Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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

European Technical Assessment

ETA-11/0213 of 22 August 2017

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	BTV Anchor bolt BMC
Product family to which the construction product belongs	Torque controlled expansion anchor for use in non-cracked concrete
Manufacturer	BTV Bautechnik Vertriebs-GmbH Obere Wässere 6-8 72764 Reutlingen DEUTSCHLAND
Manufacturing plant	BTV Werk 1 BTV manufacturing plant 1
This European Technical Assessment contains	14 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	European Assessment Document (EAD) 330232-00-0601

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Specific Part

1 Technical description of the product

The BTV Bolt Anchor BMC is an anchor made of zinc plated, hot-dip galvanised or 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 tension and shear loads in concrete	See Annex C 1 and C 2
Edge distances and spacing	See Annex C 1 and C 2
Displacements under tension and shear loads	See Annex C 3

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchorages satisfy requirements for Class A1
Resistance to fire	No performance assessed

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

In accordance with European Assessment Documents EAD No. 330232-00-0601 the applicable European legal act is: [96/582/EC].

The system to be applied is: 1

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

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

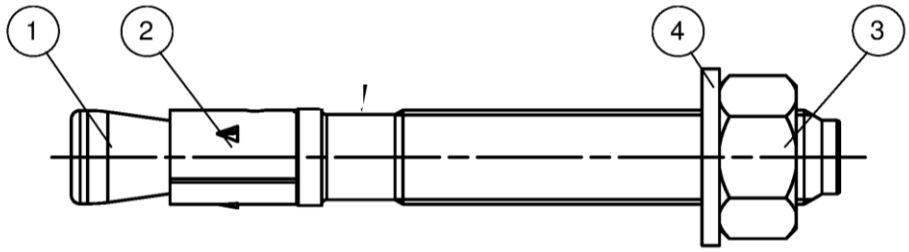
Issued in Berlin on 22 August 2017 by Deutsches Institut für Bautechnik

