Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA
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Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-16/0761 of 30 September 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 BZ2
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 DEUTSCHLAND
Manufacturing plant	MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach
This European Technical Assessment contains	16 pages including 3 annexes which form an integral part of this assessment
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	Guideline for European technical approval of "Metal anchors for use in concrete", ETAG 001 Part 2: "Torque controlled expansion anchors", April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

The MKT Wedge Anchor BZ2 is an anchor made of galvanised steel or made of stainless steel which is placed into a drilled hole and anchored by torque-controlled expansion.

The product description is given in Annex A.

2 Specification of the intended use in accordance with the applicable European Assessment Document

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

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the anchor of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance for static and quasi static action	See Annex C 1 to C 3
Displacements under tension and shear loads	See Annex C 5

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	See Annex C 4

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.

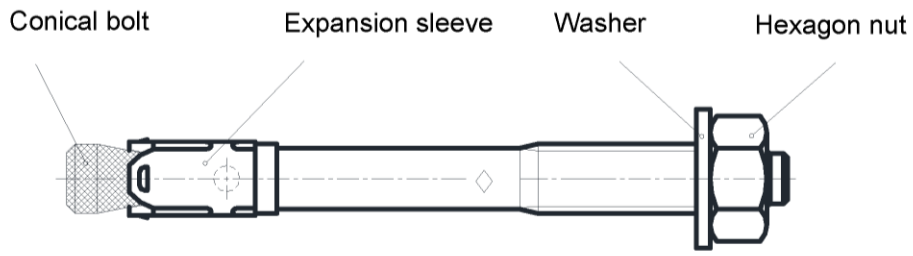
Issued in Berlin on 30 September 2016 by Deutsches Institut für Bautechnik

Andreas Kummerow
p.p. Head of Department

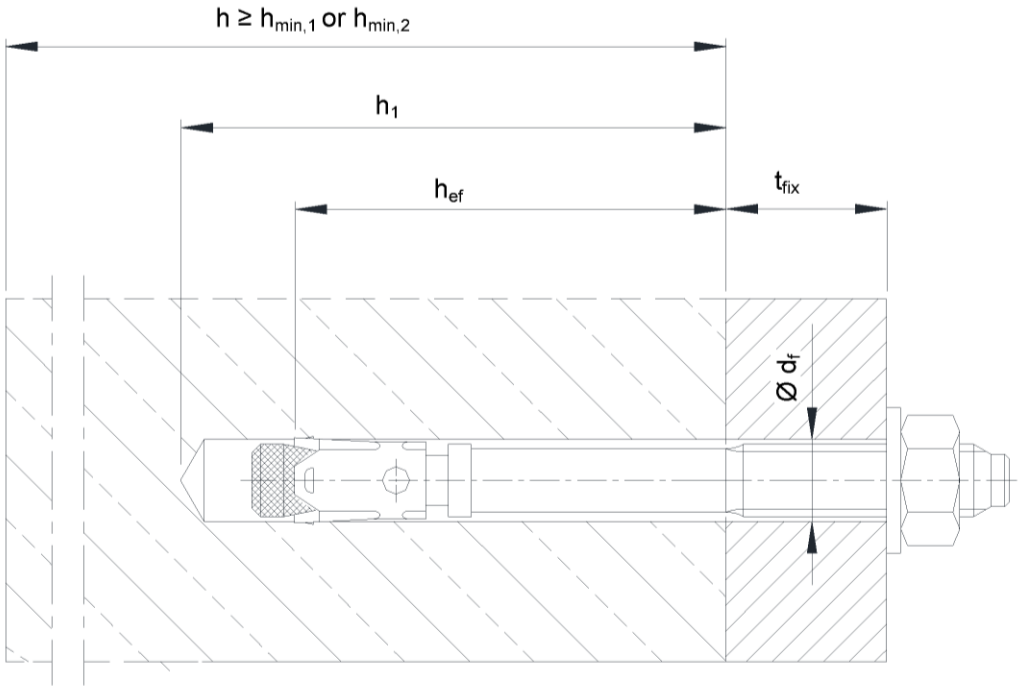
beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik

Wedge anchor BZ2



Intended use Wedge Anchor BZ2



Wedge Anchor BZ2	
Product description Anchor and installation situation	**Annex A1**

