60			0,8			1,7			3,3		
	R90			0,6			1,1			2,3		
	R120			0,4			0,7			1,7		
Steel failure <u>with</u> lever arm												
Characteristic bending resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,7			2,4			5,9		
	R60			0,6			1,8			4,5		
	R90			0,5			1,2			3,0		
	R120			0,3			0,9			2,3		
Pull-out failure												
Characteristic resistance	R30-R90	$N_{Rk,p,fi}$	[kN]	0,6	0,4	0,8	0,8	1,4	2,0	1,5	3,3	4,3
	R120	$N_{Rk,p,fi}$	[kN]	0,5	0,3	0,6	0,6	1,1	1,6	1,2	2,6	3,4
Concrete cone failure												
Characteristic resistance	R30-R90	$N^0_{Rk,c,fi}$	[kN]	0,5	1,2	2,0	1,0	1,9	2,9	1,7	4,2	5,9
	R120	$N^0_{Rk,c,fi}$	[kN]	0,4	0,9	1,6	0,8	1,5	2,3	1,4	3,4	4,7
Edge distance		$c_{cr,fi}$	[mm]	$2 \cdot h_{ef}$								
In case of fire attack from more than one side, the minimum edge distance shall be ≥ 300 mm												
Spacing		$s_{cr,fi}$	[mm]	$4 \cdot h_{ef}$								
Concrete pry-out failure												
Pry-out factor		k_8	[-]	1,0	1,6		2,1	2,8		2,5		
The anchorage depth has to be increased for wet concrete by at least 30 mm compared to the given values.												

[1)] Only for statically indeterminate non-structural systems (multiple use) according to EN 1992-4:2018, in dry internal conditions.

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Performances Characteristic values under **fire exposure**	

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Table C5: Displacements under static or quasi-static loads

Screw size				BSZ2 6		BSZ2 8			BSZ2 10		
Nominal embedment depth		h_{nom}	[mm]	45	55	45	55	65	55	75	85
Tension load											
cracked concrete	Tension load	N	[kN]	0,72	1,45	1,63	2,74	4,06	3,04	6,22	8,46
	Displacement	δ_{N0}	[mm]	0,19	0,27	0,27	0,53	0,45	0,26	0,58	0,61
		$\delta_{N\infty}$	[mm]	0,55	0,84	0,49	0,66	0,61	0,69	0,92	1,10
uncracked concrete	Tension load	N	[kN]	2,11	4,07	4,24	5,97	8,03	5,42	9,17	12,28
	Displacement	δ_{N0}	[mm]	0,42	0,43	0,33	0,49	0,58	0,84	0,62	0,79
		$\delta_{N\infty}$	[mm]	0,42	0,43	0,58			0,79		
Shear load											
Shear load		V	[kN]	3,3		8,6			16,2		
Displacement		δ_{V0}	[mm]	1,55		2,7			2,7		
		$\delta_{V\infty}$	[mm]	3,1		4,1			4,3		

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Displacements

Annex C5