Lars Eckfeldt
p.p. Head of Department

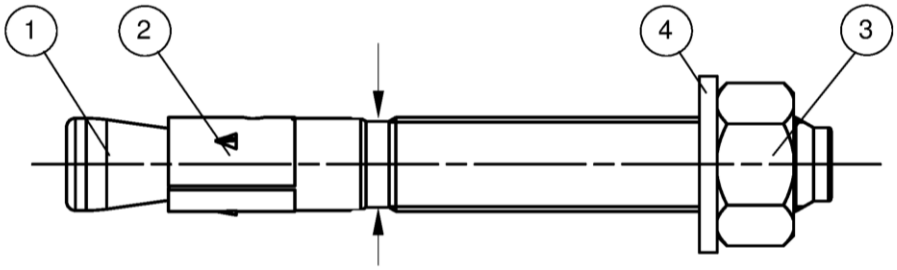
beglaubigt:
Baderschneider

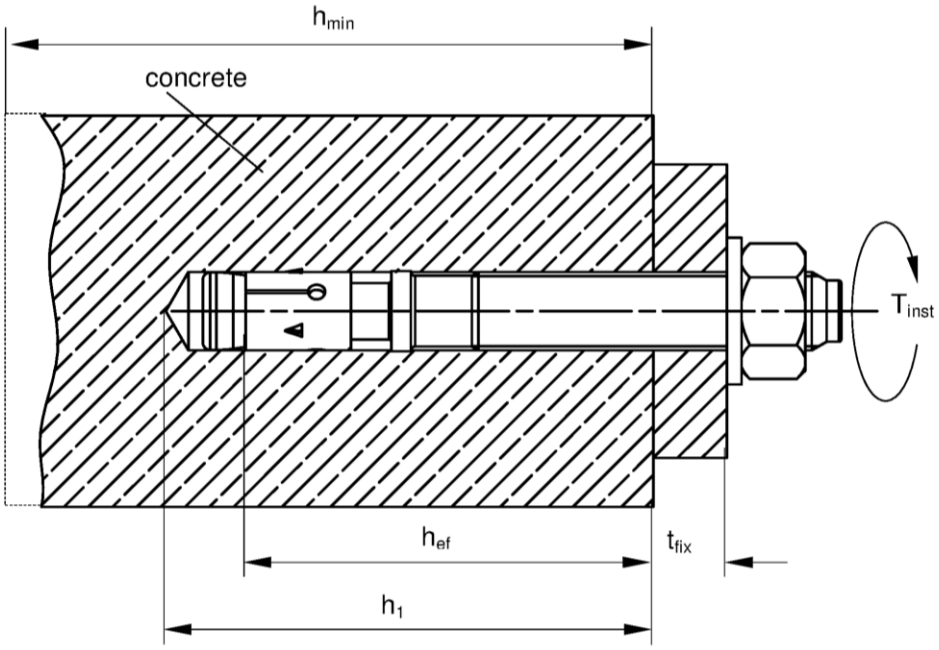
Deutsches Institut für Bautechnik DIBt

Cone bolt manufactured by cold - forming:



Cone bolt manufactured by turning:





① Cone bolt (cold – formed or turned)
② Expansion sleeve
③ Hexagon nut
④ Washer

h_{ef} = Effective anchorage depth
t_{fix} = Thickness of fixture
h_1 = Drill hole depth
h_{min} = Thickness of concrete member
T_{inst} = Required torque moment

BTV Bolt Anchor BMC	**Annex A 1**
Product description Installed condition	

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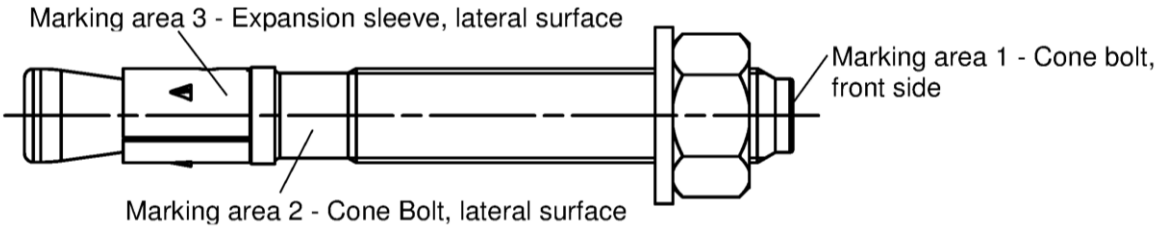
BMC for use with standard and reduced anchorage depth ($h_{ef,\,sta}$ and $h_{ef,\,red}$)



Product marking, example: BMC 12/10 A4

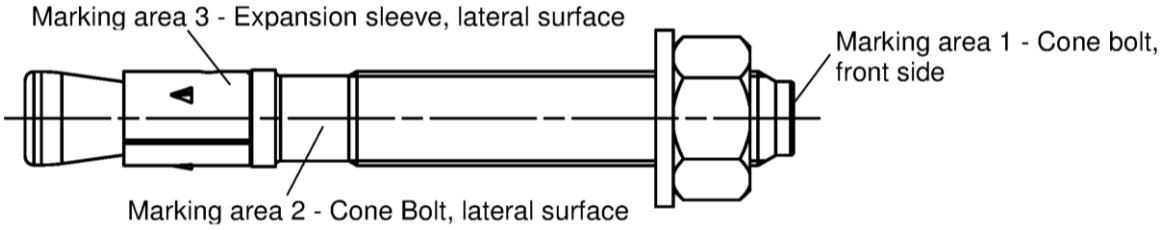
works symbol | type of anchor placed on marking area 2 or marking area 3

thread size / thickness of fixture (t_{fix}) for $h_{ef,\,sta}$
identification A4
placed on marking area 2