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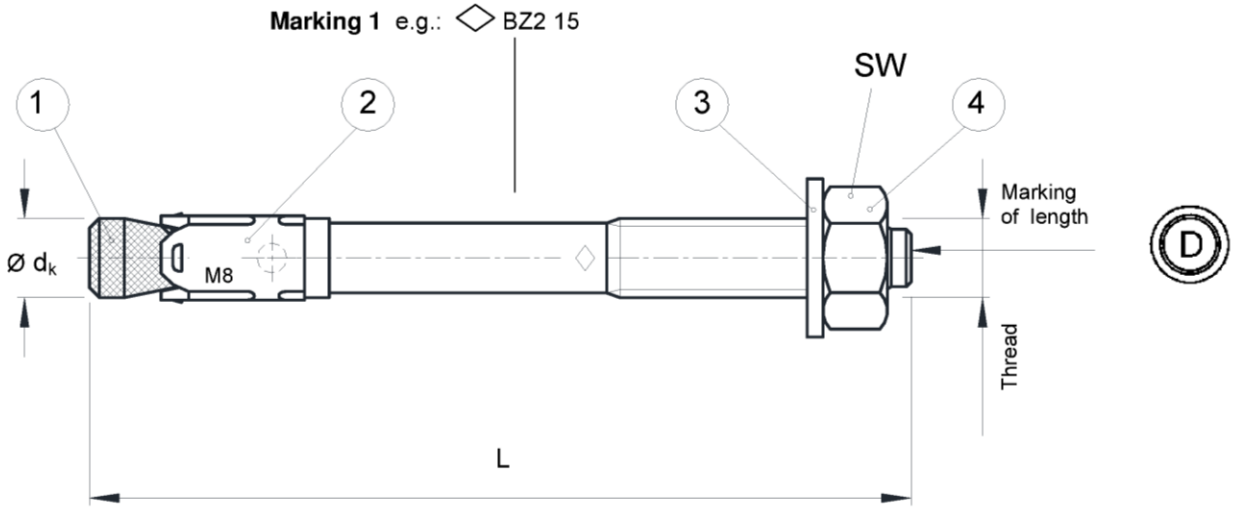

Marking 1 e.g.: ◇ BZ2 15

◇	Identifying mark of manufacturing plant
BZ2	Trade name
15	maximum thickness of fixture for h_{ef}
M8	Thread size
A4	additional marking of stainless 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 ≥	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 ≥	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 BZ2

Product description
Marking

Annex A2

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Table A1: Anchor dimensions

Anchor size		M8	M10	M12	M16
Conical bolt	Thread	M8	M10	M12	M16
	∅ d_k =	7,9	9,8	12,0	15,7
Length of anchor	L	65 + t_{fix}	80 + t_{fix}	96,5+t_{fix}	118+t_{fix}
Hexagon nut	SW	13	17	19	24

Dimensions in mm

Table A2: Material

No.	Part	BZ2	BZ2 A4
		Steel, zinc plated	Stainless steel
1	Conical bolt	Cold formed steel, galvanised, Cone plastic coated	Stainless steel (e.g. 1.4401, 1.4404, 1.4578, 1.4571) EN 10088:2014, Cone plastic coated
2	Expansion sleeve	Steel, galvanised or 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
3	Washer	Steel, galvanised	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014
4	Hexagon nut	Steel, galvanised, coated	Stainless steel (e.g. 1.4401, 1.4571) EN 10088:2014, coated

Wedge Anchor BZ2

Product description
Dimensions and material

Annex A3

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Specifications of intended use

Wedge Anchor BZ2	M8	M10	M12	M16
Steel, galvanised	✓			
Stainless steel A4	✓			
Static or quasi-static action	✓			
Fire exposure	✓			

Base materials:

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

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (steel zinc plated or stainless 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).

  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.)

