

Declaration of performance

Heavy-duty anchor BZ and BZ-IG

valid for MÜPRO Heavy-duty anchor BZ

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Declaration of performance acc. Regulation (EU) 305/2011

DoP No.: MP Hochleistungsanker 20160824

1. Unique identification code of the product-type:

Heavy-duty anchor BZ and BZ-IG

2. Type, batch or serial number or any other element allowing identification of the construction product as required pursuant to Article 11(4):

ETA-05/0158, Annex A3 and A5 Batch number: see packaging of the product

3. Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:

generic type	torque controlled expansion anchor (bolt type (with internal thread))
for use in	cracked and non-cracked concrete, C20/25 - C50/60 (EN 206)
option	1
loading	static or quasi-static seismic, category C1 + C2 (covered sizes: BZ plus M8, M10, M12, M16, M20)
material	zinc-plated steel: dry internal conditions only covered sizes: BZ: M8, M10, M12, M16, M20, M24, M27 BZ-IG: M6, M8, M10, M12 Steel sheradized: dry internal conditions only covered sizes BZ: M10, M12, M16, M20 stainless steel (marking A4): internal and external use without particular aggressive conditions covered sizes: BZ: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12
	highly corrosion resistant steel (marking HCR): internal and external use with particular aggressive conditions covered sizes: BZ: M8, M10, M12, M16, M20, M24 BZ-IG: M6, M8, M10, M12
temperature rang (if applicable)	e

4. Name, registered trade name or registered trade mark and contact address of the manufacturer as required pursuant to Article 11(5):

MÜPRO Services GmbH Hessenstrasse 11 65719 Hofheim-Wallau

construction product as set out in Annex V:

5. Where applicable, name and contact address of the authorised representative whose mandate covers the tasks specified in Article 12(2):

6. System or systems of assessment and verification of constancy of performance of the

MP02022b

MÜPRO GmbH Postfach 40 01 44 D-65708 Hofheim-Wallau Hessenstr. 11 D-65719 Hofheim-Wallau
 Kontakt

 Telefon:
 +49 6122 808-0

 Telefax:
 +49 6122 47 02

 Internet:
 www.muepro.de

 E-Mail:
 info@muepro.de

Geschäftsführer Harald Müller, Frank Schell Amtsgericht Frankfurt/Main HRB 76963 Ust.-Id.-Nr. DE 814699553 Bankkonten Commerzbank Konto: 126 971 900 BLZ: 510 800 60 SWIFT-BIC: DRES DE FF 510 IBAN: DE04 5108 0060 0126 9719 00 Frankfurter Sparkasse Konto: 608 141 BLZ: 500 502 01 SWIFT-BIC: HELADEF1822 IBAN: DE86 5005 0201 0000 6081 41



MÜPRO

System 1

7. In case of the declaration of performance concerning a construction product covered by a harmonised standard:

8. In case of the declaration of performance concerning a construction product for which a European Technical Assessment has been issued:

Deutsches Institut für Bautechnik, Berlin

issued

ETA-05/0158

on the basis of

ETAG 001-2

The notified body 1343-CPR performed under system 1:

- (i) determination of the product type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product;
- (ii) initial inspection of the manufacturing plant and of factory production control;
- (iii) continuous surveillance, assessment and evaluation of factory production control

and issued: Certificate of constancy of performance 1343-CPR-M552-1

9. Declared performance:

Essential	Desire Mathead	Perfo	rmance	Harmonized
Characteristics	Design Method	BZ	BZ-IG	Technical Specification
Characteristic resistance for tension	ETAG 001, Annex C CEN/TS 1992-4	ETA-05/0158, Annex C1-C4	ETA-05/0158, Annex C11-C12	
Characteristic resistance for shear	ETAG 001, Annex C CEN/TS 1992-4	ETA-05/0158, Annex C5	ETA-05/0158, Annex C13	
Characteristic resistance for seismic loading	TR 045	ETA-05/0158, Annex C8	NPD	ETAG 001
Displacement for serviceability limit state	ETAG 001, Annex C CEN/TS 1992-4	ETA-05/0158, Annex C9-C10	ETA-05/0158, Annex C15	
Characteristic resistance under fire exposure	TR 020	ETA-05/0158, Annex C7-C8	ETA-05/0158, Annex C14	

Where pursuant to Article 37 or 38 in the Specific Technical Documentation has been used, the requirements with which the product complies:

MÜPRO GmbH Postfach 40 01 44 D-65708 Hofheim-Wallau Hessenstr. 11 D-65719 Hofheim-Wallau

MP02022b

 Kontakt

 Telefon:
 +49 6122 808-0

 Telefax:
 +49 6122 47 02

 Internet:
 www.muepro.de

 E-Mail:
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Geschäftsführer Harald Müller, Frank Schell Amtsgericht Frankfurt/Main HRB 76963 Ust.-Id.-Nr. DE 814699553 Bankkonten Commerzbank Konto: 126 971 900 BLZ: 510 800 60 SWIFT-BIC: DRES DE FF 510 IBAN: DE04 5108 0060 0126 9719 00 Frankfurter Sparkasse Konto: 608 141 BLZ: 500 502 01 SWIFT-BIC: HELADEF1822 IBAN: DE86 5005 0201 0000 6081 41





10. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 9.

