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
www.eota.eu

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

European Technical Assessment ETA-09/0158 of 25 April 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 drop in anchor BE
Product family to which the construction product belongs	Deformation-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
This European Technical Assessment contains	15 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 drop-in anchor BE is an anchor made of galvanized or stainless steel which is placed into a drilled hole and anchored by deformation-controlled expansion.

The fixture shall be anchored with a fastening screw or threaded rod.

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 loading, displacements	See Annex C 1 to C 4

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

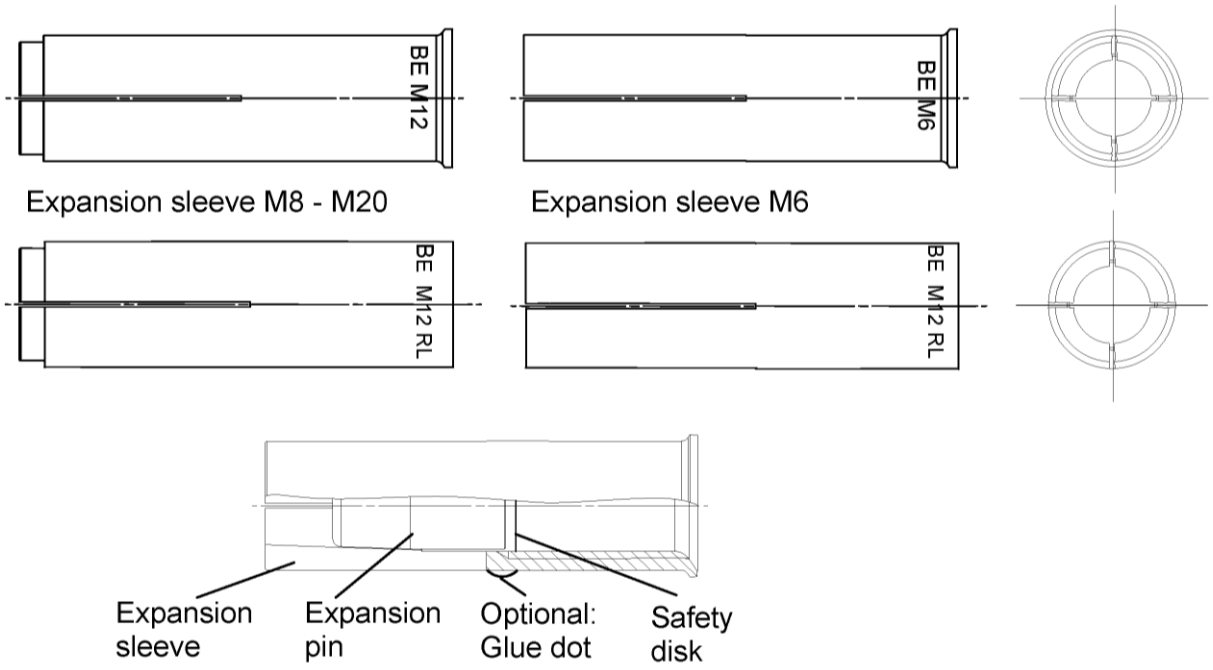
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 25 April 2017 by Deutsches Institut für Bautechnik

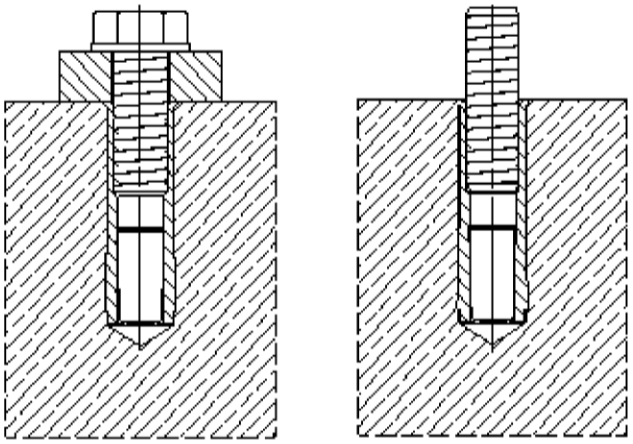
Andreas Kummerow
Head of Department

beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt



Intended use in concrete



BTI drop-in anchor BE	**Annex A 1**
Product description Anchor types Installed condition	