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 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 BZ2	
Intended use Specifications	**Annex B1**

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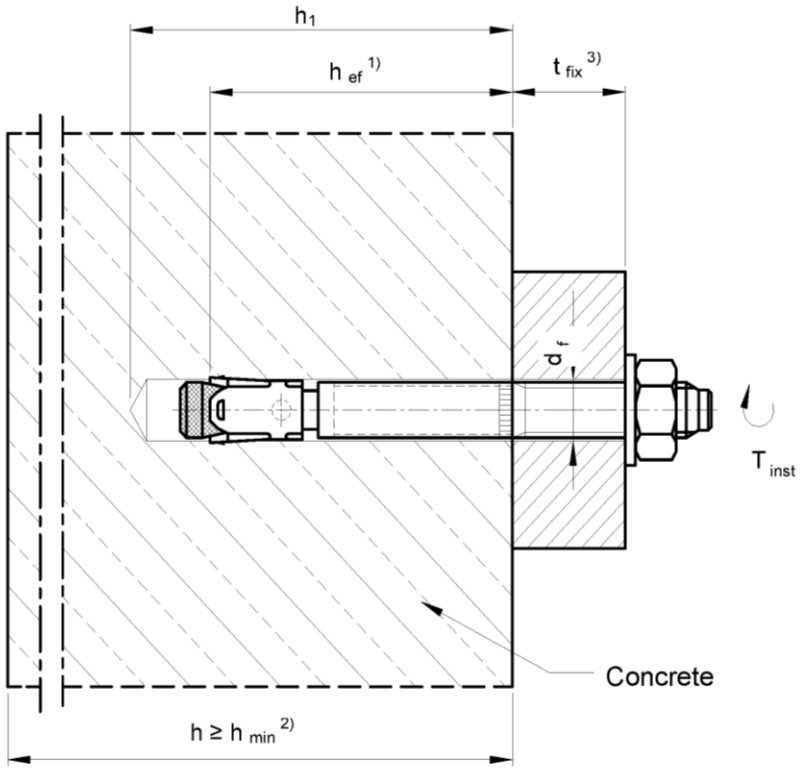
Table B1: Installation parameters

Anchor size				M8	M10	M12	M16
Nominal 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
Installation torque	Steel, galvanised	T_{inst}	[Nm]	20	25	45	90
	Stainless steel A4	T_{inst}	[Nm]	20	35	50	110
Diameter of clearance hole in the fixture		$d_f \leq$	[mm]	9	12	14	18
Depth of drill hole		$h_1 \geq$	[mm]	60	75	90	110
Effective anchorage depth		h_{ef}	[mm]	46	60	70	85



1) Effective anchorage depth h_{ef}
2) Minimum thickness of concrete member h_{min}
3) Thickness of fixture t_{fix}

Wedge Anchor BZ2

Intended use
Installation parameters

Annex B2

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Table B2: Minimum **spacings** and **edge distances**

Anchor size			**M8**	**M10**	**M12**	**M16**
Standard thickness of concrete member						
Steel zinc plated						
Standard thickness of member	$h_{min,1}$	[mm]	100	120	140	170
Cracked concrete						
Minimum spacing	s_{min}	[mm]	40	45	60	60
	for c ≥	[mm]	70	70	100	100
Minimum edge distance	c_{min}	[mm]	40	45	60	60
	for s ≥	[mm]	80	90	140	180
Non-cracked concrete						
Minimum spacing	s_{min}	[mm]	40	45	60	65
	for c ≥	[mm]	80	70	120	120
Minimum edge distance	c_{min}	[mm]	50	50	75	80
	for s ≥	[mm]	100	100	150	150
Stainless steel A4						
Standard thickness of member	$h_{min,1}$	[mm]	100	120	140	160
Cracked concrete						
Minimum spacing	s_{min}	[mm]	40	50	60	60
	for c ≥	[mm]	70	75	100	100
Minimum edge distance	c_{min}	[mm]	40	55	60	60
	for s ≥	[mm]	80	90	140	180
Non-cracked concrete						
Minimum spacing	s_{min}	[mm]	40	50	60	65
	for c ≥	[mm]	80	75	120	120
Minimum edge distance	c_{min}	[mm]	50	60	75	80
	for s ≥	[mm]	100	120	150	150
Minimum thickness of concrete member						
Steel zinc plated, stainless steel A4						
Minimum thickness of member	$h_{min,2}$	[mm]	80	100	120	140
Cracked concrete						
Minimum spacing	s_{min}	[mm]	40	45	60	70
	for c ≥	[mm]	70	90	100	160
Minimum edge distance	c_{min}	[mm]	40	50	60	80
	for s ≥	[mm]	80	115	140	180
Non-cracked concrete						
Minimum spacing	s_{min}	[mm]	40	60	60	80
	for c ≥	[mm]	80	140	120	180
Minimum edge distance	c_{min}	[mm]	50	90	75	90
	for s ≥	[mm]	100	140	150	200

Fire exposure from one side			
Minimum spacing	$s_{min,fi}$	[mm]	See normal ambient temperature
Minimum edge distance	$c_{min,fi}$	[mm]	See normal ambient temperature
Fire exposure from more than one side			
Minimum spacing	$s_{min,fi}$	[mm]	See normal ambient temperature
Minimum edge distance	$c_{min,fi}$	[mm]	≥ 300 mm

Intermediate values by linear interpolation.