This declaration of performance is issued under the sole responsibility of the manufacturer identified in point 4.

Signed for and on behalf of the manufacturer by:

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Hofheim-Wallau, 24.08.2016

i.V. Stefan Podszus,

Quality Manager

MP02022b

MÜPRO GmbH Postfach 40 01 44 D-65708 Hofheim-Wallau Hessenstr. 11 D-65719 Hofheim-Wallau

 Kontakt

 Telefon:
 +49 6122 808-0

 Telefax:
 +49 6122 47 02

 Internet:
 www.muepro.de

 E-Mail:
 info@muepro.de

Geschäftsführer Harald Müller, Frank Schell Amtsgericht Frankfurt/Main HRB 76963 Ust.-Id.-Nr. DE 814699553
 Bankkonten

 Commerzbank

 Konto: 126 971 900

 BLZ: 510 800 60

 SWIFT-BIC: DRES DE FF 510

 IBAN: DE04 5108 0060 0126 9719 00

Frankfurter Sparkasse Konto: 608 141 BLZ: 500 502 01 SWIFT-BIC: HELADEF1822 IBAN: DE86 5005 0201 0000 6081 41





Table C1: Characteristic values for tension loads, BZ zinc plated, cracked concrete, static and quasi-static action Anchor size **M8** M10 M12 M16 M20 M24 M27 Installation safety factor 1,0 [-] Y2 = Vinst Steel failure Characteristic tension resistance N_{Rk,s} [kN] 16 27 40 60 86 126 196 Partial safety factor 1,53 [-] 1,5 1,6 1,5 YMs Pull-out Standard anchorage depth Characteristic resistance in 1) 1) 1) NRKP [kN] 5 9 16 25 concrete C20/25 **Reduced anchorage depth** Characteristic resistance in 1) 1) [kN] 5 7,5 N_{Rk,p} _ concrete C20/25 0,5 I_{ck,cube} Increasing factor for NRkp ψc [-] 25 **Concrete cone failure** Effective anchorage depth het [mm] 70 46 60 85 100 115 125 35 ²⁾ Reduced anchorage depth [mm] 40 50 65 hef,rad -42 -Factor acc. to CEN/TS 1992-4 ker 7.2 [-]

¹⁾ Pull-out is not decisive.

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

Heavy duty anchor BZ

Performance

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



Table C2: Characteristic values for tension loads, BZ A4 / HCR, cracked concrete, static and quasi-static action **Anchor size** M8 M10 M12 M16 M20 M24 Installation safety factor [-] 1,0 Y2 = Yinst Steel failure Characteristic tension resistance [kN] NRKS 16 27 40 64 108 110 Partial safety factor [-] 1,5 YMs 1.68 1,5 **Pull-out** Standard anchorage depth Characteristic resistance in concrete NRK.P [kN] 1) 5 9 16 25 40 C20/25 **Reduced anchorage depth** Characteristic resistance in concrete 1) 1) NRKP [kN] 5 7.5 . C20/25 0,5 Increasing factor for NRkp (fck,cube VIC [-] 25 Concrete cone failure Effective anchorage depth hat [mm] 46 60 70 85 100 125 35 ²⁾ Reduced anchorage depth haf red [mm] 40 50 65 --Factor according to k_{cr} [-] 7,2 CEN/TS 1992-4

¹⁾ Pull-out is not decisive.