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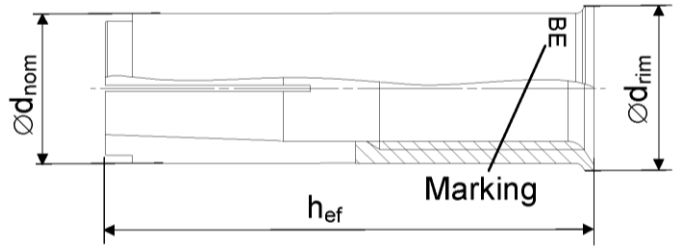
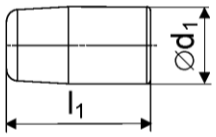
Expansion sleeve

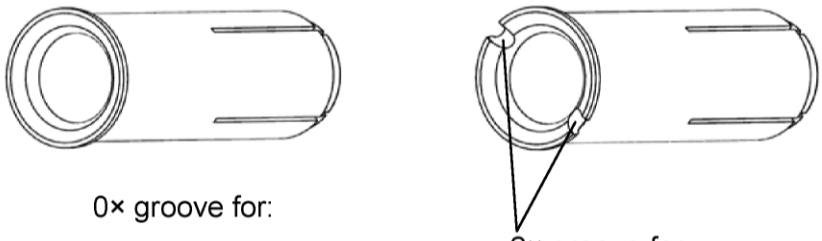


Expansion pin



Anchor size BE	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M12x50 D	M16x65	M20x80
h_{ef} [mm]	30	30	40	30	40	50		65	80
∅ d_{nom} [mm]	8	10		12		15	16	20	25
∅ d_{rim} [mm]	9,5	11,5		13,5		16,5	17,5	21,5	27,0
∅ d_1 [mm]	5	6,5		8		10		13,5	17,5
l_1 [mm]	14	13,5		13	18	18		25	26

Distinctive feature



0× groove for:

- BE M6x30..
- BE M8x30..
- BE M10x40..
- BE M12x50..
- BE M16x65..
- BE M20x80..

2× groove for:

- BE M8x40..
- BE M10x30..

Marking on anchor body

galvanized steel (gvz)		stainless steel (A4)	
with rim	*rimless*	*with rim*	*rimless*
BE M6x30	BE M6x30 RL	BE M6x30 A4	BE M6x30 RL A4
BE M8x30	BE M8x30 RL	BE M8x30 A4	BE M8x30 RL A4
BE M8x40	BE M8x40 RL	BE M8x40 A4	BE M8x40 RL A4
BE M10x30	BE M10x30 RL	BE M10x30 A4	BE M10x30 RL A4
BE M10x40	BE M10x40 RL	BE M10x40 A4	BE M10x40 RL A4
BE M12x50	BE M12x50 RL	BE M12x50 A4	BE M12x50 RL A4
BE M12x50 D	BE M12x50 RL D	BE M12x50 D A4	BE M12x50 RL D A4
BE M16x65	BE M16x65 RL	BE M16x65 A4	BE M16x65 RL A4
BE M20x80	BE M20x80 RL	BE M20x80 A4	BE M20x80 RL A4

BTI drop-in anchor BE

Product description
Anchor types

Annex A 2

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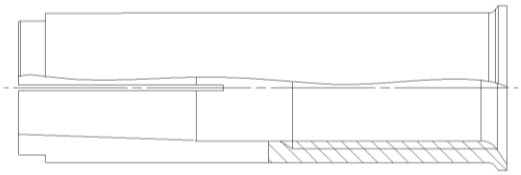
Expansion sleeve