Wedge Anchor BZ2

Intended use
Minimum **spacings** and **edge distances**

Annex B3

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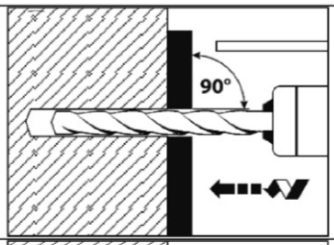
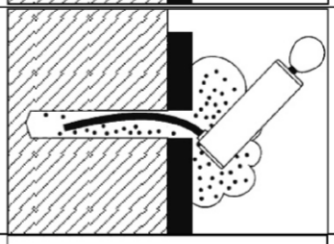
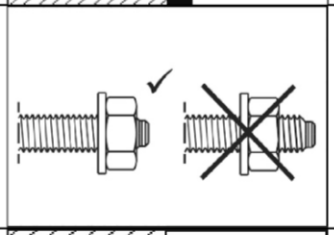
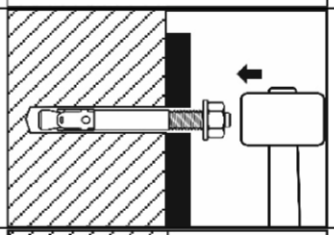
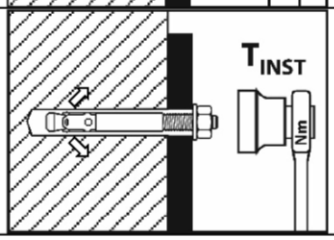
Installation instructions BZ2

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} 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 BZ2

Intended use
Installation instructions

Annex B4

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Table C1: Characteristic values for **tension loads, cracked concrete**

Anchor size			**M8**	**M10**	**M12**	**M16**
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0			
Steel failure						
Steel galvanised						
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60
Partial safety factor	γ_{Ms}	[-]	1,53		1,5	
Stainless steel A4						
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	64
Partial safety factor	γ_{Ms}	[-]	1,5			
Pull-out failure						
Steel galvanised						
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	20
Stainless steel A4						
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	25
Increasing factor for $N_{Rk,p}$	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85
Factor acc. to CEN/TS 1992-4	k_{cr}	[-]	7,2			

Wedge Anchor BZ2

Performance
Characteristic values for **tension loads**, **cracked concrete**

Annex C1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values for **tension loads, non-cracked concrete**

Anchor size			**M8**	**M10**	**M12**	**M16**
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0			
Steel failure						
Steel galvanised						
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	60
Partial safety factor	γ_{Ms}	[-]	1,53		1,5	
Stainless steel A4						
Characteristic tension resistance	$N_{Rk,s}$	[kN]	16	27	40	64
Partial safety factor	γ_{Ms}	[-]	1,5			
Pull-out failure						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	9	16	20	35
Splitting For the proof against splitting failure $N^0_{Rk,c}$ has to be replaced by $N^0_{Rk,sp}$ with consideration of the member thickness						
Splitting for **standard thickness of concrete member** (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
Case 1						
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	12	20	30
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	3 h_{ef}			
Case 2						
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	-	16	-	35
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	-	240 (vz) 250 (A4)	-	340 (vz) 400 (A4)
Splitting for **minimum thickness of concrete member**						
Minimum thickness of concrete	$h_{min,2} \geq$	[mm]	80	100	120	140
Characteristic resistance in non-cracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	9	16	20	35
Spacing (edge distance)	$s_{cr,sp}$ (= 2 $c_{cr,sp}$)	[mm]	5 h_{ef}			
Increasing factor for $N_{Rk,p}$ and $N^0_{Rk,sp}$	ψc	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$			
Concrete cone failure						
Effective anchorage depth	h_{ef}	[mm]	46	60	70	85
Spacing (edge distance)	$s_{cr,N}$ (= 2 $c_{cr,N}$)	[mm]	3 h_{ef}			
Factor according to CEN/TS 1992-4	k_{ucr}	[-]	10,1			