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

Heavy duty anchor BZ

Performance

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

Deutsches Institut für Bautechnik

Table C3: Characteristic values fo non-cracked concrete								
Anchor size		M8	M10	M12	M16	M20	M24	M27
Installation safety factor $\gamma_2 = \gamma_{inst}$	[-]		-		1,0			<u> </u>
Steel failure					.,.			
Characteristic tension resistance N _{Rks}	[kN]	16	27	40	60	86	126	196
			53		,5	1,6		5
Partial safety factor γ_{Ms}		1 2	55	1	,5	1,0		, <u> </u>
Standard anchorage depth Characteristic resistance in			1	T		······		
non-cracked concrete C20/25	[kN]	12	16	25	35	1)	1)	1)
Reduced anchorage depth								
Characteristic resistance in	(1. A.12			1)	1)	1		
non-cracked concrete C20/25	[kN]	7,5	9			-	-	-
Splitting For the proof against splitting failure N ⁰ RI	k,c has to	be replac	ed by N ^G Rk	se with cons	sideration c	of the memb	er thicknes	55
Standard anchorage depth	14							
Splitting for standard thickness of concrete	memb	er (The hi	gher resista	ance of cas	e 1 and ca	se 2 may b	e applied;	
the values scr.sp and ccr.sp may be linearly interpolate	d for the	e member f	thickness h	1 _{min.2} < h < h	1 _{min,1} (Case	12); Whisp= 1	.0))	
Standard thickness of concrete $h_{min,1} \ge$	[mm]	100	120	140	170	200	230	250
Case 1								
Characteristic resistance in N ⁰ _{Rk.ap}	[kN]	9	12	20	30	40	62,3	50
Horr oldokod ooriciete ozorzo			14	٤v		40	02,0	
Spacing (edge distance) $s_{\alpha,sp} (= 2 c_{\alpha,sp})$	[mm]				3 h _{ef}			
Case 2								
Characteristic resistance N [®] _{Rksp}	[kN]	12	16	25	35	50,5	62,3	70,6
III HOH-GROKEG CONCIECE OZVIZO	1							
Spacing (edge distance) $s_{cr,sp}$ (= 2 $c_{cr,sp}$)			4	h _{ef}		4,4 h _{ef}	3 h _{ef}	5 h _{ef}
Splitting for minimum thickness of concrete								
$\begin{array}{llllllllllllllllllllllllllllllllllll$		80	100	120	140			
Characteristic resistance N ⁰ _{Rk,ap}	[kN]	12	16	25	35	-		-
						-		
	[[nim]]			h _{ef}				
Reduced anchorage depth	1	20	00	100	110	1		
Minimum thickness of concrete $h_{min,3} \ge$ Characteristic resistance 10		80	80	100	140			
in non-cracked concrete C20/25	[kN]	7,5	9	17,9	26,5	-	-	-
Spacing (edge distance) $s_{\alpha,sp}$ (= 2 $c_{\alpha,sp}$)	[mm]	200	200	250	300		9	
Increasing factor					fck,cube	,5		
for $N_{Rk,p}$ and $N^{0}_{Rk,sp}$ ψc	[-]			($\frac{\frac{1}{25}}{25}$			1
Concrete cone failure								
Effective anchorage depth h _{ef}	[mm]	46	60	70	85	100	115	125
	[mm]	35 ²⁾	40	50	65			-
Factor according to CEN/TS 1992-4 k _{ucr}	<u> </u>				10,1			
¹⁾ Pull-out is not decisive.			-		10,1			
²⁾ Use restricted to anchoring of structural components	statically	/ indetermin	late.					
Heavy duty anchor BZ								
Performance Characteristic values for tension loads, BZ non-cracked concrete, static and quasi-static							Annex	C3

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Anchor size			M8	M10	M12	M16	M20	M24
Installation safety factor	Y2 = Yinst	[-]			1	,0		
Steel failure								
Characteristic tension resistance	N _{Rk.s}	[kN]	16	27	40	64	108	110
Partial safety factor	110.0	[-]		L	5	04	1,68	1,5
Pull-out	Ytts						1,00	1,5
Standard anchorage depth Characteristic resistance in								
non-cracked concrete C20/25	N _{Rk,p}	[kN]	12	16	25	35	1)	1)
Reduced anchorage depth								- 1
Characteristic resistance in					1)	0		1
non-cracked concrete C20/25	N _{Rk,p}	[kN]	7,5	9	1)	1)	-	-
Splitting For the proof against split	ting failure N ⁰ Rke ha	as to be i	replaced by	N ⁰ _{Rk.so} with	considerati	on of the m	ember thick	ness
Standard anchorage depth				- the opt		- 4 1 3		
Splitting for standard thickness	of concrete me	mber (T	he higher i	esistance of	f case 1 and	d case 2 ma	v be applied	4.
he values s _{cr.sp} and c _{cr.sp} may be line	arly interpolated fo	r the me	mber thickr	ness h _{min,2} <	$h < h_{min,1}$ (C	case 2); whis	p= 1,0)	,
Standard thickness of concrete	h _{min,1} ≥		100	120	140	160	200	250
Case 1								
Characteristic resistance in	N ⁰ _{Rk,sp}	PL-NIT	9	40	00		40	
non-cracked concrete C20/25	IN Rk,sp	[kN]	9	12	20	30	40	-
Spacing (edge distance)	$S_{cr,sp} (= 2 C_{cr,sp})$	[mm]		_	3	h _{ef}		
Case 2								
Characteristic resistance in	N ⁰ _{Rk,sp}	[kN]	12	16	25	35	50,5	70,6
non-cracked concrete C20/25								70,0
Spacing (edge distance)	S _{cr,sp} (= 2 C _{cr,sp})	[mm]	230	250	280	400	440	500
Splitting for minimum thickness	of concrete me	mber						
Minimum thickness of concrete	h _{min,2} ≥	[mm]	80	100	120	140		
Characteristic resistance in	N ⁰ _{Rk,sp}	[kN]	12	16	25	35		-
non-cracked concrete C20/25					1.			
Spacing (edge distance)	s _{cr.sp} (= 2 c _{cr.sp})	[mm]		5	h _{ef}			
Reduced anchorage depth								
Minimum thickness of concrete	h _{min,3} ≥	[mm]	80	80	100	140		
Characteristic resistance in	N ⁰ Rk.sp	[kN]	7,5	9	17,9	26,5	-	-
non-cracked concrete C20/25		Imml	200	200	250	300		
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	200	200	250	. 0,5		
ncreasing factor	ψc	[-]			(fck,cu	ibe		
for N _{Rk,p} and N ⁰ _{Rk,sp}			_		25	5 /		
Concrete cone failure		-						
Effective anchorage depth	h _{ef}	[mm]	46	60	70	85	100	125
Reduced anchorage depth	h _{ef,red}	[mm]	35 ²⁾	40	50	65	-	-
Factor according to CEN/TS 199	2-4 k _{ucr}	[-]			10	0,1		
Pull-out is not decisive.		cally inde	eterminate.					
Use restricted to anchoring of structure								



