

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

ETA-11/0382  
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

BTI simplex anchor BA

Product family  
to which the construction product belongs

Torque controlled expansion anchor  
for use in non-cracked concrete

Manufacturer

BTI Befestigungstechnik GmbH & Co. KG  
Salzstraße 51  
74653 Ingelfingen  
DEUTSCHLAND

Manufacturing plant

BTI Herstellwerk 1  
BTI 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 BTI simplex anchor BA 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	Anchorage 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

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

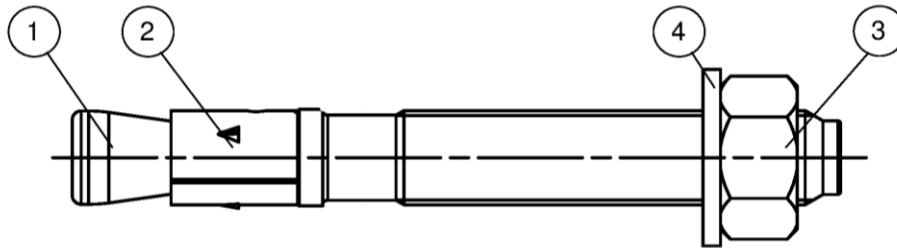
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

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

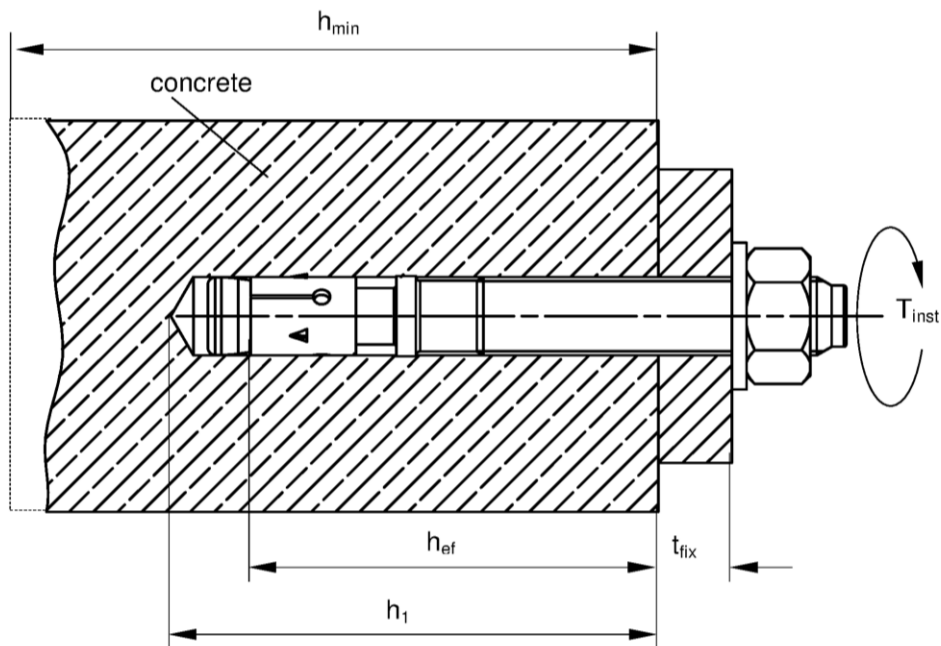
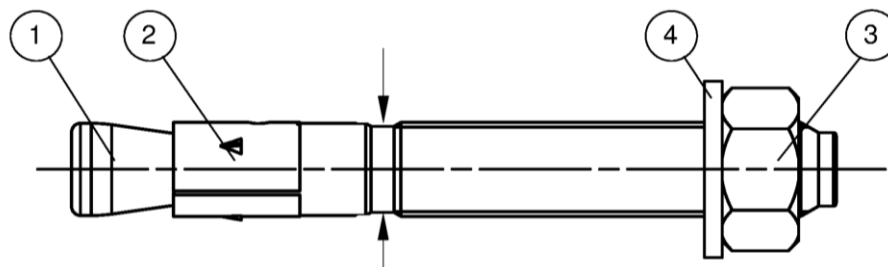
Lars Eckfeldt  
p.p. Head of Department