Table A1: Letter-code on marking area 1 and maximum thickness of fixture t_{fix}:

marking		A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S	T	U	V	W	X	Y	Z
max. t_{fix} for $h_{ef,\,sta}$	M6-M20	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400
max. t_{fix} for $h_{ef,\,red}$	M8, M10	15	20	25	30	35	40	45	50	55	60	70	80	90	100	110	130	150	170	190	210	260	310	360	410
	M12, 16	20	25	30	35	40	45	50	55	60	65	75	85	95	105	115	135	155	175	195	215	265	315	365	415
	M20	30	35	40	45	50	55	60	65	70	75	85	95	105	115	125	145	165	185	205	225	275	325	375	425

BMC K for use with reduced anchorage depth only ($h_{ef,\,red}$):



Product marking, example: BMC 12/10 K A4

works symbol | type of anchor placed on marking area 2 or marking area 3

thread size / thickness of fixture (t_{fix})
identification K for $h_{ef,\,red}$ | identification A4
placed on marking area 2

Table A2: Letter-code on marking area 1 and maximum thickness of fixture t_{fix}:

marking		-A-	-B-	-C-	-D-	-E-	-F-	-G-	-H-	-I-	-K-	-L-	-M-	-N-	-O-	-P-	-R-	-S-	-T-	-U-	-V-	-W-	-X-	-Y-	-Z-
max. t_{fix} for $h_{ef,\,red}$	M8-M20	5	10	15	20	25	30	35	40	45	50	60	70	80	90	100	120	140	160	180	200	250	300	350	400

Identification for $h_{ef,\,red}$ is the letter-code between 2 hyphen

BTV Bolt Anchor BMC	**Annex A 2**
Product description Anchor Types	

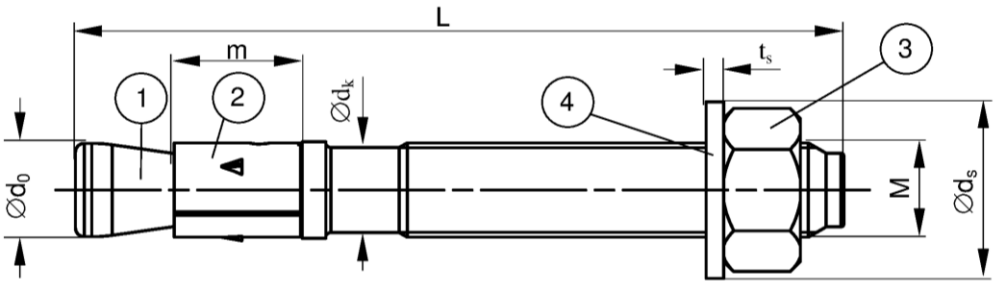


Table A3: Anchor dimensions [mm]

Part	Designation			BMC, BMC A4					
				M6	**M8**	**M10**	**M12**	**M16**	**M20**
1	Cone bolt	M	=	M6	M8	M10	M12	M16	M20
		$\varnothing d_0$	=	5,9	7,9	9,9	11,9	15,9	19,6
		$\varnothing d_k$	=	5,2	7,1	8,9	10,8	14,5	18,2
2	Expansion sleeve	m	=	10	11,5	13,5	16,5	21,5	33,5
3	Hexagon nut	SW	=	10	13	17	19	24	30
4	Washer	t_S	≥	1,0	1,4	1,8	2,3	2,7	2,7
		$\varnothing d_s$	≥	11,5	15	19	23	29	36
Thickness of fixture		t_{fix}	≥	0	0	0	0	0	0
			≤	200	200	250	300	400	500
Length of anchor		L_{min}	-	45	56	71	86	120	139
		L_{max}	-	245	261	316	396	520	654

BTV Bolt Anchor BMC

Product description
Anchor dimensions

Annex A 3

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Table A4: Materials BMC (zinc plated ≥ 5µm, DIN EN ISO 4042: 2001-01)

Part	Designation	Material
1	Cone bolt	Cold form steel or free cutting steel
2	Expansion sleeve	Cold strip [1)]
3	Hexagon nut	Steel, property class 8
4	Washer	Cold strip

[1)] Optional stainless steel

Table A5: Materials BMC (hot-dip galvanized ≥ 50µm, ISO 10684: 2004 [1)])