Table C5: Characteristic values for shear loads. BZ. cracked and non-cracked concrete, static or quasi static action Anchor size **M8** M10 M12 M16 M20 M24 M27 Installation safety factor [-] 1.0 $\gamma_2 = \gamma_{inst}$ Steel failure without lever arm, Steel zinc plated Characteristic shear resistance 20,1 VRKS 12.2 30 55 69 114 169.4 [kN] Factor for ductility 1.0 k₂ [-] Partial safety factor [-] 1,25 1.33 1,25 1.25 YMs Steel failure without lever arm, Stainless steel A4, HCR Characteristic shear resistance [kN] 13 20 30 55 86 123.6 VRks Factor for ductility 1,0 k_2 [-] _ Partial safety factor 1,25 E 1,4 1,25 YMs Steel failure with lever arm, Steel zinc plated Characteristic bending resistance M^D_{Rks} [Nm] 23 47 82 216 363 898 1331,5 Partial safety factor 1,25 1,33 1,25 1,25 [-] YMs Steel failure with lever arm, Stainless steel A4, HCR Characteristic bending resistance M⁹Rks 200 [Nm] 26 52 92 454 785.4 Partial safety factor 1,25 1,4 1,25 [-] YMs Concrete pry-out failure Factor k acc. to ETAG 001, Annex C [-] 2.4 2.8 k(3) or k3 acc. to CEN/TS 1992-4 Concrete edge failure Steel zinc plated ŀ [mm] 46 60 70 85 100 Effective length of 115 125 anchor in shear Stainless steel loading with het ŀ [mm] 46 60 70 85 100 125 . A4, HCR 35¹⁾ Effective length of Steel zinc plated 40 50 [mm] 65 If,red anchor in shear _ . -Stainless steel 35¹⁾ loading with het.red 40 65 [mm] 50 If.red A4, HCR dnom Outside diameter of anchor 8 10 12 16 20 24 27 [mm]

¹⁾ Use restricted to anchoring of structural components statically indeterminate.

Heavy duty anchor BZ

Performance

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

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English translation prepared by DIBt

Deutsches Institut DIBt für Bautechnik

Anchor size			M8	M10	M12	M16	M20
Tension loads							19-2 L
Installation safety factor	Y2 = Yinst	[-]			1,0		
Steel failure, Steel zinc plat							
Characteristic resistance C1	N _{Rk,s,seis,C1}	[kN]	16	27	40	60	86
Characteristic resistance C2	NR%, seis.C2	[kN]	16	27	40	60	86
Partial safety factor	YMs, seis	[-]	1,	53	1	,5	1,6
Steel failure, Stainless stee	A4, HCR						
Characteristic resistance C1	N _{Rk.s.seis.C1}	[kN]	16	27	40	64	108
Characteristic resistance C2	NRK, Seis, C2	[kN]	16	27	40	64	108
Partial safety factor YMs, seis [-]				1,	5		1,68
Pull-out (steel zinc plated, st	ainless steel	A4 and	HCR)				
Characteristic resistance C1	N _{Rk,p.seis,C1}	[kN]	5	9	16	25	36
Characteristic resistance C2	NREp.seis.C2	[kN]	2,3	3,6	10,2	13,8	24,4
Increasing factor for N _{Rk,p}	ψc	[-]			1,0		
Shear loads							
Steel failure without lever a	rm, Steel zi	nc plate	d				
Characteristic resistance C1	VRIK, Seis, C1	[kN]	9,3	20	27	44	69
Characteristic resistance C2	V _{Rk,s,seis,C2}	[kN]	6,7	14	16,2	35,7	55,2
Partial safety factor	YMa, seis	[-]		1,	25		1,33
Steel failure without lever a	rm, Stainles	ss steel	A4, HCR				
Characteristic resistance C1	V _{Rks.seis,C1}	[kN]	9,3	20	27	44	69
Characteristic resistance C2	V _{Rk,s.seis,C2}	[kN]	6,7	14	16,2	35,7	55,2
Partial safety factor	YMs, seis	[-]		1,	25		1,4

