

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-99/0010  
of 6 April 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

Wedge anchor BZ plus and BZ-IG

Product family  
to which the construction product belongs

Torque controlled expansion anchor  
for use in concrete

Manufacturer

MKT  
Metall-Kunststoff-Technik GmbH & Co. KG  
Auf dem Immel 2  
67685 Weilerbach

Manufacturing plant

MKT  
Metall-Kunststoff-Technik GmbH & Co. KG  
Auf dem Immel 2  
67685 Weilerbach

This European Technical Assessment  
contains

35 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.

This version replaces

ETA-99/0010 issued on 9 December 2015

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English translation prepared by DIBt

**Specific Part**

**1 Technical description of the product**

The MKT Wedge anchor BZ plus and BZ-IG is an anchor made of galvanised steel or made of stainless steel or high corrosion resistant steel which is placed into a drilled hole and anchored by torque-controlled expansion. The following anchor types are covered:

- Anchor type BZ plus with external thread, washer and hexagon nut, sizes M8 to M27,
- Anchor type BZ-IG S with internal thread, hexagon head nut and washer S-IG, sizes M6 to M12,
- Anchor type BZ-IG SK with internal thread, countersunk head screw and countersunk washer SK-IG, sizes M6 to M12,
- Anchor type BZ-IG B with internal thread, hexagon nut and washer MU-IG, sizes M6 to M12.

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 for BZ plus	See Annex C 1 to C 5
Characteristic resistance for seismic performance categories C1 and C2 for BZ plus	See Annex C 6
Characteristic resistance for static and quasi static action for BZ-IG	See Annex C 11 to C 13
Displacements under tension and shear loads for BZ plus	See Annex C 9 to C 10
Displacements under tension and shear loads for BZ-IG	See Annex C 15

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

Essential characteristic	Performance
Reaction to fire	Anchorage satisfy requirements for Class A1
Resistance to fire for BZ plus	See Annex C 7 and C 8
Resistance to fire for BZ-IG	See Annex C 14

**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**

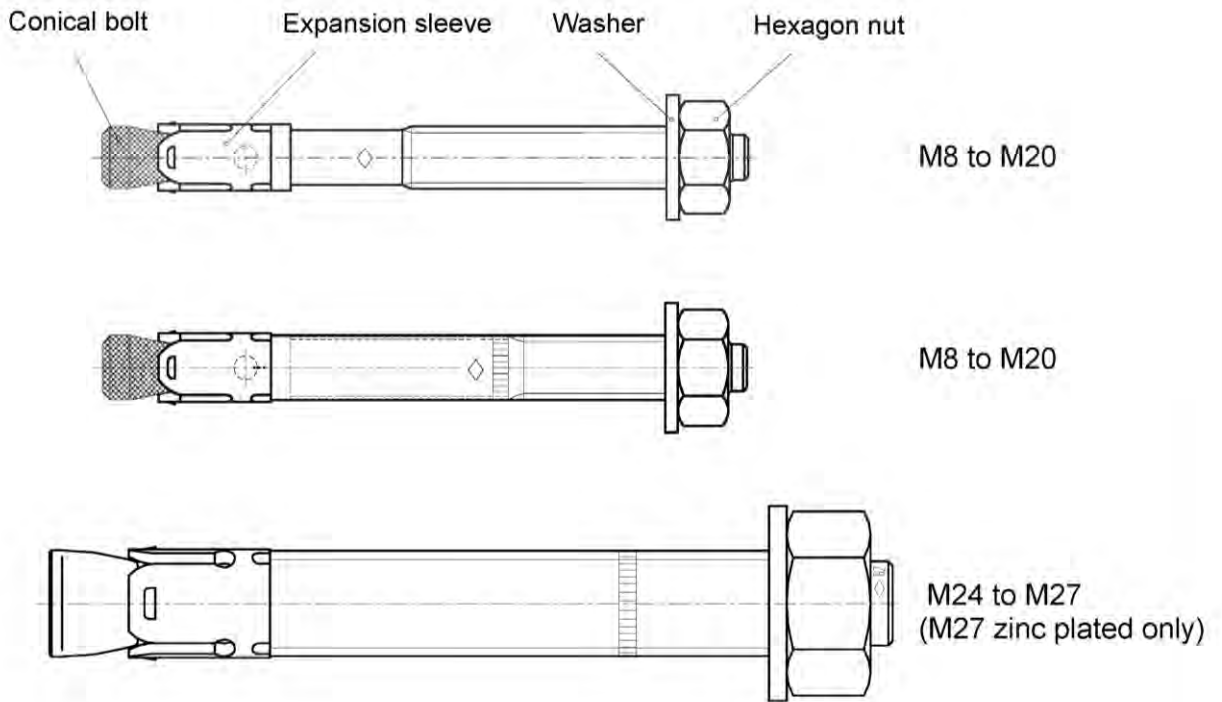
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 6 April 2016 by Deutsches Institut für Bautechnik

Uwe Bender  
Head of Department

*beglaubigt:*  
Baderschneider

### Wedge anchor BZ plus



### Wedge anchor BZ-IG M6 to M12

#### Anchor system

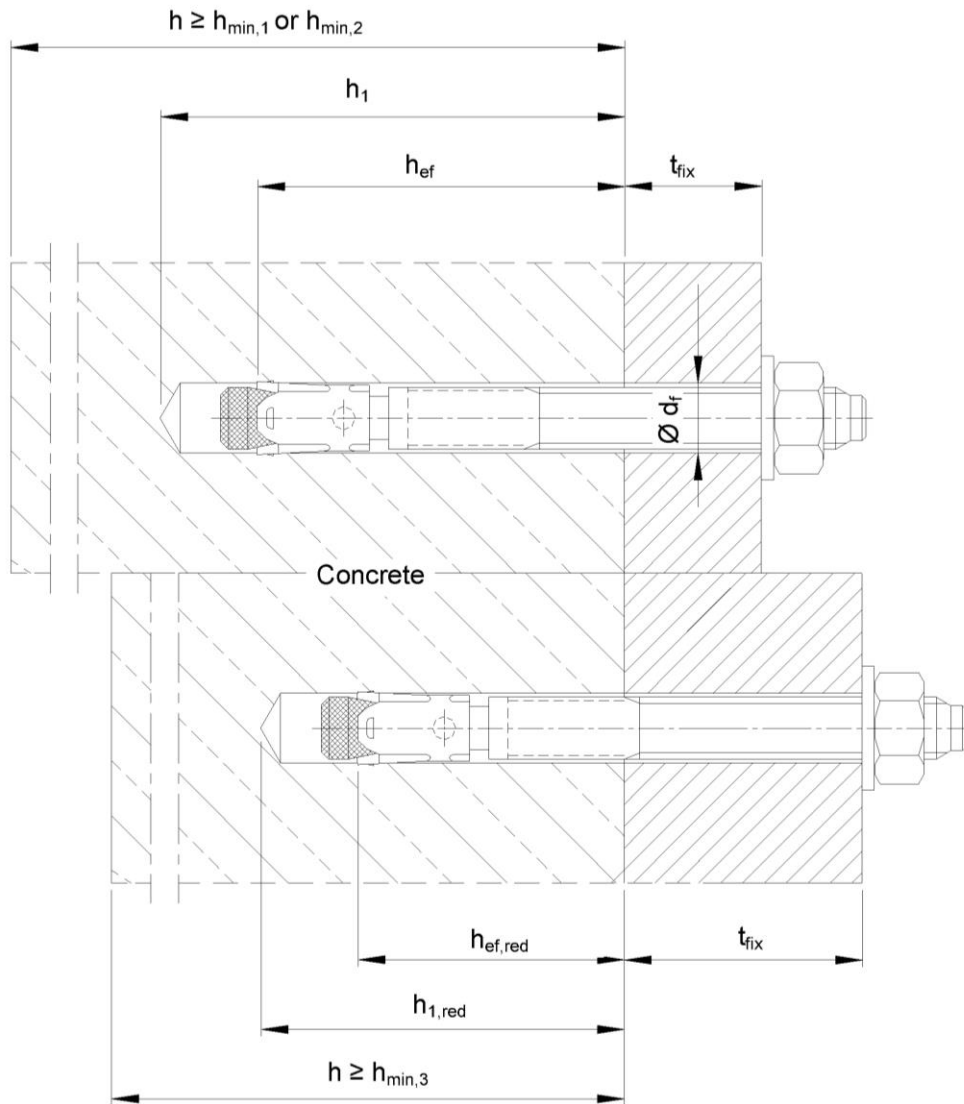
<b>BZ-IG S</b>		Washer	Hexagon head screw
<b>BZ-IG SK</b>	Conical bolt	Countersunk washer	Countersunk head screw
<b>BZ-IG B</b>	Expansion sleeve	Washer      Hexagon nut	Commercial standard rod

Anchor version	Product description	Intended use	Performance
<b>BZ plus</b>	Annex A1 – Annex A4	Annex B1 – Annex B6	Annex C1 – Annex C10
<b>BZ-IG</b>	Annex A1 Annex A5 – Annex A7	Annex B1 – Annex B2 Annex B7 – Annex B9	Annex C11 – Annex C15