Wedge Anchor BZ2

Performance
Characteristic values for **tension loads, non-cracked concrete**

Annex C2

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic values for **shear loads**, **cracked** and **non-cracked concrete**

Anchor size			**M8**	**M10**	**M12**	**M16**
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,0			
Steel failure without lever arm						
Steel zinc plated						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	12,2	20,1	30	55
Factor for ductility	k_2	[-]	1,0			
Partial safety factor	γ_{Ms}	[-]	1,25			
Stainless steel A4						
Characteristic shear resistance	$V_{Rk,s}$	[kN]	13	20	30	55
Factor for ductility	k_2	[-]	1,0			
Partial safety factor	γ_{Ms}	[-]	1,25			
Steel failure with lever arm						
Steel zinc plated						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	23	47	82	216
Partial safety factor	γ_{Ms}	[-]	1,25			
Stainless steel A4						
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	200
Partial safety factor	γ_{Ms}	[-]	1,25			
Concrete pry-out failure						
Factor k acc. to ETAG 001, Annex C or k_3 acc. to CEN/TS 1992-4	$k_{(3)}$	[-]	2,4			
Concrete edge failure						
Effective length of anchor in shear loading	l_f	[mm]	46	60	70	85
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16

Wedge Anchor BZ2

Performance
Characteristic values for **shear loads**, **cracked** and **non-cracked concrete**

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C4: Characteristic values **for tension and shear load** under **fire exposure,** cracked and non-cracked concrete C20/25 to C50/60

Anchor size				**M8**	**M10**	**M12**	**M16**
Tension load							
Steel failure							
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	1,4	2,4	4,4
	R120			0,7	1,2	2,2	4,0
Shear load							
Steel failure without lever arm							
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	1,6	2,6	4,1	7,7
	R60			1,5	2,5	3,6	6,8
	R90			1,2	2,1	3,5	6,5
	R120			1,0	2,0	3,4	6,4
Steel failure with lever arm							
Characteristic resistance	R30	$M^0_{Rk,s,fi}$	[Nm]	1,7	3,3	6,4	16,3
	R60			1,6	3,2	5,6	14
	R90			1,2	2,7	5,4	14
	R120			1,1	2,5	5,3	13

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 BZ2

Performance
Characteristic values **for tension and shear load** under **fire exposure**

Annex C4

Deutsches Institut für Bautechnik DIBt

Table C5: Displacements

Anchor size			M8	M10	M12	M16
Displacement under tension load						
Steel galvanised						
Tension load in cracked concrete	N	[kN]	2,4	4,3	5,7	9,5
Displacement	δ_{N0}	[mm]	0,6	1,0	0,3	0,8
	$\delta_{N\infty}$	[mm]	1,4	1,2	1,1	1,0
Tension load in non-cracked concrete	N	[kN]	4,3	7,6	9,5	16,7
Displacement	δ_{N0}	[mm]	0,3	0,5	0,6	0,3
	$\delta_{N\infty}$	[mm]	0,6	0,8	1,1	0,8
Stainless steel A4						
Tension load in cracked concrete	N	[kN]	2,4	4,3	5,7	11,9
Displacement	δ_{N0}	[mm]	0,7	1,8	0,3	0,7
	$\delta_{N\infty}$	[mm]	1,2	1,4	1,1	1,4
Tension load in non-cracked concrete	N	[kN]	4,3	7,6	9,5	16,7
Displacement	δ_{N0}	[mm]	0,5	0,5	0,6	0,2
	$\delta_{N\infty}$	[mm]	0,9	1,0	1,1	0,4
Displacement under shear load						
Steel zinc plated						
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4
Displacement	δ_{V0}	[mm]	2,0	3,2	3,6	3,5
	$\delta_{V\infty}$	[mm]	3,0	4,7	5,5	5,3
Stainless steel A4						
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4
Displacement	δ_{V0}	[mm]	1,9	2,4	4,0	4,3
	$\delta_{V\infty}$	[mm]	2,9	3,6	5,9	6,4

Wedge Anchor BZ2

Performance
Displacements

Annex C5