Heavy duty anchor BZ

Performance

Characteristic resistance for selsmic loading, BZ, standard anchorage depth, performance category C1 and C2



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

Anchor size				M8	M10	M12	M16	M20	M24	M27			
Tension load													
Steel failure													
Steel, galvanis	ed												
	R30			1,5	2,6	4,1	7,7	9,4	13,6	17,6			
Characteristic	R60	N	FI-517	1,1	1,9	3,0	5,6	8,2	11,8	15,3			
resistance	R90	N _{Rk,s,fi}	[kN]	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			
Stainless steel	A4, HCR												
	R30			3,8	6,9	12,7	23,7	33,5	48.2				
Characteristic	R60	81	FL-NIT	2,9	5,3	9,4	17,6	25,0	35,9				
resistance	R90	N _{Rk,s,fi}	[kN]	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				
Shear load													
Steel failure wit	hout lever arm	1											
Steel, galvanise	ed												
	R30			1,6	2,6	4,1	7,7	11	16	20,6			
Characteristic	R60	- - V		1,5	2,5	3,6	6,8	11	15	19,8			
resistance	R90	− V _{Rk,s,fi}	∙ V _{Rk,s,fi}	VRk,s,fi	V Rk,s,fi	[kN]	1,2	2,1	3,5	6,5	10	15	19,0
	R120		ļ	1,0	2,0	3,4	6,4	10	14	18,6			
Stainless steel	A4, HCR												
	R30			3,8	6,9	12,7	23,7	33,5	48,2				
Characteristic	R60			2,9	5,3	9,4	17,6	25,0	35,9				
resistance	R90	V _{Rk,s,fi}	[kN]	2,0	3,6	6,1	11,5	16,4	23,6	-			
	R120		ľ	1,6	2,8	4,5	8,4	12,1	17,4				
Steel failure wit	h lever arm	'											
Steel, galvanise	d												
	R30			1,7	3,3	6,4	16,3	29	50	75			
Characteristic	R60	0		1,6	3,2	5,6	14	28	48	72			
resistance	R90	M ⁰ Rk,s,fi	[Nm]	1,2	2,7	5,4	14	27	47	69			
	R120		ľ	1,1	2,5	5,3	13	26	46	68			
Stainless steel	A4, HCR												
	R30			3,8	9,0	19,7	50,1	88,8	153,5				
Characteristic	R60		Ì	2,9	6,8	14,6	37,2	66,1	114,3				
resistance	R90	M ⁰ Rk.s.fi	[Nm]	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				

according to TR020 / CEN/TS 1992-4. If pull-out is not decisive in Eq. 2.4 and Eq. 2.5, TR 020 N_{Rkp} must be replaced by N⁰_{Rkc}.