### Wedge Anchor BZ plus and BZ-IG

Product description Anchor types	<b>Annex A1</b>
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### Intended use Wedge Anchor BZ plus



#### Wedge Anchor BZ plus

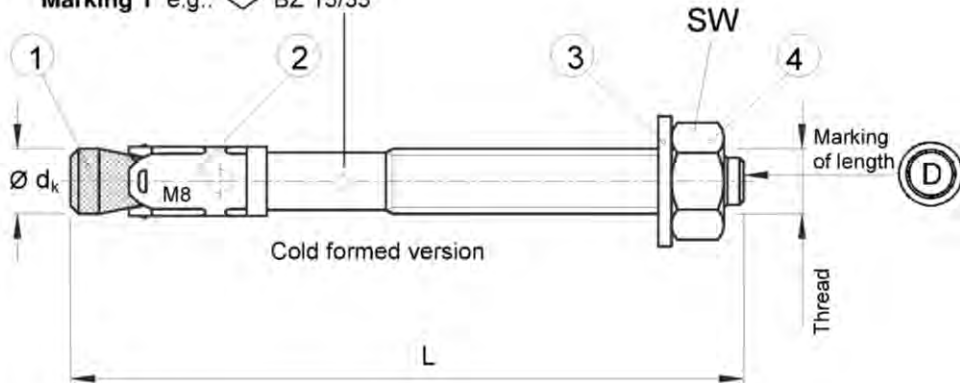
Product description  
Installation situation BZ plus

Annex A2



**Anchor size BZ plus M8 to M20:**

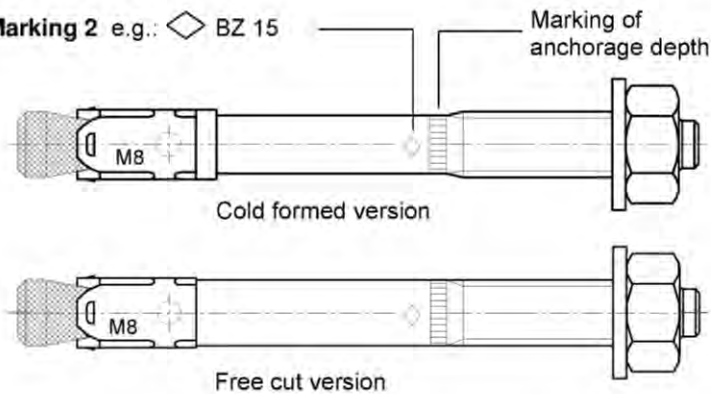
Marking 1 e.g.:  $\diamond$  BZ 15/35



Marking 1 e.g.:  $\diamond$  BZ 15/35

- $\diamond$  Identifying mark of manufacturing plant
- BZ Trade name
- 15 maximum thickness of fixture for  $h_{ef}$
- 35 max. thickness of fixture for  $h_{ef,red}$
- M8 Thread diameter
- A4 additional marking of stainless steel
- HCR additional marking of high corrosion resistant steel

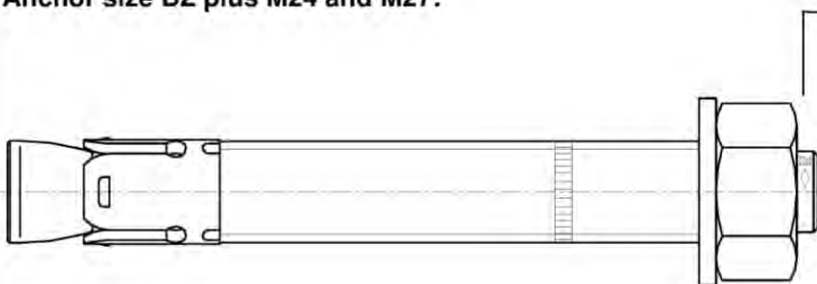
Marking 2 e.g.:  $\diamond$  BZ 15



Marking 2 e.g.:  $\diamond$  BZ 15

- $\diamond$  Identifying mark of manufacturing plant
- BZ Trade name
- 15 maximum thickness of fixture for  $h_{ef}$
- M8 Thread diameter
- A4 additional marking of stainless steel
- HCR additional marking of high corrosion resistant steel

**Anchor size BZ plus M24 and M27:**



Marking 3 e.g.:  $\diamond$  BZ M24-30

- $\diamond$  Identifying mark of manufacturing plant
- BZ Trade name
- M24 Thread diameter
- 30 maximum thickness of fixture
- A4 additional marking of stainless steel
- HCR additional marking of high corrosion resistant steel

Marking of length	C (c)	D (d)	E (e)	F (f)	G (g)	H (h)	I (i)	J (j)	K (k)	L (l)	M (m)	N (n)
Length of anchor min $\geq$	63,5	76,2	88,9	101,6	114,3	127,0	139,7	152,4	165,1	177,8	190,5	203,2
Length of anchor max $<$	76,2	88,9	101,6	114,3	127,0	139,7	152,4	165,1	177,8	190,5	203,2	215,9

Marking of length	O (o)	P (p)	Q (q)	R (r)	S (s)	T (t)	U (u)	V (v)	W (w)	X (x)	Y (y)	Z (z)
Length of anchor min $\geq$	215,9	228,6	241,3	254,0	279,4	304,8	330,2	355,6	381,0	406,4	431,8	457,2
Length of anchor max $<$	228,6	241,3	254,0	279,4	304,8	330,2	355,6	381,0	406,4	431,8	457,2	483,0

**Wedge Anchor BZ plus**

Product description  
Anchor sizes and marking

**Annex A3**

**Table A1: Anchor dimensions BZ plus**

Anchor size			M8	M10	M12	M16	M20	M24	M27
1	Conical bolt	Thread	M8	M10	M12	M16	M20	M24	M27
		$\varnothing d_k =$	7,9	9,8	12,0	15,7	19,7	24	28
	Length of anchor	Steel, zinc plated	$65 + t_{fix}$	$80 + t_{fix}$	$96,5 + t_{fix}$	$118 + t_{fix}$	$137 + t_{fix}$	$161 + t_{fix}$	$178 + t_{fix}$
		A4, HCR	$65 + t_{fix}$	$80 + t_{fix}$	$96,5 + t_{fix}$	$118 + t_{fix}$	$137 + t_{fix}$	$168 + t_{fix}$	-
	reduced anchorage depth	$L_{hef,red}$	$54 + t_{fix}$	$60 + t_{fix}$	$76,5 + t_{fix}$	$98 + t_{fix}$	-	-	
2	Expansion sleeve		see Table A2						
3	Washer		see Table A2						
4	Hexagon nut	SW	13	17	19	24	30	36	41

Dimensions in mm

**Table A2: Materials BZ plus**

No.	Part	BZ plus		BZ plus A4	BZ plus HCR
		Steel, zinc plated		Stainless steel A4	High corrosion resistant steel (HCR)
1	Conical bolt	M8 to M20: Cold formed or machined steel, <b>galvanised</b> $\geq 5\mu\text{m}$ , Cone plastic coated	M10 to M20: Cold formed or machined steel, <b>sherardized</b> $\geq 40\mu\text{m}$ , Cone plastic coated	M8 to M20: Stainless steel (e.g. 1.4401, 1.4404, 1.4578, 1.4571) EN 10088:2014, Cone plastic coated	M8 to M20: High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014, Cone plastic coated
	Threaded bolt and threaded cone	M24 and M27: Steel, galvanised	-	M24: Stainless steel (e.g. 1.4401, 1.4404) EN 10088:2014	M24: High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014
2	Expansion sleeve	M8 to M20: Steel acc. to EN 10088:2014, material No. 1.4301 or 1.4401 M24 and M27: Steel acc. to EN 10139:1997	M10 to M20: Steel acc. to EN 10088:2014, material No. 1.4301 or 1.4401	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014
3	Washer	Steel, galvanised	Steel, mechanically galvanised	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014	High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014
4	Hexagon nut	Steel, galvanised, coated	Steel, hot dip galvanised	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel 1.4529 or 1.4565, EN 10088:2014, coated