Part	Designation	Material
1	Cone bolt	Cold form steel or free cutting steel
2	Expansion sleeve	Stainless steel
3	Hexagon nut	Steel, property class 8
4	Washer	Cold strip

[1)] Alternative method sherardized ≥ 50 µm, EN 13811:2003

Table A6: Materials BMC A4

Part	Designation	Material
1	Cone bolt	Stainless steel
2	Expansion sleeve	Stainless steel
3	Hexagon nut	Stainless steel, property class ≥ 70
4	Washer	Stainless steel

BTV Bolt Anchor BMC

Product description
Materials

Annex A 4

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Specifications of intended use

BTV Bolt Anchor BMC, BMC A4			M6	M8	M10	M12	M16	M20
Material	Steel	Zinc plated			✓			
		Hot-dip galvanized	-			✓		
	Stainless steel	A4			✓			
Static and quasi-static loads					✓			
Reduced anchorage depth			-			✓		
Uncracked concrete					✓			

Base materials:

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

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (BMC, BMC A4)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and to permanently damp internal condition, if no particular aggressive conditions exist (BMC A4)

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

Design:

- Anchorages are to be designed under the responsibility of an engineer experienced in anchorages and concrete work
- Verifiable calculation notes and drawings are to be prepared taking account of the loads to be anchored. The position of the anchor is indicated on the design drawings (e.g. position of the anchor relative to reinforcement or to supports, etc.)
- Design of fastenings according to FprEN 1992-4: 2016 and EOTA Technical Report TR 055

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Hammer or hollow drilling according to Annex B3

BTV Bolt Anchor BMC	**Annex B 1**
Intended Use Specifications	

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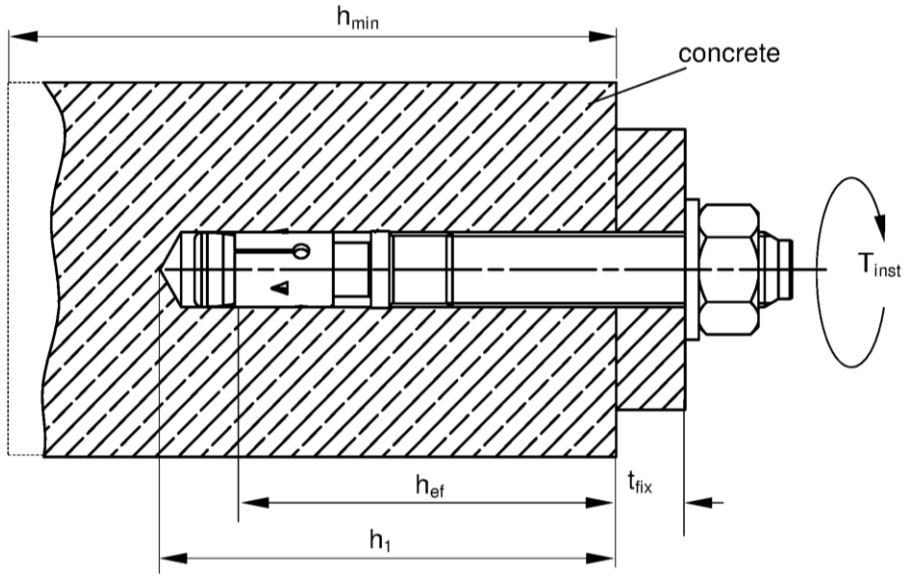
Table B1: Installation parameters

Type of anchor / size **BMC, BMC A4**		**M6**	**M8**	**M10**	**M12**	**M16**	**M20**
Nominal drill hole diameter	d_0 = [mm]	6	8	10	12	16	20
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	6,45	8,45	10,45	12,5	16,5	20,55
Effective anchorage depth	h_{ef} = [mm]	30[2)]	40 (30[1) 2)])	50 (40[1)])	65 (50[1)])	80 (65[1)])	105 (80[1)])
Depth of drill hole in concrete	$h_1 \geq$ [mm]	40	56 (46[1) 2)])	68 (58[1)])	85 (70[1)])	104 (89[1)])	135 (110[1)])
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	7	9	12	14	18	22
Required torque moment BMC (zinc plated)	T_{inst} = [Nm]	4	15	30	50	100	200
Required torque moment BMC (hot-dip galvanized)	T_{inst} = [Nm]	-	15	30	40	70	200
Required torque moment BMC A4	T_{inst} = [Nm]	4	10	20	35	80	150

