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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-99/0010

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*	MKT Bolzenanker BZ plus *MKT Wedge anchor BZ plus*
Zulassungsinhaber *Holder of approval*	MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*	Kraftkontrolliert spreizender Dübel in den Größen M8, M10, M12, M16 und M20 zur Verankerung im Beton *Torque controlled expansion anchor of sizes M8, M10, M12, M16 and M20 for use in concrete*
Geltungsdauer: vom *Validity: from*	7 July 2010
bis *to*	30 January 2014
Herstellwerk *Manufacturing plant*	MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach

Diese Zulassung umfasst *This Approval contains*	14 Seiten einschließlich 7 Anhänge *14 pages including 7 annexes*
Diese Zulassung ersetzt *This Approval replaces*	ETA-99/0010 mit Geltungsdauer vom 30.01.2009 bis 30.01.2014 *ETA-99/0010 with validity from 30.01.2009 to 30.01.2014*

- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools,
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply,
- Check of concrete being well compacted, e.g. without significant voids,
- Edge distances and spacings not less than the specified values without minus tolerances,
- Positioning of the drill holes without damaging the reinforcement,
- 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,
- Cleaning of the hole of drilling dust,
- Anchor installation such that the effective anchorage depth is complied with. This compliance is ensured when the embedment mark of the anchor does no more exceed the concrete surface,
- Application of the torque moment given in Annex 3 using a calibrated torque wrench.

5 Indications to the manufacturer

The manufacturer is responsible to ensure that the information on the specific conditions according to 1 and 2 including Annexes referred to and 4.2.1 and 4.2.2 is given to those who are concerned. This information may be made by reproduction of the respective parts of the European technical approval. In addition all installation data shall be shown clearly on the package and/or on an enclosed instruction sheet, preferably using illustration(s).

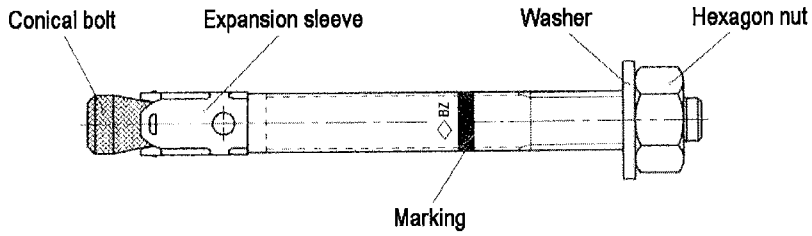
The minimum data required are:

- Diameter of drill bit,
- Thread diameter,
- Maximum diameter of clearance hole in the fixture,
- Maximum thickness of the fixture,
- Minimum effective anchorage depth,
- Minimum hole depth,
- Torque moment,
- Information on the installation procedure, including cleaning of the hole, preferably by means of an illustration,
- Reference to any special installation equipment needed,
- Identification of the manufacturing batch.