**Wedge Anchor BZ plus**

Product description  
Dimensions and materials

**Annex A4**



## Intended use Wedge anchor BZ-IG

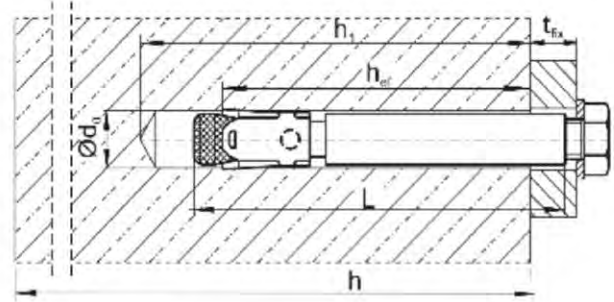
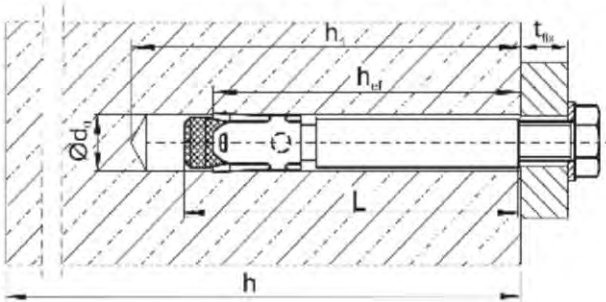
### Installation type V pre-setting installation

pre-set anchor body, the fixture bears on the screw or thread rod only

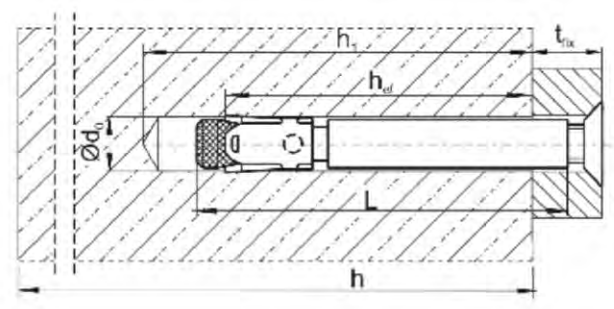
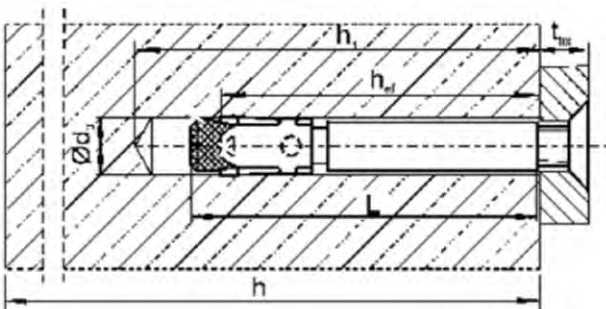
### Installation type D through-setting installation

the anchor is set through the fixture, the fixture bears on the conical bolt BZ-IG

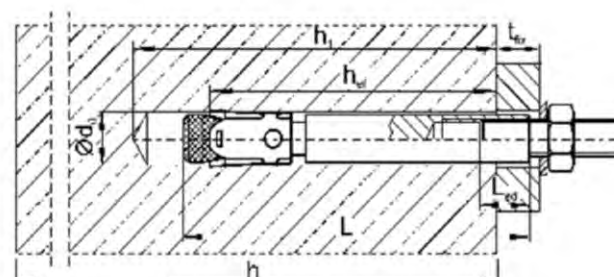
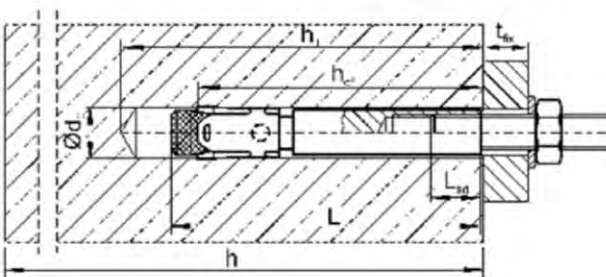
#### BZ-IG S consisting of BZ-IG and S-IG



#### BZ-IG SK consisting of BZ-IG and SK-IG




#### BZ-IG B consisting of BZ-IG and MU-IG

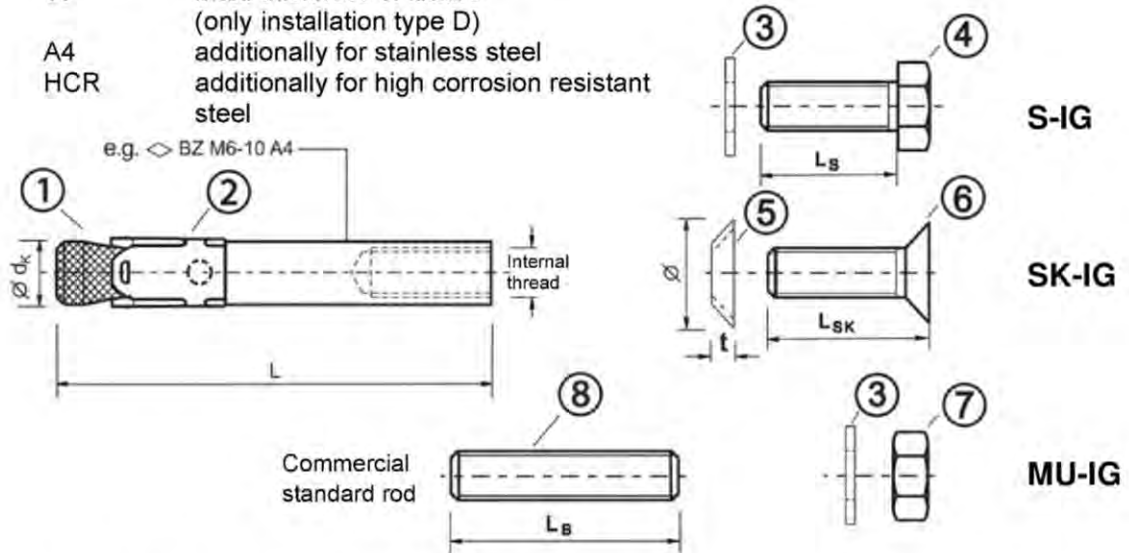


### Wedge Anchor BZ-IG

Product description  
Installation situation BZ-IG

Annex A5

**Marking:**  Identifying mark of manufacturing plant  
 BZ Trade name  
 M6 Size of internal thread  
 10 max. thickness of fixture (only installation type D)  
 A4 additionally for stainless steel  
 HCR additionally for high corrosion resistant steel



**Table A3: Anchor dimensions BZ-IG**

No.	Anchor size		M6	M8	M10	M12	
1	Conical bolt with Internal thread Installation type V Installation type D	$\varnothing d_k$	7,9	9,8	11,8	15,7	
		L	50	62	70	86	
		L	$50 + t_{fix}$	$62 + t_{fix}$	$70 + t_{fix}$	$86 + t_{fix}$	
2	Expansion sleeve	see table A4					
3	Washer	see table A4					
4	Hexagon head screw Installation type V Installation type D	width across flats	10	13	17	19	
		$L_S$	$t_{fix} + (13 \text{ to } 21)$	$t_{fix} + (17 \text{ to } 23)$	$t_{fix} + (21 \text{ to } 25)$	$t_{fix} + (24 \text{ to } 29)$	
		$L_S$	14 to 20	18 to 22	20 to 22	25 to 28	
5	Countersunk washer	$\varnothing$ countersunk	17,3	21,5	25,9	30,9	
		t	3,9	5,0	5,7	6,7	
6	Countersunk head screw Installation type V Installation type D	bit size	Torx T30	Torx T45 (Steel, zinc plated) T40 (Stainless steel A4, HCR)	Hexagon socket 6 mm	Hexagon socket 8 mm	
		$L_{SK}$	$t_{fix} + (11 \text{ to } 19)$	$t_{fix} + (15 \text{ to } 21)$	$t_{fix} + (19 \text{ to } 23)$	$t_{fix} + (21 \text{ to } 27)$	
		$L_{SK}$	16 to 20	20 to 25	25	30	
7	Hexagon nut	width across flats	10	13	17	19	
8	Commercial standard rod <sup>1)</sup>	type V	$L_B \geq$	$t_{fix} + 21$	$t_{fix} + 28$	$t_{fix} + 34$	$t_{fix} + 41$
		type D	$L_B \geq$	21	28	34	41

<sup>1)</sup> acc. to specifications (Table A4)

Dimensions in mm

**Wedge Anchor BZ-IG**

**Product description**  
Anchor parts, marking and dimensions

**Annex A6**

**Table A4: Materials BZ-IG**

No.	Part	BZ-IG	BZ-IG A4	BZ-IG HCR
		Steel, zinc plated ≥ 5 µm acc. to EN ISO 4042:1999	Stainless steel A4	High corrosion resistant steel HCR
1	Conical bolt BZ-IG with internal thread	Machined steel, Cone plastic coated	Stainless steel (e.g. 1.4401, 1.4404, 1.4571, 1.4362) EN 10088:2014, Cone plastic coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, Cone plastic coated
2	Expansion sleeve BZ-IG	Stainless steel (e.g. 1.4301, 1.4401) EN 10088:2014	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014
3	Washer S-IG / MU-IG	Steel, galvanised	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014
4	Hexagon head screw S-IG	Steel, galvanised, coated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, coated
5	Countersunk washer SK-IG	Steel, galvanised	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014, zinc plated, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, zinc plated, coated
6	Countersunk head screw SK-IG	Steel, galvanised coated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, coated
7	Hexagon nut MU-IG	Steel, galvanised coated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, coated
8	Commercial standard rod	Property class 8.8, EN ISO 898-1:2013 A <sub>5</sub> > 8 % ductile	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, property class 70, EN ISO 3506:2009	High corrosion resistant steel, 1.4529, 1.4565, EN 10088:2014, property class 70, EN ISO 3506:2009