*beglaubigt:*  
Baderschneider

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

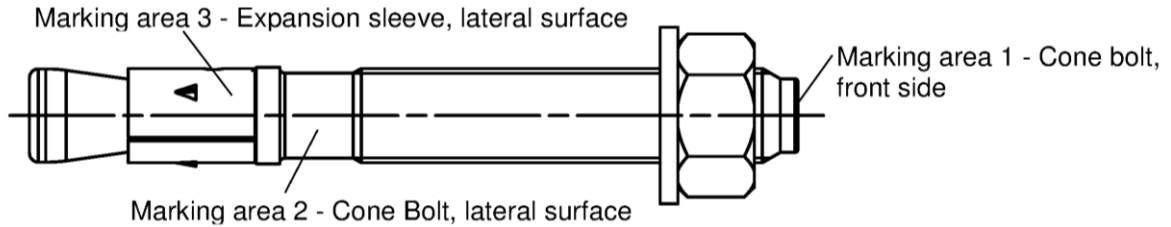
- $h_{ef}$  = Effective anchorage depth
- $t_{fix}$  = Thickness of fixture
- $h_1$  = Drill hole depth
- $h_{min}$  = Thickness of concrete member
- $T_{inst}$  = Required torque moment

BTI simplex anchor BA

**Product description**  
Installed condition

**Annex A 1**

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



Product marking, example:

BA 12/10 A4

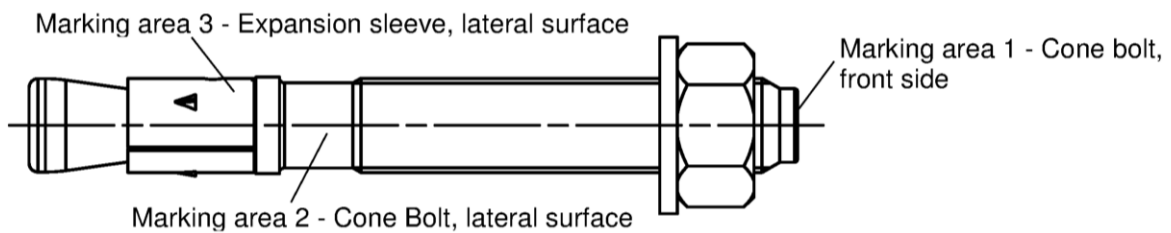
Plant identification | type of anchor  
placed on marking area 2 or marking area 3

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
	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
max. $t_{fix}$ for $h_{ef, red}$	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

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



Product marking, example:

BA 12/10 K A4

Plant identification | 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

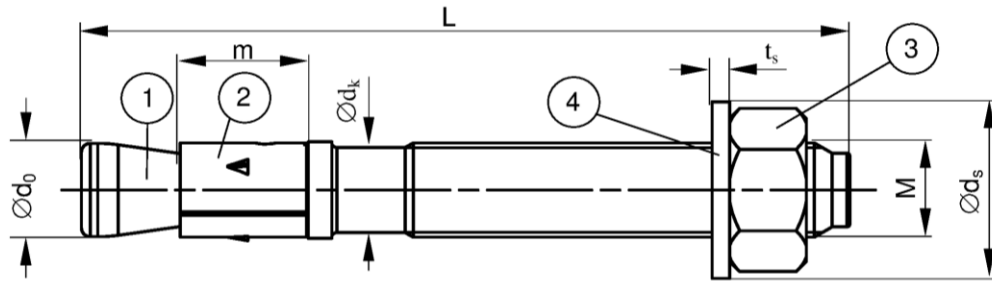
**Table A2:** Letter-code on marking area 1 and maximum thickness of fixture  $t_{fix}$ :

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

BTI simplex anchor BA

**Product description**  
Anchor Types

**Annex A 2**



**Table A3:** Anchor dimensions [mm]

Part	Designation			BA, BA A4						
				M6	M8	M10	M12	M16	M20	
1	Cone bolt	M	=	M6	M8	M10	M12	M16	M20	
		Ø d <sub>0</sub>	=	5,9	7,9	9,9	11,9	15,9	19,6	
		Ø d <sub>k</sub>	=	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 <sub>s</sub>	≥	1,0	1,4	1,8	2,3	2,7	2,7	
		Ø d <sub>s</sub>	≥	11,5	15	19	23	29	36	
Thickness of fixture		t <sub>fix</sub>	≥	0	0	0	0	0	0	
			≤	200	200	250	300	400	500	
Length of anchor			L <sub>min</sub>	-	45	56	71	86	120	139
			L <sub>max</sub>	-	245	261	316	396	520	654

**Table A4:** Materials BA (zinc plated  $\geq 5\mu\text{m}$ , DIN EN ISO 4042: 2001-01)

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

<sup>1)</sup> Optional stainless steel

**Table A5:** Materials BA (hot-dip galvanized  $\geq 50\mu\text{m}$ , ISO 10684: 2004 <sup>1)</sup>)

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

<sup>1)</sup> Alternative method sherardized  $\geq 50\mu\text{m}$ , EN 13811:2003