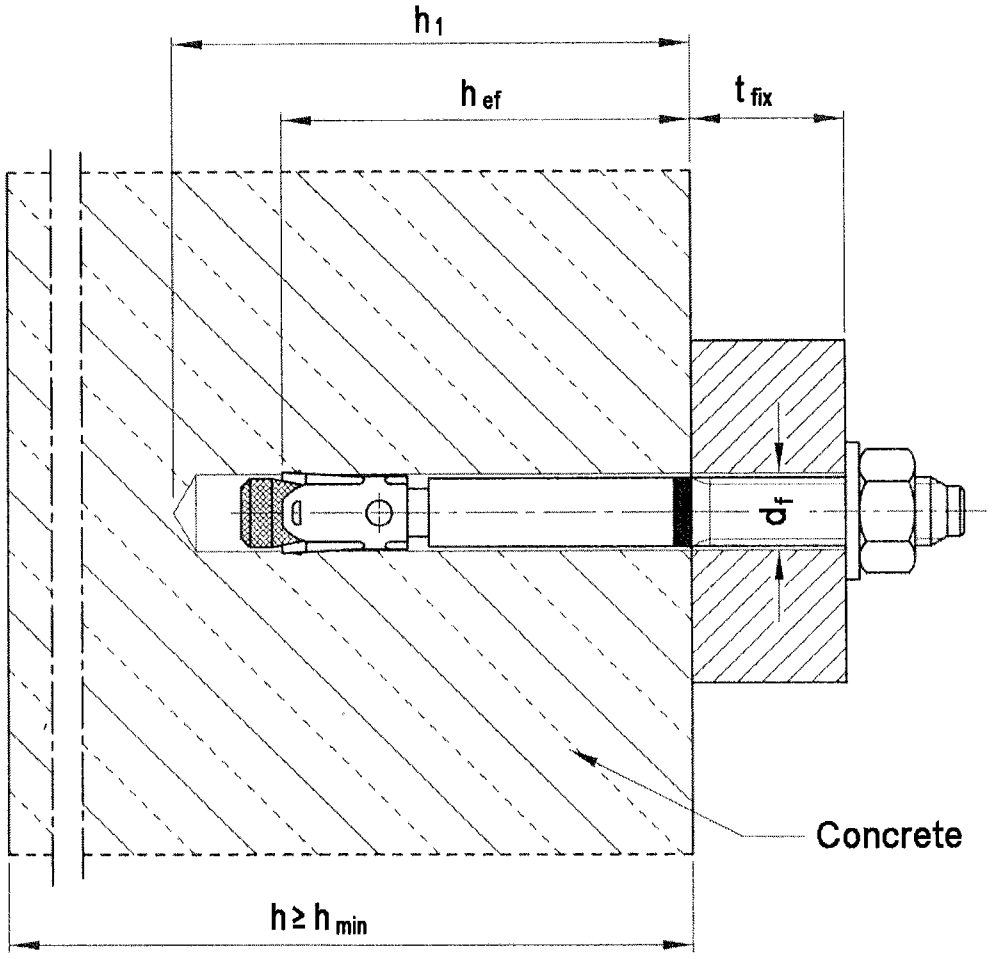
All data shall be presented in a clear and explicit form.

Dipl.-Ing. Georg Feistel
Head of Division Construction Engineering
of Deutsches Institut für Bautechnik
Berlin, 7 July 2010

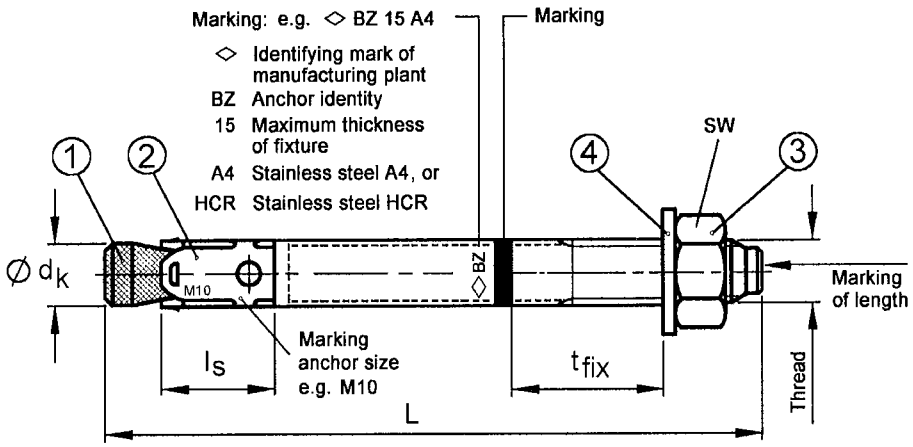
beglaubigt:
Lange



M8 to M20



MKT Wedge Anchor BZ plus A4 or HCR	**Annex 1**
Product and intended use	of European technical Approval **ETA–99/0010**



Marking of length	C	D	E	F	G	H	I	J	K	L	M
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
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

(D)

Marking of length	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Length of anchor min ≥	203.2	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 <	215.9	228.6	241.3	254.0	279.4	304.8	330.2	355.6	381.0	406.4	431.8	457.2	483.0

Table 1: Anchor dimensions

	Anchor size			M8	M10	M12	M16	M20
1	Conical bolt	Thread		M8	M10	M12	M16	M20
		Ø d_k	=	7.9	9.8	11.8	15.7	19.7
		t_{fix} max	≤	3000	3000	3000	3000	3000
		L max		3065	3080	3095	3120	3137
2	Expansion sleeve	l_s	=	14.5	18.5	22	24.3	28
3	Hexagon nut	SW		13	17	19	24	30