**Wedge Anchor BZ-IG**

Product description  
Materials

**Annex A7**



### Specifications of intended use

Wedge Anchor BZ plus							
Standard anchorage depth	M8	M10	M12	M16	M20	M24	M27
Steel, galvanised				✓			
Steel, sherardized	-		✓			-	
Stainless steel A4 and high corrosion resistant steel HCR			✓				-
Static or quasi-static action				✓			
Fire exposure				✓			
Seismic action (C1 and C2) <sup>1)</sup>			✓			-	-
Reduced anchorage depth <sup>1)</sup>							
	M8	M10	M12	M16			
Steel, galvanised			✓				
Steel, sherardized	-		✓				
Stainless steel A4 and high corrosion resistant steel HCR			✓				
Static or quasi-static action			✓				
Fire exposure			✓				
Seismic action (C1 and C2)			-				

<sup>1)</sup> only cold formed anchors acc. to Annex A3

Wedge Anchor BZ-IG				
	M6	M8	M10	M12
Steel zinc plated			✓	
Stainless steel A4 and high corrosion resistant steel HCR			✓	
Static or quasi-static action			✓	
Fire exposure			✓	
Seismic action (C1 and C2)			-	

#### Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2013
- Strength classes C20/25 to C50/60 according to EN 206-1:2013
- Cracked or non-cracked concrete

#### Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (steel zinc plated, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure including industrial and marine environment or exposure to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions (high corrosion resistant steel)

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor pools or atmosphere with extreme chemical pollution (e.g. in desulphurization plants or road tunnels where de-icing materials are used.)

### Wedge Anchor BZ plus and BZ-IG

Intended use  
Specifications

Annex B1

## Specifications of intended use

### 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 actions (cracked concrete) are designed in accordance with:
  - EOTA Technical Report TR 045, Edition February 2013
  - 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
  - It must be ensured that local spalling of the concrete cover does not occur

### 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 the anchor,
- 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 load application.

**Wedge Anchor BZ plus and BZ-IG**

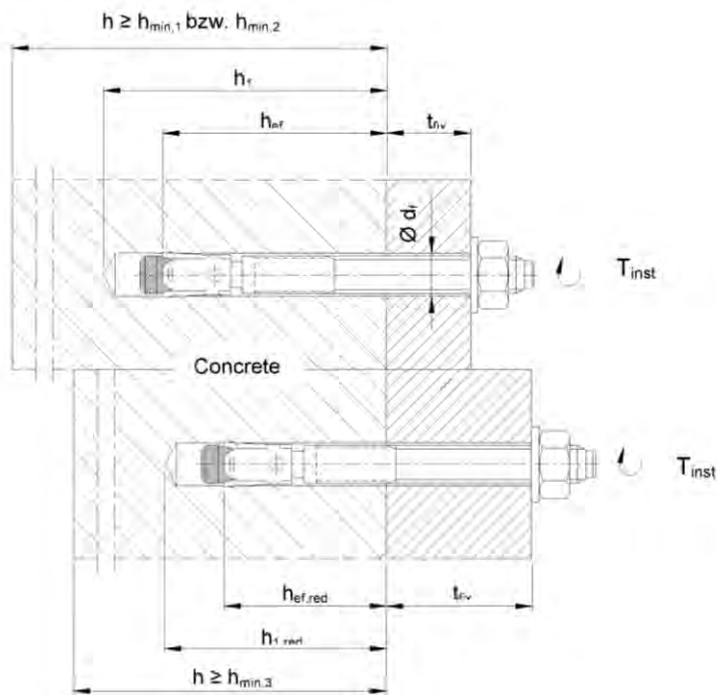
**Intended use**  
Specifications

**Annex B2**



**Table B1: Installation parameters, BZ plus**

Anchor size			M8	M10	M12	M16	M20	M24	M27	
Nominal drill hole diameter	$d_0$	[mm]	8	10	12	16	20	24	28	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	12,5	16,5	20,55	24,55	28,55	
Installation torque	Steel, galvanised	$T_{inst}$	[Nm]	20	25	45	90	160	200	300
	Steel, sherardized	$T_{inst}$	[Nm]	-	22	40	90	160	-	-
	Stainless steel A4, HCR	$T_{inst}$	[Nm]	20	35	50	110	200	290	-
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18	22	26	30	
<b>Standard anchorage depth</b>										
Depth of drill hole	Steel, zinc plated	$h_1 \geq$	[mm]	60	75	90	110	125	145	160
	Stainless steel A4, HCR	$h_1 \geq$	[mm]	60	75	90	110	125	155	-
Effective anchorage depth	Steel, zinc plated	$h_{ef}$	[mm]	46	60	70	85	100	115	125
	Stainless steel A4, HCR	$h_{ef}$	[mm]	46	60	70	85	100	125	-
<b>Reduced anchorage depth</b>										
Depth of drill hole	$h_{1,red} \geq$	[mm]	49	55	70	90	-	-	-	
Reduced effective anchorage depth	$h_{ef,red}$	[mm]	35	40	50	65	-	-	-	



**Wedge Anchor BZ plus**

Intended use  
Installation parameters

**Annex B3**

**Table B2: Minimum spacings and edge distances, standard anchorage depth, BZ plus**

Anchor size			M8	M10	M12	M16	M20	M24	M27
<b>Standard thickness of concrete member</b>									
<b>Steel zinc plated</b>									
Standard thickness of member	$h_{min,1}$	[mm]	100	120	140	170	200	230	250
<b>Cracked concrete</b>									
Minimum spacing	$s_{min}$	[mm]	40	45	60	60	95	100	125
	for $c \geq$	[mm]	70	70	100	100	150	180	300
Minimum edge distance	$c_{min}$	[mm]	40	45	60	60	95	100	180
	for $s \geq$	[mm]	80	90	140	180	200	220	540
<b>Non-cracked concrete</b>									
Minimum spacing	$s_{min}$	[mm]	40	45	60	65	90	100	125
	for $c \geq$	[mm]	80	70	120	120	180	180	300
Minimum edge distance	$c_{min}$	[mm]	50	50	75	80	130	100	180
	for $s \geq$	[mm]	100	100	150	150	240	220	540
<b>Stainless steel A4, HCR</b>									
Standard thickness of member	$h_{min,1}$	[mm]	100	120	140	160	200	250	-
<b>Cracked concrete</b>									
Minimum spacing	$s_{min}$	[mm]	40	50	60	60	95	125	-
	for $c \geq$	[mm]	70	75	100	100	150	125	
Minimum edge distance	$c_{min}$	[mm]	40	55	60	60	95	125	
	for $s \geq$	[mm]	80	90	140	180	200	125	
<b>Non-cracked concrete</b>									
Minimum spacing	$s_{min}$	[mm]	40	50	60	65	90	125	-
	for $c \geq$	[mm]	80	75	120	120	180	125	
Minimum edge distance	$c_{min}$	[mm]	50	60	75	80	130	125	
	for $s \geq$	[mm]	100	120	150	150	240	125	
<b>Minimum thickness of concrete member</b>									
<b>Steel zinc plated, stainless steel A4, HCR</b>									
Minimum thickness of member	$h_{min,2}$	[mm]	80	100	120	140	-	-	-
<b>Cracked concrete</b>									
Minimum spacing	$s_{min}$	[mm]	40	45	60	70	-	-	-
	for $c \geq$	[mm]	70	90	100	160			
Minimum edge distance	$c_{min}$	[mm]	40	50	60	80			
	for $s \geq$	[mm]	80	115	140	180			
<b>Non-cracked concrete</b>									
Minimum spacing	$s_{min}$	[mm]	40	60	60	80	-	-	-
	for $c \geq$	[mm]	80	140	120	180			
Minimum edge distance	$c_{min}$	[mm]	50	90	75	90			
	for $s \geq$	[mm]	100	140	150	200			
<b>Fire exposure from one side</b>									
Minimum spacing	$s_{min,fi}$	[mm]	See normal ambient temperature						
Minimum edge distance	$c_{min,fi}$	[mm]	See normal ambient temperature						
<b>Fire exposure from more than one side</b>									
Minimum spacing	$s_{min,fi}$	[mm]	See normal ambient temperature						
Minimum edge distance	$c_{min,fi}$	[mm]	$\geq 300$ mm						

Intermediate values by linear interpolation.

**Wedge Anchor BZ plus**

**Intended use**  
Minimum spacings and edge distances for standard anchorage depth

**Annex B4**

**Table B3: Minimum spacings and edge distances, reduced anchorage depth, BZ plus**

Anchor size			M8	M10	M12	M16
Minimum thickness of concrete member	$h_{\min,3}$	[mm]	80	80	100	140
<b>Cracked concrete</b>						
Minimum spacing	$s_{\min}$	[mm]	50	50	50	65
	for $c \geq$	[mm]	60	100	160	170
Minimum edge distance	$c_{\min}$	[mm]	40	65	65	100
	for $s \geq$	[mm]	185	180	250	250
<b>Non-cracked concrete</b>						
Minimum spacing	$s_{\min}$	[mm]	50	50	50	65
	for $c \geq$	[mm]	60	100	160	170
Minimum edge distance	$c_{\min}$	[mm]	40	65	100	170
	for $s \geq$	[mm]	185	180	185	65
<b>Fire exposure from one side</b>						
Minimum spacing	$s_{\min,fi}$	[mm]	See normal ambient temperature			
Minimum edge distance	$c_{\min,fi}$	[mm]	See normal ambient temperature			
<b>Fire exposure from more than one side</b>						
Minimum spacing	$s_{\min,fi}$	[mm]	See normal ambient temperature			
Minimum edge distance	$c_{\min,fi}$	[mm]	$\geq 300$ mm			

Intermediate values by linear interpolation.