Expansion pin

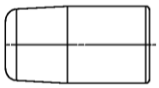


Table A1: Materials

	Material	
Designation	galvanised steel (≥ 5 µm)	stainless steel
Expansion sleeve	EN 10277:2008 or EN 10084:2008 or EN 10111:2008 or EN 10263:2001 or EN 10087:1998 or ASTM A29/A29M	EN 10088:2005
Expansion pin		
Fastening screw or threaded rod	steel, property class 4.6, 5.6, 5.8 or 8.8 according to EN ISO 898-1:2012	property class 50, 70 or 80 according to EN ISO 3506:2009

BTI drop-in anchor BE

Product description
Material

Annex A 3

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Specifications of Intended use

Anchorages subject to:

- Static and quasi-static loads

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
- Non-cracked concrete: all sizes

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions
  (zinc coated steel or stainless steel)
- Structures subject to external atmospheric exposure (including industrial and marine environment) and 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 swimming 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 into account 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 in accordance to FprEN 1992-4:2016 and EOTA Technical Report TR 055.
- Fasteners can be used as a single fixing for use in structural application.

Installation:

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site
- Create drill hole with hammer drill or with hollow drill and vacuum cleaner
- The anchor may only be used once
- In case of aborted hole: New hole must be drilled at a minimum distance of twice the depth of the aborted hole or closer, if the hole is filled with a high strength mortar and only if the hole is not in the direction of the oblique tensile or shear load
- Anchor expansion by impact using the setting tools given in Annex B 3. The anchor is property set if the stop of the setting tool reaches the expansion sleeve. The manual setting tool with installation control leaves a visible mark on the sleeve, as illustrated in Annex B 3 and B 4

BTI drop-in anchor BE	**Annex B 1**
Intended Use Specifications	

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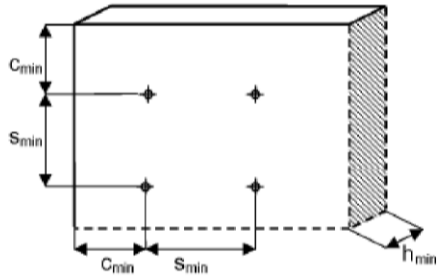
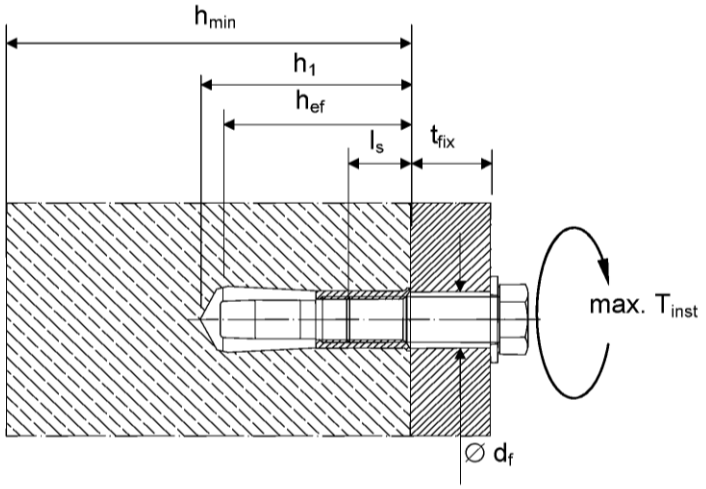
Table B2: Installation parameters for concrete C20/25 to C50/60