Heavy duty anchor BZ

Performance

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



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

			M8	M10	M12	M16
R30			1,5	2,6	4,1	7,7
R60	N	PL-NU	1,1	1,9	3,0	5,6
R90	INRk,s,fi	[KIN]	0,8	1,3	1,9	3,5
R120			0,6	1,0	1,3	2,5
HCR						
R30	1		3,2	6,9	12,7	23,7
R60		PLAT	2,5	5,3	9,4	17,6
R90	- INRk,s,fi		1,9	3,6	6,1	11,5
R120			1,6	2,8	4,5	8,4
t lever arm						
		· · · · · · · · · · · · · · · · · · ·				
R30			1,5	2,6	4.1	7,7
R60	_			1,9		5,6
R90	– V _{Rk,s,fi} –	[KN]	0,8	1,3		3,5
R120			0,6	1,0	1,3	2,5
HCR		•			· · · · · · · · · · · · · · · · · · ·	
R30			3,2	6,9	12,7	23.7
R60			2,5	5,3		17,6
R90	V Rk,s,fi	[KN]	1,9	3,6		11,5
R120	_	ſ	1,6	2,8	4,5	8,4
ver arm						
R30			1,5	3,3	6,4	16,3
R60						11,9
R90	— M° _{Rk,s,fi}	[Nm]				7,5
R120			0,6	1,2	2,1	5,3
HCR						
			3,2	8,9	19,7	50,1
R30		-				
	-		2,6	6,8	14,6	37.2
R30	— M ⁰ _{Rk,s,fi}	[Nm]	2,6 2,0	6,8 4,7	14,6 9,5	37,2 24,2
	R60 R90 R120 HCR R30 R60 R90 R120 It lever arm R30 R60 R90 R120 It lever arm R30 R60 R90 R120 HCR R30 R60 R90 R120 HCR R30 R60 R90 R120	R60 NRk.s.fi R90 R120 HCR R30 R60 NRk.s.fi R90 NRk.s.fi R120 NRk.s.fi R120 NRk.s.fi R120 NRk.s.fi R120 NRk.s.fi R120 NRk.s.fi R120 VRk.s.fi R120 VRk.s.fi R120 VRk.s.fi R120 VRk.s.fi R120 VRk.s.fi R30 R60 R90 VRk.s.fi R120 Ver arm	R60 NRk,s,fi [kN] R120 KN KK R30 NRk,s,fi [KN] R60 NRk,s,fi [KN] R120 NRk,s,fi [KN] R120 NRk,s,fi [KN] R120 NRk,s,fi [KN] R120 NRk,s,fi [KN] R60 VRk,s,fi [KN] R120 VRk,s,fi [KN] R120 VRk,s,fi [KN] R120 VRk,s,fi [KN] HCR R60 VRk,s,fi [KN] R120 VRk,s,fi [KN] [KN] R120 VRk,s,fi [KN] [KN] Ver arm [KN] [KN] [KN]	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

Performance

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

Deutsches Institut für Bautechnik

Anchor size			M8	M10	M12	M16	M20	M24	M27
Standard anchorage depth						- 1. S - S -	12011		
Steel zinc plated									
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	21,1	24
Displacement	δ _{NO}	[mm]	0,6	1,0	0,4	1,0	0,9	0,7	0,9
	δ _{N∞}	[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	δ _{NO}	[mm]	0,4	0,5	0,7	0,3	0,4	0,5	0,3
	δ _{N22}	[mm]	0.	,8	1,4		0,8		1,4
Displacements under seismic tension le									
Displacements for DLS	δ _{N,seis,C2(DLS)}	[mm]	2,3	4,1	4,9	3,6	5,1		
Displacements for ULS	δ _{N.seis,C2(ULS)}	[mm]	8,2	13,8	15,7	9,5	15,2	-	-
Stainless steel A4, HCR			<u> 67 - 1</u>						
Tension load in cracked concrete	N	[kN]	2,4	4,3	7,6	11,9	17,1	19,0	
Displacement	δΝΟ	[mm]	0,7	1,8	0,4	0,7	0,9	0.5	-
	δ _{N∞}	[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	δ _{NG}	[mm]	0,6	0,5	0,7	0,2	0,4	0,5	
	δ _{N∞}	[mm]	1,2	1,0	1,4	0,4	0,4	1,1	-
Displacements under seismic tension lo		Frind		1,0		0,1	0,0	1,1	
Displacements for DLS	δ _{N.seis.C2(DLS)}	[mm]	2,3	4,1	4,9	3,6	5,1	1	
Displacements for ULS	δ _{N,seis.C2(ULS)}	[mm]	8,2	13,8	15,7	9.5	15.2	-	-
Reduced anchorage depth	- H, OLG (ULG)		-,-		1011				
Steel zinc plated, stainless steel A4,	HCR		_		·				_
Tension load in cracked concrete	N	[kN]	2,4	3.6	6,1	9.0			
Displacement	δ _{N0}	[mm]	0,8	0,7	0,5	1,0	_	_	_
	δ _{N∞}	[mm]	1,2	1,0	0,8	1,1			-
Tension load in non-cracked concrete	N∞ N	[kN]	3,7	4,3	8,5	12,6			
Displacement	SNG	[mm]	0,1	0,2	0,2	0,2			
		[mm]	0,7	0,2	0,2	0,2 0,7	-	-	-
	δ _{N∞}	frind	0,1	0,7	0,7	0,7			