**Wedge Anchor BZ plus**

**Intended use**  
Minimum spacings and edge distances for reduced anchorage depth

**Annex B5**



### Installation instructions BZ plus

1		Drill hole perpendicular to concrete surface.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3		Check position of nut.
4		Drive in anchor, such that $h_{ef}$ or $h_{ef,red}$ depth is met. This compliance is ensured, if the thickness of fixture is not greater than the maximum thickness of fixture marked on the anchor in accordance with Annex A3.
5		Max. tightening torque $T_{inst}$ shall be applied by using calibrated torque wrench.

### Wedge Anchor BZ plus

Intended Use  
Installation instructions

Annex B6

**Table B4: Installation parameters BZ-IG**

Anchor size			M6	M8	M10	M12
Effective anchorage depth	$h_{ef}$	[mm]	45	58	65	80
Drill hole diameter	$d_0$	[mm]	8	10	12	16
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	12,5	16,5
Depth of drill hole	$h_1 \geq$	[mm]	60	75	90	105
Screwing depth of threaded rod	$L_{sd}^{2)} \geq$	[mm]	9	12	15	18
Installation moment, steel zinc plated	$T_{inst}$	S [Nm]	10	30	30	55
		SK [Nm]	10	25	40	50
		B [Nm]	8	25	30	45
Installation moment, stainless steel A4, HCR	$T_{inst}$	S [Nm]	15	40	50	100
		SK [Nm]	12	25	45	60
		B [Nm]	8	25	40	80
<b>Installation type V (Pre-setting installation)</b>						
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	9	12	14
Minimum thickness of fixture	$t_{fix} \geq$	S [mm]	1	1	1	1
		SK [mm]	5	7	8	9
		B [mm]	1	1	1	1
<b>Installation type D (Through-setting installation)</b>						
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18
Minimum thickness of fixture <sup>1)</sup>	$t_{fix} \geq$	S [mm]	5	7	8	9
		SK [mm]	9	12	14	16
		B [mm]	5	7	8	9

<sup>1)</sup> The minimum thickness of fixture can be reduced to the value of installation type V, if the shear load at steel failure is designed with lever arm.

<sup>2)</sup> see Annex A5

**Table B5: Minimum spacings and edge distances BZ-IG**

Anchor size			M6	M8	M10	M12
Minimum thickness of concrete member	$h_{min}$	[mm]	100	120	130	160
<b>Cracked concrete</b>						
Minimum spacing	$s_{min}$	[mm]	50	60	70	80
	for $c \geq$	[mm]	60	80	100	120
Minimum edge distance	$c_{min}$	[mm]	50	60	70	80
	for $s \geq$	[mm]	75	100	100	120
<b>Non-cracked concrete</b>						
Minimum spacing	$s_{min}$	[mm]	50	60	65	80
	for $c \geq$	[mm]	80	100	120	160
Minimum edge distance	$c_{min}$	[mm]	50	60	70	100
	for $s \geq$	[mm]	115	155	170	210
<b>Fire exposure from one side</b>						
Minimum spacing	$s_{min,fi}$	[mm]	See normal temperature			
Minimum edge distance	$c_{min,fi}$	[mm]	See normal temperature			
<b>Fire exposure from more than one side</b>						
Minimum spacing	$s_{min,fi}$	[mm]	See normal temperature			
Minimum edge distance	$c_{min,fi}$	[mm]	$\geq 300$ mm			

Intermediate values by linear interpolation.

**Wedge Anchor BZ-IG**

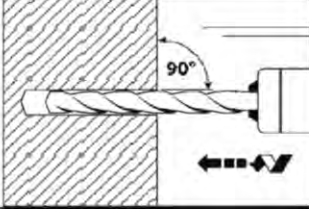
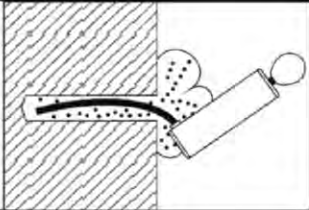
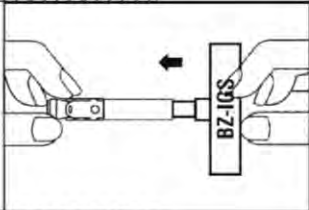
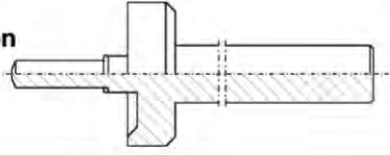
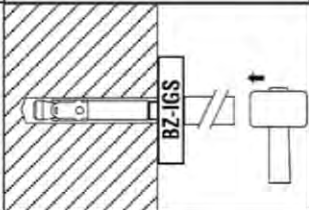
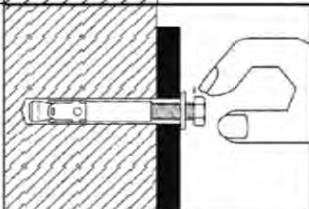
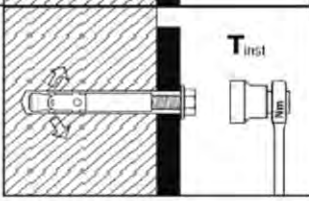
**Intended use**  
Installation parameters, minimum spacings and edge distances

**Annex B7**



## Installation instructions BZ-IG

### Pre-setting installation

1		Drill hole perpendicular to concrete surface.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3		Setting tool for <b>pre-setting installation</b> insert in anchor. 
4		Drive in anchor with setting tool.
5		Drive in screw.
6		Max. tightening torque $T_{inst}$ may be applied by using calibrated torque wrench.

### Wedge Anchor BZ-IG

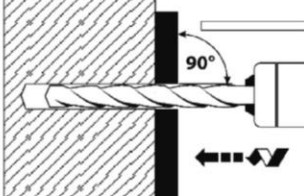
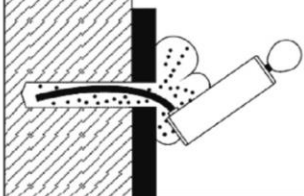
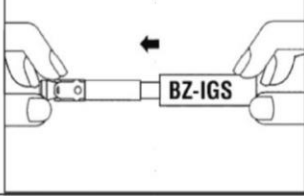
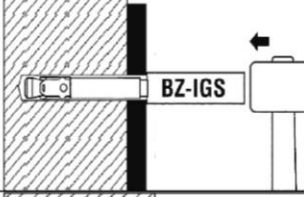
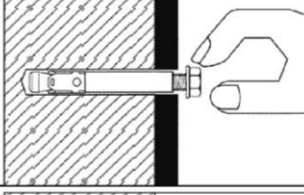
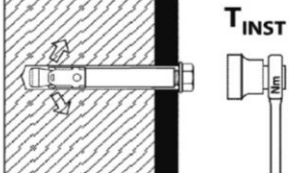
#### Intended Use

Installation instructions for pre-setting installation

Annex B8

## Installation instructions BZ-IG

### Through-setting installation

1		Drill hole perpendicular to concrete surface.
2		Blow out dust. Alternatively vacuum clean down to the bottom of the hole.
3		Setting tool for <b>through-setting installation</b> insert in anchor.
4		Drive in anchor with setting tool.
5		Drive in screw.
6		Max. tightening torque $T_{inst}$ may be applied by using calibrated torque wrench.

### Wedge Anchor BZ-IG

#### Intended Use

Installation instructions for through-setting installation

Annex B9

**Table C1: Characteristic values for tension loads, BZ plus zinc plated, cracked concrete, static and quasi-static action**

Anchor size			M8	M10	M12	M16	M20	M24	M27
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0						
<b>Steel failure</b>									
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60	86	126	196
Partial safety factor	$\gamma_{Ms}$	[-]	1,53		1,5		1,6	1,5	
<b>Pull-out</b>									
<b>Standard anchorage depth</b>									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	16	25	1)	1)	1)
<b>Reduced anchorage depth</b>									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	7,5	1)	1)	-	-	-
Increasing factor for $N_{Rk,p}$	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$						
<b>Concrete cone failure</b>									
Effective anchorage depth	$h_{ef}$	[mm]	46	60	70	85	100	115	125
Reduced anchorage depth	$h_{ef,red}$	[mm]	35 <sup>2)</sup>	40	50	65	-	-	-
Factor acc. to CEN/TS 1992-4	$k_{cr}$	[-]	7,2						

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> Use restricted to anchoring of structural components statically indeterminate.