[1)] Values for reduced anchorage depth
[2)] Use restricted to anchoring of structural components which are statically indeterminate



h_{ef} = Effective anchorage depth
t_{fix} = Thickness of fixture
h_1 = Drill hole depth
h_{min} = Thickness of concrete member
T_{inst} = Required torque moment

BTV Bolt Anchor BMC

Intended Use
Installation instructions

Annex B 2

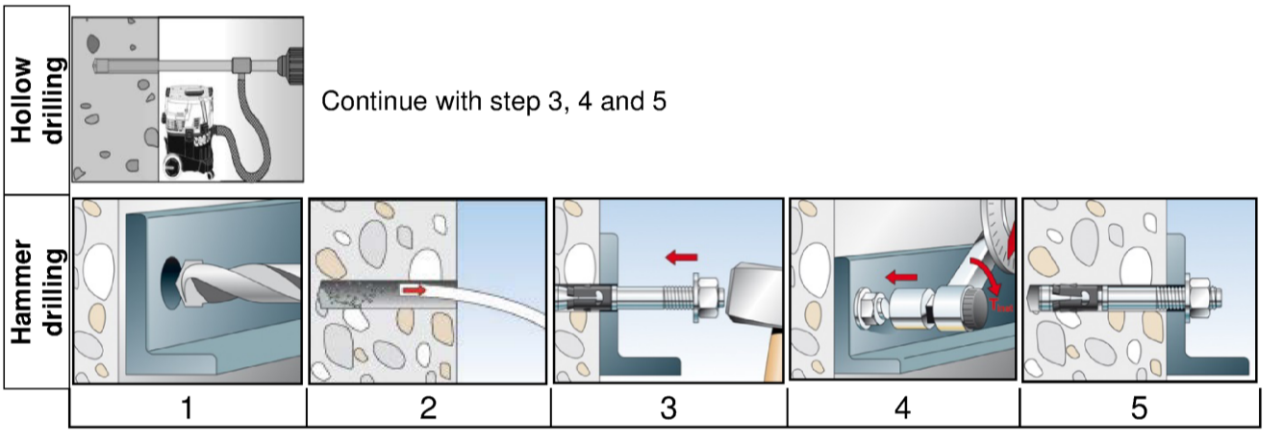
Deutsches Institut für Bautechnik DIBt

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

Type of anchor / size **BMC, BMC A4**				**M6**	**M8**	**M10**	**M12**	**M16**	**M20**
Standard anchorage depth	Effective anchorage depth	$h_{ef,\,sta}$	[mm]	30[2)]	40	50	65	80	105
	Minimum thickness of member	h_{min}	[mm]	100	100	100	120	160	200
	Minimum spacing	s_{min}	[mm]	40	40	50 (70[1)])	70	90 (120[1)])	120
	Minimum edge distance	c_{min}	[mm]	40	40 (45[1)])	50 (55[1)])	70	90 (80[1)])	120
Reduced anchorage depth	Effective anchorage depth	$h_{ef,\,red}$	[mm]	-	30[2)]	40	50	65	80
	Minimum thickness of member	h_{min}	[mm]	-	100	100	100	120	160
	Minimum spacing	s_{min}	[mm]	-	40 (50[1)])	50	70	90	120 (140[1)])
	Minimum edge distance	c_{min}	[mm]	-	40 (45[1)])	80	100	120	120

[1)] Values for BMC A4
[2)] Use restricted to anchoring of structural components which are statically indeterminate

Installation instructions



No.	Description	
1	Create drill hole with hammer drill	Create drill hole with hollow drill and vacuum cleaner
2	Clean bore hole	-
3	Set anchor	
4	Expand anchor with prescribed installation torque T_{inst}	
5	Finished installation	