Dimension in mm

Table 2: Materials

Part No.	Anchor part	Stainless Steel A4	Stainless Steel HCR
1	Conical bolt	Stainless steel 1.4401, 1.4404, 1.4571, 1.4578 or 1.4362, EN 10088 Cone plastic coated	Stainless steel 1.4529 or 1.4565, EN 10088 Cone plastic coated
2	Expansion sleeve	Stainless steel 1.4401 or 1.4571, EN 10088	Stainless steel 1.4401 or 1.4571, EN 10088
3	Hexagon nut	ISO 3506, strength class 70, stainless steel 1.4401 or 1.4571 EN 10088, coated	ISO 3506, strength class 70, stainless steel 1.4529 or 1.4565, EN 10088, coated
4	Washer acc. to EN ISO 7089, or EN ISO 7093, or EN ISO 7094	Stainless steel 1.4401 or 1.4571, EN 10088	Stainless steel 1.4529 or 1.4565, EN 10088

MKT Wedge Anchor BZ plus A4 or HCR

Anchor dimensions, material

Annex 2

of European technical Approval

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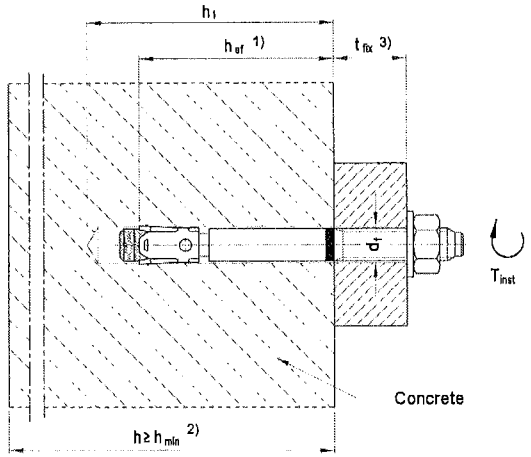
Table 3: Installation parameters

Anchor Size			M8	M10	M12	M16	M20
Nominal drill hole diameter	d_0	[mm]	8	10	12	16	20
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8.45	10.45	12.5	16.5	20.55
Depth of drill hole	$h_1 \geq$	[mm]	60	75	90	110	125
Effective anchorage depth	h_{ef}	[mm]	46	60	65	85	100
Torque moment	T_{inst}	[Nm]	20	35	50	110	200
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	9	12	14	18	22



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

Table 4: Standard thickness of concrete member and respective minimum spacing and edge distance

Anchor Size			M8	M10	M12	M16	M20
Standard thickness of concrete member	h_{std}	[mm]	100	120	130	160	200
Cracked concrete							
Minimum spacing	s_{min}	[mm]	40	50	60	60	95
	for c ≥	[mm]	70	75	100	100	150
Minimum edge distance	c_{min}	[mm]	40	55	60	60	95
	for s ≥	[mm]	80	90	140	180	200
Non-cracked concrete							
Minimum spacing	s_{min}	[mm]	40	50	60	65	90
	for c ≥	[mm]	80	75	120	120	180
Minimum edge distance	c_{min}	[mm]	50	60	75	80	130
	for s ≥	[mm]	100	120	150	150	240

Intermediate values by linear interpolation

Table 5: Minimum thickness of concrete member and respective minimum spacing and edge distance

Anchor Size			M8	M10	M12	M16	M20
Minimum thickness of concrete member	h_{min}	[mm]	80	100	110	140	200
Cracked concrete							
Minimum spacing	s_{min}	[mm]	40	45	60	70	95
	for c ≥	[mm]	70	90	100	160	150
Minimum edge distance	c_{min}	[mm]	40	50	60	80	95
	for s ≥	[mm]	80	115	140	180	200
Non-cracked concrete							
Minimum spacing	s_{min}	[mm]	40	60	60	80	90
	for c ≥	[mm]	80	140	120	180	180
Minimum edge distance	c_{min}	[mm]	50	90	75	90	130
	for s ≥	[mm]	100	140	150	200	240

Intermediate values by linear interpolation

MKT Wedge Anchor BZ plus A4 or HCR

Installation parameters, minimum thickness of member, minimum spacing and edge distance