Heavy duty anchor BZ

Performance Displacements under tension load

Deutsches Institut für Bautechnik

Anchor size			M8	M10	M12	M16	M20	M24	M27
Standard anchorage dep	oth								
Steel zinc plated									
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	δνα	[mm]	2,0	3,2	3,6	3,5	1,8	3,5	3,6
	δv∞	[mm]	3,0	4,7	5,5	5,3	2,7	5,3	5,4
Displacements under seisn	nic shear loa	ds C2							
Displacements for DLS	δ√,seis,C2(DLS)	[mm]	3,0	2,7	3,5	4,3	4,7		
Displacements for ULS	δ _{V,seis,C2(ULS)}	[mm]	5,9	5,3	9,5	9,6	10,1		•
Stainless steel A4, HCR									
Shear load in cracked and non-cracked concrete	v	[kN]	7,3	11,4	17,1	31,4	43,8	70,6	
Displacement	δνο	[mm]	1,9	2,4	4,0	4,3	2,9	2,8	-
	ðv.o	[mm]	2,9	3,6	5,9	6,4	4,3	4,2	
Displacements under seisr	nic shear loa	ds C2						kesselferenkel , .	
Displacements for DLS	δ _{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		
Reduced anchorage dep	oth				- The second second			and the same	
Steel zinc plated									
Shear load in cracked and non-cracked concrete	V	[kN]	6,9	11,4	17,1	31,4			
Displacement	δνο	[mm]	2,0	3,2	3,6	3,5	-	-	-
	δ _{V∞}	[mm]	3,0	4,7	5,5	5,3			
Stainless steel A4, HCR									
Shear load in cracked and non-cracked concrete	V	[kN]	7,3	11,4	17,1	31,4			
Displacement	δνο	[mm]	1,9	2,4	4,0	4,3	-	-	-
	δν∞	[mm]	2.9	3,6	5,9	6,4			

Heavy duty anchor BZ

Performance Displacements under shear load



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	Y2 = Yinst	[-]		1,	2	<u>.</u>
Steel failure						
Characteristic tension resistance, steel zinc plated	N _{Rk,s}	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	ΎMs	[-]		1	,5	
Characteristic tension resistance, stainless steel A4, HCR	N _{Rk,s}	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	Υма	[-]		1,	87	
Pull-out failure						
Characteristic resistance in cracked concrete C20/25	N _{Rkp}	[kN]	5	9	12	20
Increasing factor	ψc	[-]		$\left(\frac{f_{ck,cu}}{25}\right)$		
Concrete cone failure						
Effective anchorage depth	h _{ef}	[mm]	45	58	65	80
Factor according to CEN/TS 1992-4	k _{cr}	[-]		7	.2	·····

Heavy duty anchor BZ-IG

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

Deutsches Institut für Bautechnik

Anchor size			M6	M8	M10	M12
Installation safety factor	Y2 = Yinst	[-]		1,	2	
Steel failure						
Characteristic tension resistance, steel zinc plated	N _{Rk,s}	[kN]	16,1	22,6	26,0	56,6
Partial safety factor	Ϋ́Ms	[-]		1	,5	
Characteristic tension resistance, stainless steel A4, HCR	N _{Rk,s}	[kN]	14,1	25,6	35,8	59,0
Partial safety factor	Ϋ́Ms	[-]		1,	87	
Pull-out						
Characteristic resistance in non-cracked concrete C20/25	N _{Rk,p}	[kN]	12	16	20	30
Splitting ($N^{G}_{Pk,c}$ has to be replaced by N^{G}	Rk,sp. The higher	resistance	of Case 1 and	d Case 2 may b	e applied.)	
Minimum thickness of concrete memb		[mm]	100	120	130	160
Case 1						
Characteristic resistance in non-cracked concrete C20/25	N ⁰ _{Rk,sp}	[kN]	9	12	16	25
Spacing (edge distance)	$S_{cr,sp} (= 2 C_{cr,sp})$	[mm]		31	h _{ef}	
Case 2						
Characteristic resistance in non-cracked concrete C20/25	N ⁰ _{Rk,sp}	[kN]	12	16	20	30
Spacing (edge distance)	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]		5	h _{af}	
Increasing factor for N _{Rkp} and N ^o _{Rksp}	ψc	[-]		$\left(\frac{\mathbf{f}_{ck,cu}}{25}\right)$	<u>he</u>) ^{0,5}	
Concrete cone failure					î	
Effective anchorage depth	h _{ef}	[mm]	45	58	65	80
Factor according to CEN/TS 1992-4	kucr	[-]		10	.1	