**Wedge Anchor BZ plus**

**Performance**

Characteristic values for **tension loads, BZ plus zinc plated, cracked concrete**, static and quasi-static action

**Annex C1**

**Table C2:** Characteristic values for **tension loads, BZ plus A4 / HCR, cracked concrete**, static and quasi-static action

Anchor size		M8	M10	M12	M16	M20	M24
Installation safety factor	$\gamma_2 = \gamma_{inst}$ [-]	1,0					
<b>Steel failure</b>							
Characteristic tension resistance	$N_{Rk,s}$ [kN]	16	27	40	64	108	110
Partial safety factor	$\gamma_{Ms}$ [-]	1,5				1,68	1,5
<b>Pull-out</b>							
<b>Standard anchorage depth</b>							
Characteristic resistance in concrete C20/25	$N_{Rk,p}$ [kN]	5	9	16	25	1) <sup>1)</sup>	40
<b>Reduced anchorage depth</b>							
Characteristic resistance in concrete C20/25	$N_{Rk,p}$ [kN]	5	7,5	1) <sup>1)</sup>	1) <sup>1)</sup>	-	-
Increasing factor for $N_{Rk,p}$	$\psi_c$ [-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
<b>Concrete cone failure</b>							
Effective anchorage depth	$h_{ef}$ [mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$ [mm]	35 <sup>2)</sup>	40	50	65	-	-
Factor according to CEN/TS 1992-4	$k_{cr}$ [-]	7,2					

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> Use restricted to anchoring of structural components statically indeterminate.

**Wedge Anchor BZ plus**

**Performance**

Characteristic values for **tension loads, BZ plus A4 / HCR, cracked concrete**, static and quasi-static action

**Annex C2**



**Table C3: Characteristic values for tension loads, BZ plus zinc plated, non-cracked concrete, static and quasi-static action**

Anchor size		M8	M10	M12	M16	M20	M24	M27	
Installation safety factor	$\gamma_z = \gamma_{inst}$ [-]	1,0							
<b>Steel failure</b>									
Characteristic tension resistance	$N_{Rk,s}$ [kN]	16	27	40	60	86	126	196	
Partial safety factor	$\gamma_{Ms}$ [-]	1,53		1,5		1,6	1,5		
<b>Pull-out</b>									
<b>Standard anchorage depth</b>									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$ [kN]	12	16	25	35	<sup>1)</sup>	<sup>1)</sup>	<sup>1)</sup>	
<b>Reduced anchorage depth</b>									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$ [kN]	7,5	9	<sup>1)</sup>	<sup>1)</sup>	-	-	-	
<b>Splitting</b> For the proof against splitting failure $N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$ with consideration of the member thickness									
<b>Standard anchorage depth</b>									
Splitting for <b>standard thickness of concrete member</b> (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp} = 1,0$ )									
Standard thickness of concrete	$h_{min,1} \geq$ [mm]	100	120	140	170	200	230	250	
<b>Case 1</b>									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	9	12	20	30	40	62,3	50	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	3 $h_{ef}$							
<b>Case 2</b>									
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	12	16	25	35	50,5	62,3	70,6	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	4 $h_{ef}$				4,4 $h_{ef}$	3 $h_{ef}$	5 $h_{ef}$	
<b>Splitting for minimum thickness of concrete member</b>									
Minimum thickness of concrete	$h_{min,2} \geq$ [mm]	80	100	120	140				
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	12	16	25	35	-	-	-	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	5 $h_{ef}$							
<b>Reduced anchorage depth</b>									
Minimum thickness of concrete	$h_{min,3} \geq$ [mm]	80	80	100	140				
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	7,5	9	17,9	26,5	-	-	-	
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	200	200	250	300				
Increasing factor for $N_{Rk,p}$ and $N_{Rk,sp}^0$	$\psi_c$ [-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$							
<b>Concrete cone failure</b>									
Effective anchorage depth	$h_{ef}$ [mm]	46	60	70	85	100	115	125	
Reduced anchorage depth	$h_{ef,red}$ [mm]	35 <sup>2)</sup>	40	50	65	-	-	-	
Factor according to CEN/TS 1992-4	$k_{ucr}$ [-]	10,1							

<sup>1)</sup> Pull-out is not decisive.

<sup>2)</sup> Use restricted to anchoring of structural components statically indeterminate.

**Wedge Anchor BZ plus**

**Performance**

Characteristic values for **tension loads, BZ plus zinc plated, non-cracked concrete, static and quasi-static action**

**Annex C3**



**Table C4: Characteristic values for tension loads, BZ plus A4 / HCR, non-cracked concrete, static and quasi-static action**

Anchor size		M8	M10	M12	M16	M20	M24
Installation safety factor	$\gamma_2 = \gamma_{inst}$ [-]	1,0					
<b>Steel failure</b>							
Characteristic tension resistance	$N_{Rk,s}$ [kN]	16	27	40	64	108	110
Partial safety factor	$\gamma_{Ms}$ [-]	1,5				1,68	1,5
<b>Pull-out</b>							
<b>Standard anchorage depth</b>							
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$ [kN]	12	16	25	35	1)	1)
<b>Reduced anchorage depth</b>							
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$ [kN]	7,5	9	1)	1)	-	-
<b>Splitting</b> For the proof against splitting failure $N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$ with consideration of the member thickness							
<b>Standard anchorage depth</b>							
Splitting for <b>standard thickness of concrete member</b> (The higher resistance of case 1 and case 2 may be applied; the values $s_{cr,sp}$ and $c_{cr,sp}$ may be linearly interpolated for the member thickness $h_{min,2} < h < h_{min,1}$ (Case 2); $\psi_{h,sp} = 1,0$ )							
Standard thickness of concrete	$h_{min,1} \geq$ [mm]	100	120	140	160	200	250
<b>Case 1</b>							
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	9	12	20	30	40	-
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	3 $h_{ef}$					
<b>Case 2</b>							
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	12	16	25	35	50,5	70,6
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	230	250	280	400	440	500
<b>Splitting for minimum thickness of concrete member</b>							
Minimum thickness of concrete	$h_{min,2} \geq$ [mm]	80	100	120	140	-	-
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	12	16	25	35		
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	5 $h_{ef}$					
<b>Reduced anchorage depth</b>							
Minimum thickness of concrete	$h_{min,3} \geq$ [mm]	80	80	100	140	-	-
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$ [kN]	7,5	9	17,9	26,5		
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$ [mm]	200	200	250	300		
Increasing factor for $N_{Rk,p}$ and $N_{Rk,sp}^0$	$\psi_c$ [-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$					
<b>Concrete cone failure</b>							
Effective anchorage depth	$h_{ef}$ [mm]	46	60	70	85	100	125
Reduced anchorage depth	$h_{ef,red}$ [mm]	35 <sup>2)</sup>	40	50	65	-	-
Factor according to CEN/TS 1992-4	$k_{ucr}$ [-]	10,1					

1) Pull-out is not decisive.

2) Use restricted to anchoring of structural components statically indeterminate.

**Wedge Anchor BZ plus**

**Performance**

Characteristic values for tension loads, BZ plus A4 / HCR, non-cracked concrete, static and quasi-static action

**Annex C4**

**Table C5:** Characteristic values for **shear loads**, BZ plus,  
**cracked and non-cracked concrete**, static or quasi static action

Anchor size			M8	M10	M12	M16	M20	M24	M27	
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0							
<b>Steel failure without lever arm, Steel zinc plated</b>										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	12,2	20,1	30	55	69	114	169,4	
Factor for ductility	$k_2$	[-]	1,0							
Partial safety factor	$\gamma_{Ms}$	[-]	1,25				1,33	1,25	1,25	
<b>Steel failure without lever arm, Stainless steel A4, HCR</b>										
Characteristic shear resistance	$V_{Rk,s}$	[kN]	13	20	30	55	86	123,6	-	
Factor for ductility	$k_2$	[-]	1,0							
Partial safety factor	$\gamma_{Ms}$	[-]	1,25				1,4	1,25		
<b>Steel failure with lever arm, Steel zinc plated</b>										
Characteristic bending resistance	$M_{Rk,s}^0$	[Nm]	23	47	82	216	363	898	1331,5	
Partial safety factor	$\gamma_{Ms}$	[-]	1,25				1,33	1,25	1,25	
<b>Steel failure with lever arm, Stainless steel A4, HCR</b>										
Characteristic bending resistance	$M_{Rk,s}^0$	[Nm]	26	52	92	200	454	785,4	-	
Partial safety factor	$\gamma_{Ms}$	[-]	1,25				1,4	1,25		
<b>Concrete pry-out failure</b>										
Factor k acc. to ETAG 001, Annex C or $k_3$ acc. to CEN/TS 1992-4	$k_{(3)}$	[-]	2,4				2,8			
<b>Concrete edge failure</b>										
Effective length of anchor in shear loading with $h_{ef}$	Steel zinc plated	$l_f$	[mm]	46	60	70	85	100	115	125
	Stainless steel A4, HCR	$l_f$	[mm]	46	60	70	85	100	125	-
Effective length of anchor in shear loading with $h_{ef,red}$	Steel zinc plated	$l_{f,red}$	[mm]	35 <sup>1)</sup>	40	50	65	-	-	-
	Stainless steel A4, HCR	$l_{f,red}$	[mm]	35 <sup>1)</sup>	40	50	65			
Outside diameter of anchor	$d_{nom}$	[mm]	8	10	12	16	20	24	27	

<sup>1)</sup> Use restricted to anchoring of structural components statically indeterminate.