Types of drills	
Hammer drill	
Hollow drill	

BTV Bolt Anchor BMC

Intended Use
Minimum spacing and edge distance
Installation instructions

Annex B 3

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values of **tension** resistance for **standard and reduced anchorage depth** under static and quasi-static action

Type of anchor / size			M6	M8	M10	M12	M16	M20
Steel failure for standard and reduced anchorage depth BMC								
Characteristic resistance **BMC**	$N_{Rk,s}$	[kN]	8,3	16,5	27,2	41,6	77,9	107
Partial safety factor	γ_{Ms}	[-]	1,5	1,4	1,4	1,4	1,5	1,5
Steel failure for standard and reduced anchorage depth BMC A4								
Characteristic resistance **BMC A4**	$N_{Rk,s}$	[kN]	10,6	16,5	27,2	41,6	78	111
Partial safety factor	γ_{Ms}	[-]	1,5	1,4	1,4	1,4	1,4	1,5
Pullout failure for standard anchorage depth BMC, BMC A4								
Characteristic resistance C20/25	$N_{Rk,p}$	[kN]	6 [2)]	- [1)]				
Pullout failure for reduced anchorage depth BMC, BMC A4								
Characteristic resistance C20/25	$N_{Rk,p}$	[kN]	-	6 [2)]	- [1)]			
Increasing factors for $N_{Rk,p}$	ψ_c	C25/30	1,12					
		C30/37	1,23					
		C35/45	1,32					
		C40/50	1,41					
		C45/55	1,50					
		C50/60	1,58					
Installation safety factor	γ_{inst}	[-]	1,0					
Concrete cone and splitting failure for standard anchorage depth BMC, BMC A4								
Effective anchorage depth	$h_{ef,sta}$	[mm]	30 [2)]	40	50	65	80	105
Factor k_1 for uncracked concrete	$k_{ucr,N}$	[-]	11,0					
Spacing	$s_{cr,N}$	[mm]	3 $h_{ef,sta}$					
Edge distance	$c_{cr,N}$	[mm]	1,5 $h_{ef,sta}$					
Spacing (splitting failure)	$s_{cr,sp}$	[mm]	130 [2)]	190	200	290	350	370
Edge distance (splitting failure)	$c_{cr,sp}$	[mm]	65 [2)]	95	100	145	175	185
Concrete cone and splitting failure for reduced anchorage depth **BMC, BMC A4**								
Effective anchorage depth	$h_{ef,red}$	[mm]	-	30 [2)]	40	50	65	80
Factor k_1 for uncracked concrete	$k_{ucr,N}$	[-]	11,0					
Spacing	$s_{cr,N}$	[mm]	3 $h_{ef,red}$					
Edge distance	$c_{cr,N}$	[mm]	1,5 $h_{ef,red}$					
Spacing (splitting failure)	$s_{cr,sp}$	[mm]	-	190 [4)]	200	290	350	370
Edge distance (splitting failure)	$c_{cr,sp}$	[mm]	-	95 [4)]	100	145	175	185

[1)] Pullout failure is not relevant
[2)] Use restricted to anchoring of structural components which are statically indeterminate

BTV Bolt Anchor BMC

Performances
Characteristic values of tension resistance for standard and reduced anchorage depth

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values of **shear** resistance for **standard and reduced anchorage depth** under static and quasi-static action