Annex 3

of European technical Approval

ETA–99/0010

Table 6: Design method A, Characteristic values for tension loads

Anchor Size			M8	M10	M12	M16	M20
Steel failure							
Characteristic resistance	$N_{Rk,s}$	[kN]	16	27	40	64	108
Partial safety factor	γ_{Ms} [3]		1.5				1.68
Pull-out							
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	5	9	12	25	- [1]
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$	[kN]	12	16	20	35	- [1]
Splitting for standard thickness of concrete member The higher one of the decisive values of Case 1 and Case 2 is applicable.							
Standard thickness of concrete member	$h_{std} \geq$	[mm]	100	120	130	160	200
Case 1							
Characteristic resistance in concrete C20/25	$N^0_{Rk,sp}$ [4]	[kN]	9	12	16	30	40
Respective spacing	$s_{cr,sp}$	[mm]	3 h_{ef}				
Respective edge distance	$c_{cr,sp}$	[mm]	1.5 h_{ef}				
Case 2							
Characteristic resistance in concrete C20/25	$N^0_{Rk,sp}$ [4]	[kN]	12	16	20	35	- [1]
Respective spacing	$s_{cr,sp}$ [5]	[mm]	230	250	260	400	440
Respective edge distance	$c_{cr,sp}$ [5]	[mm]	115	125	130	200	220
Splitting for minimum thickness of concrete member							
Minimum thickness of concrete member	$h_{min} \geq$	[mm]	80	100	110	140	200
Characteristic resistance in concrete C20/25	$N^0_{Rk,sp}$ [4]	[kN]	12	16	20	35	- [1]
Respective spacing	$s_{cr,sp}$ [5]	[mm]	5 h_{ef}				4.4 h_{ef}
Respective edge distance	$c_{cr,sp}$ [5]	[mm]	2.5 h_{ef}				2.2 h_{ef}
Increasing factors for $N_{Rk,p}$ and $N^0_{Rk,sp}$	ψ_C C30/37	[-]	1.22				
	ψ_C C40/50	[-]	1.41				
	ψ_C C50/60	[-]	1.55				
Concrete cone failure							
Effective anchorage depth	h_{ef}	[mm]	46	60	65	85	100
Spacing	$s_{cr,N}$	[mm]	3 h_{ef}				
Edge distance	$c_{cr,N}$	[mm]	1.5 h_{ef}				
Partial safety factor	$\gamma_{Mp} = \gamma_{Msp} = \gamma_{Mc}$ [3]	[-]	1.5 [2]				

[1] Pull-out is not decisive.
[2] The partial safety factor $\gamma_2 = 1.0$ is included
[3] In absence of other national regulations
[4] For the proof against splitting failure according to ETAG 001 Annex C, $N^0_{Rk,c}$ in equation (5.3) has to be replaced by $N^0_{Rk,sp}$ with consideration of the member thickness ($\psi_{ucr,sp} = 1.0$).
[5] The values $s_{cr,sp}$ und $c_{cr,sp}$ may be linearly interpolated for member thicknesses $h_{min} < h < h_{std}$ (case 2) ($\psi_{h,sp}$=1.0).

Table 7: Displacements under tension loads

Anchor Size			M8	M10	M12	M16	M20
Tension load in cracked concrete	N	[kN]	2.4	4.3	5.7	11.9	17.1
Displacement	δ_{N0}	[mm]	0.7	1.8	0.8	0.7	0.9
	$\delta_{N\infty}$	[mm]	1.2	1.4	1.4	1.4	1.0
Tension load in non-cracked concrete	N	[kN]	5.8	7.6	9.5	16.7	23.8
Displacement	δ_{N0}	[mm]	0.6	0.5	0.5	0.2	0.4
	$\delta_{N\infty}$	[mm]	1.2	1.0	1.0	0.4	0.8

Table 8: Design method A Characteristic values for shear loads

Anchor Size			M8	M10	M12	M16	M20
Steel failure without lever arm							
Characteristic resistance	$V_{Rk,s}$	[kN]	13	20	30	55	86
Partial safety factor	γ_{Ms} [1]	[-]	1.25				1.4
Steel failure with lever arm							
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	26	52	92	233	454
Partial safety factor	γ_{Ms} [1]	[-]	1.25				1.4
Concrete pryout failure							
Factor in equation (5.6) ETAG 001, Annex C, 5.2.3.3	k	[-]	2.0	2.0	2.0	2.0	2.0
Partial safety factor	γ_{Mcp} [1]	[-]	1.5 [2]				
Concrete edge failure							
Effective length of anchor in shear loading	l_f	[mm]	46	60	65	85	100
Outside diameter of anchor	d_{nom}	[mm]	8	10	12	16	20
Partial safety factor	γ_{Mc} [1]	[-]	1.5 [2]				