**Wedge Anchor BZ plus**

**Performance**

Characteristic values for **shear loads**, BZ plus,  
**cracked and non-cracked concrete**, static or quasi static action

**Annex C5**

**Table C6:** Characteristic resistance for **seismic loading**, BZ plus,  
**standard anchorage depth**, performance category **C1** and **C2**

Anchor size		M8	M10	M12	M16	M20	
<b>Tension loads</b>							
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0				
<b>Steel failure, Steel zinc plated</b>							
Characteristic resistance <b>C1</b>	$N_{Rk,s,seis,C1}$	[kN]	16	27	40	60	86
Characteristic resistance <b>C2</b>	$N_{Rk,s,seis,C2}$	[kN]	16	27	40	60	86
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,53		1,5		1,6
<b>Steel failure, Stainless steel A4, HCR</b>							
Characteristic resistance <b>C1</b>	$N_{Rk,s,seis,C1}$	[kN]	16	27	40	64	108
Characteristic resistance <b>C2</b>	$N_{Rk,s,seis,C2}$	[kN]	16	27	40	64	108
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,5				1,68
<b>Pull-out (steel zinc plated, stainless steel A4 and HCR)</b>							
Characteristic resistance <b>C1</b>	$N_{Rk,p,seis,C1}$	[kN]	5	9	16	25	36
Characteristic resistance <b>C2</b>	$N_{Rk,p,seis,C2}$	[kN]	2,3	3,6	10,2	13,8	24,4
Increasing factor for $N_{Rk,p}$	$\psi_c$	[-]	1,0				
<b>Shear loads</b>							
<b>Steel failure without lever arm, Steel zinc plated</b>							
Characteristic resistance <b>C1</b>	$V_{Rk,s,seis,C1}$	[kN]	9,3	20	27	44	69
Characteristic resistance <b>C2</b>	$V_{Rk,s,seis,C2}$	[kN]	6,7	14	16,2	35,7	55,2
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25				1,33
<b>Steel failure without lever arm, Stainless steel A4, HCR</b>							
Characteristic resistance <b>C1</b>	$V_{Rk,s,seis,C1}$	[kN]	9,3	20	27	44	69
Characteristic resistance <b>C2</b>	$V_{Rk,s,seis,C2}$	[kN]	6,7	14	16,2	35,7	55,2
Partial safety factor	$\gamma_{Ms,seis}$	[-]	1,25				1,4

**Wedge Anchor BZ plus**

**Performance**  
Characteristic resistance for **seismic loading**, BZ plus,  
**standard anchorage depth**, performance category **C1** and **C2**

**Annex C6**



**Table C7: Characteristic values for tension and shear load under fire exposure, BZ plus, standard anchorage depth, cracked and non-cracked concrete C20/25 to C50/60**

Anchor size		M8	M10	M12	M16	M20	M24	M27		
<b>Tension load</b>										
<b>Steel failure</b>										
<b>Steel, galvanised</b>										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7	9,4	13,6	17,6
	R60			1,1	1,9	3,0	5,6	8,2	11,8	15,3
	R90			0,8	1,4	2,4	4,4	6,9	10,0	13,0
	R120			0,7	1,2	2,2	4,0	6,3	9,1	11,8
<b>Stainless steel A4, HCR</b>										
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
<b>Shear load</b>										
<b>Steel failure without lever arm</b>										
<b>Steel, galvanised</b>										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,6	2,6	4,1	7,7	11	16	20,6
	R60			1,5	2,5	3,6	6,8	11	15	19,8
	R90			1,2	2,1	3,5	6,5	10	15	19,0
	R120			1,0	2,0	3,4	6,4	10	14	18,6
<b>Stainless steel A4, HCR</b>										
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	3,8	6,9	12,7	23,7	33,5	48,2	-
	R60			2,9	5,3	9,4	17,6	25,0	35,9	
	R90			2,0	3,6	6,1	11,5	16,4	23,6	
	R120			1,6	2,8	4,5	8,4	12,1	17,4	
<b>Steel failure with lever arm</b>										
<b>Steel, galvanised</b>										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,7	3,3	6,4	16,3	29	50	75
	R60			1,6	3,2	5,6	14	28	48	72
	R90			1,2	2,7	5,4	14	27	47	69
	R120			1,1	2,5	5,3	13	26	46	68
<b>Stainless steel A4, HCR</b>										
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,8	9,0	19,7	50,1	88,8	153,5	-
	R60			2,9	6,8	14,6	37,2	66,1	114,3	
	R90			2,1	4,7	9,5	24,2	43,4	75,1	
	R120			1,6	3,6	7,0	17,8	32,1	55,5	

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out and concrete edge failure can be calculated according to TR020 / CEN/TS 1992-4. If pull-out is not decisive in Eq. 2.4 and Eq. 2.5, TR 020  $N_{Rk,p}$  must be replaced by  $N^0_{Rk,c}$ .

**Wedge Anchor BZ plus**

**Performance**

Characteristic values for tension and shear load under fire exposure, BZ plus, standard anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

**Annex C7**

English translation prepared by DIBt

**Table C8: Characteristic values for tension and shear load under fire exposure, BZ plus, reduced anchorage depth, cracked and non-cracked concrete C20/25 to C50/60**

Anchor size		M8	M10	M12	M16		
<b>Tension load</b>							
<b>Steel failure</b>							
<b>Steel, galvanised</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
<b>Shear load</b>							
<b>Steel failure without lever arm</b>							
<b>Steel, galvanised</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,5	2,6	4,1	7,7
	R60			1,1	1,9	3,0	5,6
	R90			0,8	1,3	1,9	3,5
	R120			0,6	1,0	1,3	2,5
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	3,2	6,9	12,7	23,7
	R60			2,5	5,3	9,4	17,6
	R90			1,9	3,6	6,1	11,5
	R120			1,6	2,8	4,5	8,4
<b>Steel failure with lever arm</b>							
<b>Steel, galvanised</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,5	3,3	6,4	16,3
	R60			1,2	2,5	4,7	11,9
	R90			0,8	1,7	3,0	7,5
	R120			0,6	1,2	2,1	5,3
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	3,2	8,9	19,7	50,1
	R60			2,6	6,8	14,6	37,2
	R90			2,0	4,7	9,5	24,2
	R120			1,6	3,6	7,0	17,8

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out and concrete edge failure can be calculated according to TR020 / CEN/TS 1992-4. If pull-out is not decisive in Eq. 2.4 and Eq. 2.5, TR 020  $N_{Rk,p}$  must be replaced by  $N^0_{Rk,c}$ .

**Wedge Anchor BZ plus**

**Performance**

Characteristic values for tension and shear load under fire exposure, BZ plus, reduced anchorage depth, cracked and non-cracked concrete C20/25 to C50/60

**Annex C8**



**Table C9: Displacements under tension load, BZ plus**

Anchor size			M8	M10	M12	M16	M20	M24	M27
<b>Standard anchorage depth</b>									
<b>Steel zinc plated</b>									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	21,1	24
Displacement	$\delta_{N0}$	[mm]	0,6	1,0	0,4	1,0	0,9	0,7	0,9
	$\delta_{N\infty}$	[mm]	1,4	1,2	1,4	1,3	1,0	1,2	1,4
Tension load in non-cracked concrete	N	[kN]	5,7	7,6	11,9	16,7	23,8	29,6	34
Displacement	$\delta_{N0}$	[mm]	0,4	0,5	0,7	0,3	0,4	0,5	0,3
	$\delta_{N\infty}$	[mm]	0,8		1,4	0,8		1,4	
<b>Displacements under seismic tension loads C2</b>									
Displacements for DLS	$\delta_{N,seis,C2(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2	-	-
<b>Stainless steel A4, HCR</b>									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	19,0	-
Displacement	$\delta_{N0}$	[mm]	0,7	1,8	0,4	0,7	0,9	0,5	-
	$\delta_{N\infty}$	[mm]	1,2	1,4	1,4	1,4	1,0	1,8	-
Tension load in non-cracked concrete	N	[kN]	5,8	7,6	11,9	16,7	23,8	33,5	-
Displacement	$\delta_{N0}$	[mm]	0,6	0,5	0,7	0,2	0,4	0,5	-
	$\delta_{N\infty}$	[mm]	1,2	1,0	1,4	0,4	0,8	1,1	-
<b>Displacements under seismic tension loads C2</b>									
Displacements for DLS	$\delta_{N,seis,C2(DLS)}$	[mm]	2,3	4,1	4,9	3,6	5,1	-	-
Displacements for ULS	$\delta_{N,seis,C2(ULS)}$	[mm]	8,2	13,8	15,7	9,5	15,2	-	-
<b>Reduced anchorage depth</b>									
<b>Steel zinc plated, stainless steel A4, HCR</b>									
Tension load in cracked concrete	N	[kN]	2,4	3,6	6,1	9,0	-	-	-
Displacement	$\delta_{N0}$	[mm]	0,8	0,7	0,5	1,0	-	-	-
	$\delta_{N\infty}$	[mm]	1,2	1,0	0,8	1,1	-	-	-
Tension load in non-cracked concrete	N	[kN]	3,7	4,3	8,5	12,6	-	-	-
Displacement	$\delta_{N0}$	[mm]	0,1	0,2	0,2	0,2	-	-	-
	$\delta_{N\infty}$	[mm]	0,7	0,7	0,7	0,7	-	-	-