**Table A6:** Materials BA A4

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

BTI simplex anchor BA

**Product description**  
Materials

**Annex A 4**



### Specifications of intended use

BTI simplex anchor <b>BA, BA A4</b>		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:

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

BTI simplex anchor BA

**Intended Use**  
Specifications

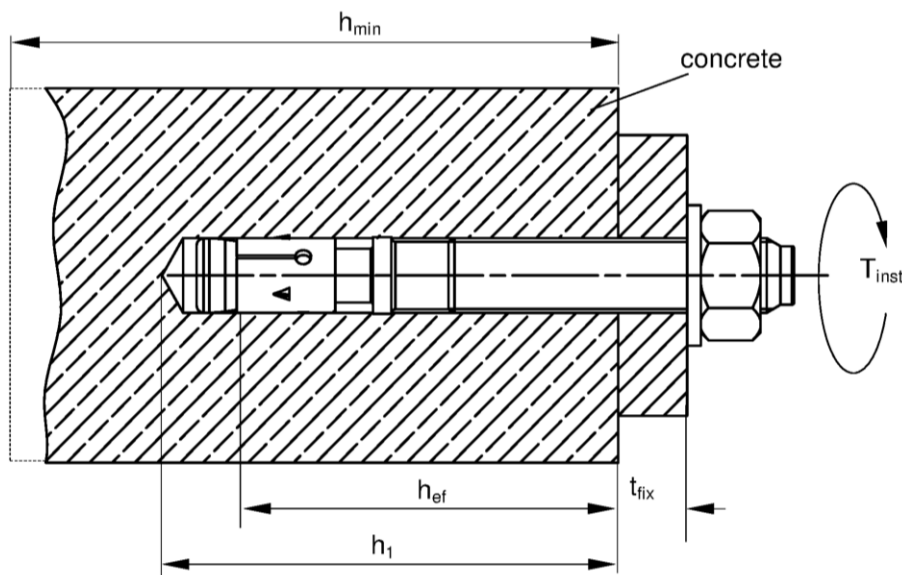
**Annex B 1**

**Table B1:** Installation parameters

Type of anchor / size <b>BA, BA A4</b>		<b>M6</b>	<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>M20</b>
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 <sup>2)</sup>	40 (30 <sup>1)2)</sup>	50 (40 <sup>1)</sup> )	65 (50 <sup>1)</sup> )	80 (65 <sup>1)</sup> )	105 (80 <sup>1)</sup> )
Depth of drill hole in concrete	$h_1 \geq$ [mm]	40	56 (46 <sup>1)2)</sup> )	68 (58 <sup>1)</sup> )	85 (70 <sup>1)</sup> )	104 (89 <sup>1)</sup> )	135 (110 <sup>1)</sup> )
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	7	9	12	14	18	22
Required torque moment <b>BA (zinc plated)</b>	$T_{inst} =$ [Nm]	4	15	30	50	100	200
Required torque moment <b>BA (hot-dip galvanized)</b>	$T_{inst} =$ [Nm]	-	15	30	40	70	200
Required torque moment <b>BA A4</b>	$T_{inst} =$ [Nm]	4	10	20	35	80	150