Heavy duty anchor BZ-IG

Performance

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



ble C13: Characteristic values for s cracked and non-cracke				Jasi-static	action	
Anchor size			M6	M8	M10	M12
Installation safety factor	Y2 = Yinst	[-]		1	1,0	<u> </u>
BZ-IG, steel zinc plated					1-	
Steel failure without lever arm, Installatio	n type V					
Characteristic shear resistance	V _{Rks}	[kN]	5,8	6,9	10,4	25,8
Steel failure without lever arm, Installation					<u> </u>	
Characteristic shear resistance	V _{Rk,s}	[kN]	5,1	7,6	10,8	24,3
Steel failure with lever arm, Installation ty				· · · ·		<u> </u>
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	12,2	30,0	59,8	104,6
Steel failure with lever arm, installation ty						
Characteristic bending resistance	M ⁰ _{Rk,s}	[Nm]	36,0	53,2	76,0	207
Partial safety factor for V _{Rks} and M ⁰ _{Rks}	YME	[-]			25	
Factor of ductility	k2	[-]			,0	
BZ-IG, stainless steel A4, HCR						
Steel failure without lever arm, Installation	n type V					
Characteristic shear resistance	V _{Rk,s}	[kN]	5,7	9,2	10,6	23,6
Partial safety factor	Yms	[-]		1,	,25	i
Steel failure without lever arm, Installation	n type D					
Characteristic shear resistance	V _{Rk,s}	[kN]	7,3	7,6	9,7	29,6
Partial safety factor	YMs	[-]		1,	.25	L
Steel failure with lever arm, Installation ty	pe V					
Characteristic bending resistance	M ⁰ Rk,s	[Nm]	10,7	26,2	52,3	91,6
Partial safety factor	YMs	[-]		1,	56	
Steel failure with lever arm, Installation ty						
Characteristic bending resistance	M ⁰ Rk.	[Nm]	28,2	44,3	69,9	191,2
Partial safety factor	γ _{Ms}	[-]		1,	25	
Factor of ductility	k ₂	[-]		1,	,0	
Concrete pry-out failure						
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
Concrete edge failure						
Effective length of anchor in shear loading	4	[mm]	45	58	65	80
Effective diameter of anchor	d _{nom}	[mm]	8	10	12	16

Heavy duty anchor BZ-IG

Performance

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

Deutsches Institut für Bautechnik

Anchor size			M6	M8	M10	M12
Tension load					والمتحد المحد الم	
Steel failure						
Steel zinc plated					··· ·· ··· ·	
	R30		0,7	1,4	2,5	3,7
Characteristic resistance	R60	[KN]	0,6	1,2	2,0	2,9
	R90 N _{Rk,s,fi}		0,5	0,9	1,5	2,2
	R120		0,4	0,8	1,3	1,8
Stainless steel /	4. HCR					
Characteristic resistance	R30	[kN]	2,9	5,4	8,7	12,6
	R60		1,9	3,8	6,3	9,2
	R90 N _{Rk,s,fi}		1,0	2,1	3,9	5,7
	R120		0,5	1,3	2,7	4,0
Shear load						
Steel failure with	nout lever arm					
Steel zinc plated						
	R30		0,7	1,4	2,5	3,7
Characteristic resistance	R60	[kN]	0,6	1,2	2,0	2,9
	R90 V _{Rk,s,fi}		0,5	0,9	1,5	2,2
	R120		0,4	0,8	1,3	1,8
Stainless steel A	A4, HCR					
	R30	[kN]	2,9	5,4	8,7	12,6
Characteristic resistance	R60		1,9	3,8	6,3	9,2
	R90 V _{Rk,s,fi}		1,0	2,1	3,9	5,7
	R120		0,5	1,3	2,7	4,0
Steel failure with	h lever arm					ign in providence in the
Steel zinc plated	1					
	R30		0,5	1,4	3,3	5,7
Characteristic	R60	[Nm]	0,4	1,2	2,6	4,6
resistance	R90 M ⁰ _{Rk,s,fr}		0,4	0,9	2,0	3,4
	R120		0,3	0,8	1,6	2,8
Stainless steel	A4, HCR					
	R30		2,2	5,5	11,2	19,6
Characteristic	Beo		1,5	3,9	8,1	14,3
resistance	R90 M ⁰ _{Rk,s,fi}	[Nm]	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.

Heavy duty 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

Deutsches Institut für Bautechnik

Table C15: Displacements under tension load, BZ-IG

Anchor size		ć.	M6	M8	M10	M12
Tension load in cracked concrete	N	[kN]	2,0	3,6	4,8	8,0
Displacements	δ _{NO}	[mm]	0,6	0,6	0,8	1,0
	ô _{Neo}	[mm]	0,8	8,0	1,2	1,4
Tension load in non-cracked concrete	N	[kN]	4,8	6,4	8,0	12,0
Diaplocomenta	Õnd	[mm]	0,4	0,5	0,7	0,8
Displacements	δ _{Neo}	[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	δνο	[mm]	2,8	2,9	2,5	3,6
	δ _{Veo}	[mm]	4,2	4,4	3,8	5,3

Heavy duty anchor BZ-IG

Performance Displacements under tension load and under shear load