[1] In absence of other national regulations
[2] The partial safety factor γ_2 = 1.0 is included

Table 9: Displacements under shear loads

Anchor Size			M8	M10	M12	M16	M20
Shear load in cracked and non-cracked concrete	V	[kN]	7.3	11.6	16.9	31.3	43.8
Displacements	δ_{V0}	[mm]	3.2	4.4	5.2	6.5	2.9
	$\delta_{V\infty}$	[mm]	4.8	6.6	7.8	9.8	4.3

Table 10: Characteristic values to tension loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60

Anchor size		M8				M10				M12				M16				M20			
Fire resistance duration	R... [min]	30	60	90	120	30	60	90	120	30	60	90	120	30	60	90	120	30	60	90	120
Steel failure:																					
Characteristic resistance	$N_{Rk,s,fi}$ [kN]	3.8	2.9	2.0	1.6	6.9	5.2	3.5	2.7	11.5	8.6	5.6	4.2	21.5	16.0	10.5	7.8	33.5	25.0	16.4	12.1
Pullout failure:																					
Characteristic resistance in concrete C20/25 to C50/60	$N_{Rk,p,fi}$ [kN]	1.3			1.0	2.3			1.8	3.0			2.4	6.3			5.0	9.0			7.2
Concrete cone failure:																					
Characteristic resistance in concrete C20/25 to C50/60	$N^0_{Rk,c,fi}$ [kN]	2.6			2.1	5.0			4.0	6.1			4.9	12.0			9.6	18.0			14.4
Spacing	$s_{cr,N,fi}$	$4 \times h_{ef}$																			
Edge Distance	$c_{cr,N,fi}$	$2 \times h_{ef}$																			
Minimum spacing and edge distance under fire exposure from one side		according to Annex 3																			
Minimum spacing and edge distance under fire exposure from more than one side		s_{min} according to Annex 3; $c_{min} \geq 300$ mm.																			

In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1.0$ is recommended.

Table 11: Characterstic values to shear loads under fire exposure in cracked and non-cracked concrete C20/25 to C50/60

Anchor size:		**M8**				**M10**				**M12**				**M16**				**M20**			
Fire resistance duration	R... [min]	30	60	90	120	30	60	90	120	30	60	90	120	30	60	90	120	30	60	90	120
Steel failure without lever arm:																					
Characteristic resistance	$V^0_{Rk,s,fi}$ [kN]	3.8	2.9	2.0	1.6	6.9	5.2	3.5	2.7	11.5	8.6	5.6	4.2	21.5	16.0	10.5	7.8	33.5	25.0	16.4	12.1
Steel failure with lever arm:																					
Characteristic resistance	$M^0_{Rk,s,fi}$ [Nm]	3.8	2.9	2.1	1.6	9.0	6.8	4.5	3.4	17.9	13.3	8.8	6.5	45.5	33.9	22.2	16.4	88.8	66.1	43.4	32.1

Concrete pryout failure:

In Equation (5.6) of ETAG 001, Annex C, 5.2.3.3 the k-factor 2.0 and the relevant values of $N^0_{Rk,c,fi}$ of Table 10 have to be considered.

Concrete edge failure:

The initial value $V^0_{Rk,c,fi}$ of the characteristic resistance in concrete C20/25 to C50/60 under fire exposure may be determined by:

$V^0_{Rk,c,fi} = 0{,}25 \times V^0_{Rk,c}$ (R30, R 60, R90) $\qquad V^0_{Rk,c,fi} = 0{,}20 \times V^0_{Rk,c}$ (R120)

with $V^0_{Rk,c}$ initial value of the characteristic resistance in cracked concrete C20/25 under normal temperature.

In absence of other national regulations the partial safety factor for resistance under fire exposure $\gamma_{M,fi} = 1.0$ is recommended.