<sup>1)</sup> Only for reduced anchorage depth

<sup>2)</sup> 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

BTI simplex anchor BA

**Intended Use**  
Installation instructions

**Annex B 2**

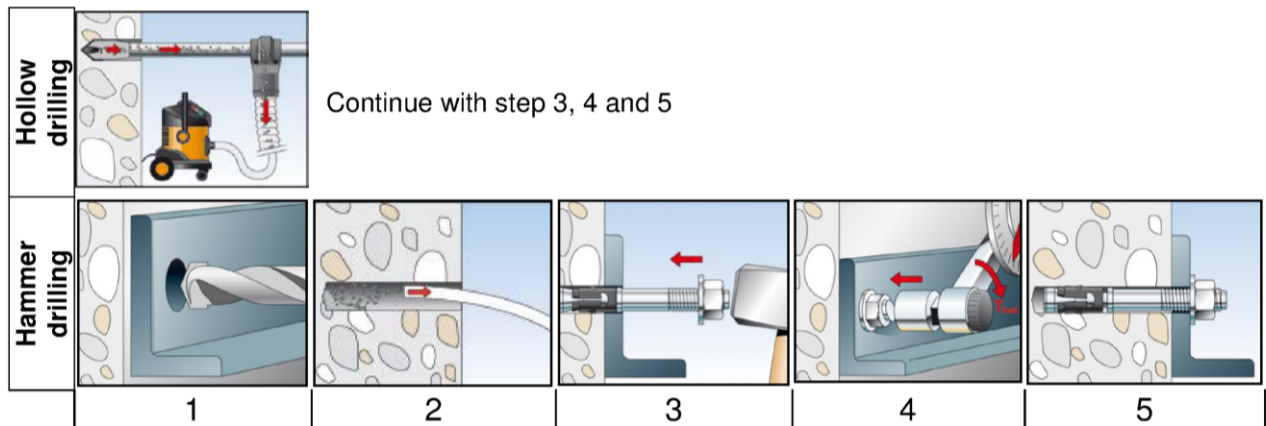
**Table B2:** Minimum thickness of concrete members, minimum spacing and minimum edge distance

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

<sup>1)</sup> Only for BA A4

<sup>2)</sup> 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	

BTI simplex anchor BA

**Intended Use**  
Minimum spacing and edge distance  
Installation instructions

**Annex B 3**

**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
<b>Steel failure for standard and reduced anchorage depth BA</b>							
Characteristic resistance <b>BA</b>	$N_{Rk,s}$ [kN]	8,3	16,5	27,2	41,6	77,9	107
Partial safety factor	$\gamma_{Ms}$ [-]	1,5	1,4	1,4	1,4	1,5	1,5
<b>Steel failure for standard and reduced anchorage depth BA A4</b>							
Characteristic resistance <b>BA A4</b>	$N_{Rk,s}$ [kN]	10,6	16,5	27,2	41,6	78	111
Partial safety factor	$\gamma_{Ms}$ [-]	1,5	1,4	1,4	1,4	1,4	1,5
<b>Pullout failure for standard anchorage depth BA, BA A4</b>							
Characteristic resistance C20/25	$N_{Rk,p}$ [kN]	6 <sup>2)</sup>					- <sup>1)</sup>
<b>Pullout failure for reduced anchorage depth BA, BA A4</b>							
Characteristic resistance C20/25	$N_{Rk,p}$ [kN]	-	6 <sup>2)</sup>				- <sup>1)</sup>
Increasing factors for $N_{Rk,p}$	$\psi_c$	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	$\gamma_{inst}$ [-]				1,0		
<b>Concrete cone and splitting failure for standard anchorage depth BA, BA A4</b>							
Effective anchorage depth	$h_{ef,sta}$ [mm]	30 <sup>2)</sup>	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 <sup>2)</sup>	190	200	290	350	370
Edge distance (splitting failure)	$c_{cr,sp}$ [mm]	65 <sup>2)</sup>	95	100	145	175	185
<b>Concrete cone and splitting failure for reduced anchorage depth BA, BA A4</b>							
Effective anchorage depth	$h_{ef,red}$ [mm]	-	30 <sup>2)</sup>	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 <sup>2)</sup>	200	290	350	370
Edge distance (splitting failure)	$c_{cr,sp}$ [mm]	-	95 <sup>2)</sup>	100	145	175	185

<sup>1)</sup> Pullout failure is not relevant

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

BTI simplex anchor BA

**Performances**

Characteristic values of tension resistance for standard and reduced anchorage depth

**Annex C 1**

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

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

BTI simplex anchor BA

**Performances**

Characteristic values of shear resistance for standard and reduced anchorage depth

**Annex C 2**

**Table C3:** Displacements due to tension loads

Type of anchor / size <b>BA, BA A4</b>		<b>M6</b>	<b>M8</b>	<b>M10</b>	<b>M12</b>	<b>M16</b>	<b>M20</b>
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	$\delta_{N0}$ [mm]	1,9	0,6	0,9	1,5 (1,9 <sup>1)</sup> )	1,8	1,8 (2,0 <sup>1)</sup> )
	$\delta_{N\infty}$ [mm]	3,1 (2,7 <sup>1)</sup> )					
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	$\delta_{N0}$ [mm]		0,4	0,7	0,7	0,9	1,0
	$\delta_{N\infty}$ [mm]		1,6 (1,7 <sup>1)</sup> )				

<sup>1)</sup> Only for BA A4

**Table C4:** Displacements due to shear loads

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

BTI simplex anchor BA

**Performances**  
Displacement under tension and shear loads

**Annex C 3**