**Wedge Anchor BZ plus**

**Performance**  
Displacements under tension load

**Annex C9**

**Table C10: Displacements under shear load, BZ plus**

Anchor size			M8	M10	M12	M16	M20	M24	M27
<b>Standard anchorage depth</b>									
<b>Steel zinc plated</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	36,8	64,9	96,8
Displacement	$\delta_{V0}$	[mm]	2,0	3,2	3,6	3,5	1,8	3,5	3,6
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	2,7	5,3	5,4
<b>Displacements under seismic shear loads C2</b>									
Displacements for DLS	$\delta_{V,seis,C2(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1	-	-
<b>Stainless steel A4, HCR</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	43,8	70,6	-
Displacement	$\delta_{V0}$	[mm]	1,9	2,4	4,0	4,3	2,9	2,8	-
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4	4,3	4,2	-
<b>Displacements under seismic shear loads C2</b>									
Displacements for DLS	$\delta_{V,seis,C2(DLS)}$	[mm]	3,0	2,7	3,5	4,3	4,7	-	-
Displacements for ULS	$\delta_{V,seis,C2(ULS)}$	[mm]	5,9	5,3	9,5	9,6	10,1	-	-
<b>Reduced anchorage depth</b>									
<b>Steel zinc plated</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4	-	-	-
Displacement	$\delta_{V0}$	[mm]	2,0	3,2	3,6	3,5	-	-	-
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3	-	-	-
<b>Stainless steel A4, HCR</b>									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4	-	-	-
Displacement	$\delta_{V0}$	[mm]	1,9	2,4	4,0	4,3	-	-	-
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4	-	-	-

**Wedge Anchor BZ plus**

**Performance**  
Displacements under shear load

**Annex C10**

**Table C11: Characteristic values for tension loads, BZ-IG, cracked concrete, static and quasi-static action**

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,2			
<b>Steel failure</b>						
Characteristic tension resistance, <b>steel zinc plated</b>	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,5			
Characteristic tension resistance, <b>stainless steel A4, HCR</b>	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	$\gamma_{Ms}$	[-]	1,87			
<b>Pull-out failure</b>						
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Increasing factor	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
<b>Concrete cone failure</b>						
Effective anchorage depth	$h_{ef}$	[mm]	45	58	65	80
Factor according to CEN/TS 1992-4	$k_{cr}$	[-]	7,2			

**Wedge Anchor BZ-IG**

**Performance**  
Characteristic values for **tension loads, BZ-IG, cracked concrete**, static and quasi-static action

**Annex C11**



**Table C12: Characteristic values for tension loads, BZ-IG, non-cracked concrete, static and quasi-static action**

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,2			
<b>Steel failure</b>						
Characteristic tension resistance, steel zinc plated	$N_{Rk,s}$	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,5			
Characteristic tension resistance, stainless steel A4, HCR	$N_{Rk,s}$	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	$\gamma_{Ms}$	[-]	1,87			
<b>Pull-out</b>						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	30
<b>Splitting</b> ( $N_{Rk,c}^0$ has to be replaced by $N_{Rk,sp}^0$ . The higher resistance of Case 1 and Case 2 may be applied.)						
Minimum thickness of concrete member	$h_{min}$	[mm]	100	120	130	160
<b>Case 1</b>						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	9	12	16	25
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	$3 h_{ef}$			
<b>Case 2</b>						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	12	16	20	30
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	$5 h_{ef}$			
Increasing factor for $N_{Rk,p}$ and $N_{Rk,sp}^0$	$\psi_c$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
<b>Concrete cone failure</b>						
Effective anchorage depth	$h_{ef}$	[mm]	45	58	65	80
Factor according to CEN/TS 1992-4	$k_{ucr}$	[-]	10,1			

**Wedge Anchor BZ-IG**

**Performance**  
Characteristic values for tension loads, BZ-IG, non-cracked concrete, static and quasi-static action

**Annex C12**

**Table C13: Characteristic values for shear loads, BZ-IG,  
cracked and non-cracked concrete, static and quasi-static action**

Anchor size			M6	M8	M10	M12
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0			
<b>BZ-IG, steel zinc plated</b>						
<b>Steel failure without lever arm, Installation type V</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,8	6,9	10,4	25,8
<b>Steel failure without lever arm, Installation type D</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,1	7,6	10,8	24,3
<b>Steel failure with lever arm, Installation type V</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	12,2	30,0	59,8	104,6
<b>Steel failure with lever arm, Installation type D</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	36,0	53,2	76,0	207
Partial safety factor for $V_{Rk,s}$ and $M^0_{Rk,s}$	$\gamma_{Ms}$	[-]	1,25			
Factor of ductility	$k_2$	[-]	1,0			
<b>BZ-IG, stainless steel A4, HCR</b>						
<b>Steel failure without lever arm, Installation type V</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	5,7	9,2	10,6	23,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
<b>Steel failure without lever arm, Installation type D</b>						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	7,3	7,6	9,7	29,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
<b>Steel failure with lever arm, Installation type V</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	10,7	26,2	52,3	91,6
Partial safety factor	$\gamma_{Ms}$	[-]	1,56			
<b>Steel failure with lever arm, Installation type D</b>						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	28,2	44,3	69,9	191,2
Partial safety factor	$\gamma_{Ms}$	[-]	1,25			
Factor of ductility	$k_2$	[-]	1,0			
<b>Concrete pry-out failure</b>						
Factor k acc. to ETAG 001, Annex C or $k_3$ acc. to CEN/TS 1992-4	$k_{(3)}$	[-]	1,5	1,5	2,0	2,0
<b>Concrete edge failure</b>						
Effective length of anchor in shear loading	$l_f$	[mm]	45	58	65	80
Effective diameter of anchor	$d_{nom}$	[mm]	8	10	12	16

**Wedge Anchor BZ-IG**

**Performance**  
Characteristic values for shear loads, BZ-IG,  
cracked and non-cracked concrete, static and quasi-static action

**Annex C13**

**Table C14: Characteristic values for tension and shear load under fire exposure, BZ-IG, cracked and non-cracked concrete C20/25 to C50/60**

Anchor size		M6	M8	M10	M12		
<b>Tension load</b>							
<b>Steel failure</b>							
<b>Steel zinc plated</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
<b>Shear load</b>							
<b>Steel failure without lever arm</b>							
<b>Steel zinc plated</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,7	1,4	2,5	3,7
	R60			0,6	1,2	2,0	2,9
	R90			0,5	0,9	1,5	2,2
	R120			0,4	0,8	1,3	1,8
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	2,9	5,4	8,7	12,6
	R60			1,9	3,8	6,3	9,2
	R90			1,0	2,1	3,9	5,7
	R120			0,5	1,3	2,7	4,0
<b>Steel failure with lever arm</b>							
<b>Steel zinc plated</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	0,5	1,4	3,3	5,7
	R60			0,4	1,2	2,6	4,6
	R90			0,4	0,9	2,0	3,4
	R120			0,3	0,8	1,6	2,8
<b>Stainless steel A4, HCR</b>							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	2,2	5,5	11,2	19,6
	R60			1,5	3,9	8,1	14,3
	R90			0,7	2,2	5,1	8,9
	R120			0,4	1,3	3,5	6,2

The characteristic resistance for pull-out failure, concrete cone failure, concrete pry-out failure and concrete edge failure can be designed according to TR020 / CEN/TS 1992-4.

**Wedge Anchor BZ-IG**

**Performance**

Characteristic values for **tension** and **shear loads** under **fire exposure, BZ-IG** cracked and non-cracked concrete C20/25 to C50/60

**Annex C14**



**Table C15: Displacements under tension load, BZ-IG**

Anchor size			M6	M8	M10	M12
Tension load in cracked concrete	N	[kN]	2,0	3,6	4,8	8,0
Displacements	$\delta_{N0}$	[mm]	0,6	0,6	0,8	1,0
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4
Tension load in non-cracked concrete	N	[kN]	4,8	6,4	8,0	12,0
Displacements	$\delta_{N0}$	[mm]	0,4	0,5	0,7	0,8
	$\delta_{N\infty}$	[mm]	0,8	0,8	1,2	1,4

**Table C16: Displacements under shear load, BZ-IG**

Anchor size			M6	M8	M10	M12
Shear load in cracked and non-cracked concrete	V	[kN]	4,2	5,3	6,2	16,9
Displacements	$\delta_{V0}$	[mm]	2,8	2,9	2,5	3,6
	$\delta_{V\infty}$	[mm]	4,2	4,4	3,8	5,3

**Wedge Anchor BZ-IG**

**Performance**  
Displacements under tension load and under shear load

**Annex C15**