Type of anchor / size			M6	M8	M10	M12	M16	M20
Steel failure without lever arm for standard and reduced anchorage depth								
Charact. resistance **BMC**	$V^0_{Rk,s}$	[kN]	6,0	13,3	21,0	31,3	55,1	67
Steel failure without lever arm for standard and reduced anchorage depth								
Charact. resistance **BMC A4**	$V^0_{Rk,s}$	[kN]	5,3	12,8	20,3	27,4	51	86
Steel failure with lever arm for standard anchorage depth								
Charact. bending moment **BMC**	$M^0_{Rk,s}$	[Nm]	9,4[1)]	26,2	52,3	91,6	232,2	422
Steel failure with lever arm for standard anchorage depth								
Charact. bending moment **BMC A4**	$M^0_{Rk,s}$	[Nm]	8[1)]	26	52	85	216	454
Steel failure with lever arm for reduced anchorage depth								
Charact. bending moment **BMC**	$M^0_{Rk,s}$	[Nm]	-	19,9[1)]	45,9	90,0	226,9	349
Steel failure with lever arm for reduced anchorage depth								
Charact. bending moment **BMC A4**	$M^0_{Rk,s}$	[Nm]	-	21[1)]	47	85	216	353
Partial safety factor steel failure	γ_{Ms}	[-]	1,25					
Factor for ductility	k_7	[-]	1,0					
Concrete pryout failure for standard anchorage depth BMC, BMC A4								
Factor for pryout	k_8	[-]	1,4[1)]	1,8	2,1	2,3	2,3	2,3
Installation safety factor	γ_{inst}	[-]	1,0					
Concrete pryout failure for reduced anchorage depth BMC, BMC A4								
Factor for pryout	k_8	[-]	-	1,8[1)]	2,1	2,3	2,3	2,3
Installation safety factor	γ_{inst}	[-]	1,0					
Concrete edge failure for standard anchorage depth BMC, BMC A4								
Effective length of anchor	$l_{f,sta}$	[mm]	30[1)]	40	50	65	80	105
Effective diameter of anchor	d_{nom}	[mm]	6	8	10	12	16	20
Installation safety factor	γ_{inst}	[-]	1,0					
Concrete edge failure for reduced anchorage depth BMC, BMC A4								
Effective length of anchor	$l_{f,red}$	[mm]	-	30[1)]	40	50	65	80
Effective diameter of anchor	d_{nom}	[mm]	-	8	10	12	16	20
Installation safety factor	γ_{inst}	[-]	1,0					

[1)] Use restricted to anchoring of structural components which are statically indeterminate

BTV Bolt Anchor BMC

Performances
Characteristic values of shear resistance for standard and reduced anchorage depth

Annex C 2

Deutsches Institut für Bautechnik DIBt

Table C3: Displacements due to tension loads

Type of anchor / size **BMC, BMC A4**			**M6**	**M8**	**M10**	**M12**	**M16**	**M20**
Standard anchorage depth	$h_{ef,\,sta}$	[mm]	30	40	50	65	80	105
Tension load C20/25	N	[kN]	2,8	6,1	8,5	12,6	17,2	25,8
Displacements	δ_{N0}	[mm]	1,9	0,6	0,9	1,5 (1,9[1)])	1,8	1,8 (2,0[1)])
	$\delta_{N\infty}$	[mm]	3,1 (2,7[1)])					
Reduced anchorage depth	$h_{ef,\,red}$	[mm]	-	30	40	50	65	80
Tension load C20/25	N	[kN]		2,8	6,1	8,5	12,6	17,2
Displacements	δ_{N0}	[mm]		0,4	0,7	0,7	0,9	1,0
	$\delta_{N\infty}$	[mm]	1,6 (1,7[1)])					

[1)] Values for BMC A4

Table C4: Displacements due to shear loads

Type of anchor / size **BMC, BMC A4**			**M6**	**M8**	**M10**	**M12**	**M16**	**M20**
Shear load BMC	V	[kN]	3,4	7,6	12,0	17,9	31,5	38,2
Displacements BMC	δ_{V0}	[mm]	0,7	1,5	1,6	2,0	3,0	2,6
	$\delta_{V\infty}$	[mm]	1,1	2,3	2,4	3,0	4,5	3,9
Shear load BMC A4	V	[kN]	3,0	7,3	11,6	15,7	29,1	49,0
Displacements BMC A4	δ_{V0}	[mm]	1,5	1,4	2,1	2,6	2,7	4,6
	$\delta_{V\infty}$	[mm]	2,3	2,2	3,2	3,9	4,1	7,0

BTV Bolt Anchor BMC

Performances
Displacement under tension and shear loads

Annex C 3