Anchor size			**M6x30**	**M8x30**	**M8x40**	**M10x30**	**M10x40**	**M12x50**	**M12x50 D**	**M16x65**	**M20x80**
Nominal drill hole diameter	d_0	[mm]	8	10		12		15	16	20	25
Effective anchorage depth	h_{ef}	[mm]	30	30	40	30	40	50		65	80
Maximum installation torque	max. T_{inst}	[Nm]	4	8		15		35		60	120
Minimum drill hole depth	h_1	[mm]	32	33	43	33	43	54		70	85
Minimum screw-in depth	$l_{s,min}$	[mm]	6	8		10		12		16	20
Maximum screw-in depth	$l_{s,max}$	[mm]	14	14		14	17	22		28	34
Clearance of hole diameter	$\varnothing\ d_f \leq$	[mm]	7	9		12		14		18	22
h_{min} = 80 mm											
Minimum spacing	s_{min}	[mm]	70	110	200	200		-	-	-	-
Minimum edge distance	c_{min}	[mm]	150	150		150		-	-	-	-
h_{min} = 100 mm											
Minimum spacing	s_{min}	[mm]	65	70		90	150	200		-	-
Minimum edge distance	c_{min}	[mm]	115	115		160	180			-	-
h_{min} = 120 mm											
Minimum spacing	s_{min}	[mm]	65	70		85	95	145		-	-
Minimum edge distance	c_{min}	[mm]	115	115		140	150	200		-	-
h_{min} = 160 mm											
Minimum spacing	s_{min}	[mm]	65	70		85	95	145		180	-
Minimum edge distance	c_{min}	[mm]	115	115		140	150	200		240	-
h_{min} = 200 mm											
Minimum spacing	s_{min}	[mm]	65	70		85	95	145		180	190
Minimum edge distance	c_{min}	[mm]	115	115		140	150	200		240	280





Fastening screw or threaded rod:

- Minimum property class and materials according to table A1
- The length of the fastening screw or threaded rod shall be determined depending on thickness of fixture t_{fix}, admissible tolerances and maximum screw length $l_{s,max}$ as well as minimum screw-in depth $l_{s,min}$

BTI drop-in anchor BE

Intended Use
Installation parameters

Annex B 2

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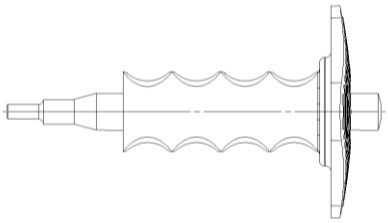
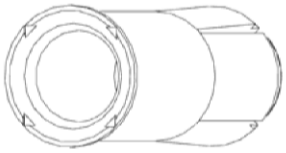
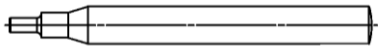
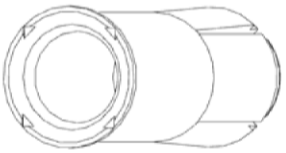
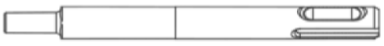
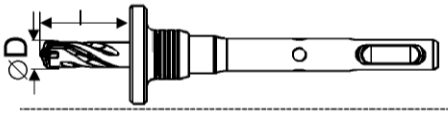
Setting & drilling tools

Setting tools	Marking	Description	Marking on BE with rim and rimless
	EHS Plus M..x h_{ef}	Manual setting tool with hand guard	
	EHS M..x h_{ef}	Manual setting tool basic format	
	EMS M..x h_{ef}	Machine setting tool with SDS Plus	No marking

Drilling tools

	EBB ∅D x l	Stop drill
Or other usual driller		

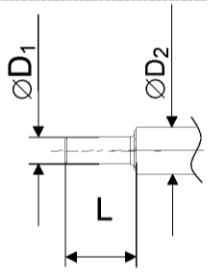


Table B3: Parameters of setting tools

Manual setting tool	Machine setting tool	Stop drill	For anchor size BE	∅ D1	∅ D2	L
EHS M6x25/30	EMS M6x25/30	EBB 8x30	BE M6x30	4,8	9,0	17,0
EHS M8x25/30	EMS M8x25/30	EBB 10x30	BE M8x30	6,4	11,0	18,0
EHS M8x40	EMS M8x40	EBB 10x40	BE M8x40			28,0
EHS M10x25/30	EMS M10x25/30	EBB 12x30	BE M10x30	7,9	13,0	18,0
EHS M10x40	EMS M10x40	EBB 12x40	BE M10x40			24,0
EHS M12x50	EMS M12x50	EBB 15x50	BE M12x50	10,2	16,5	30,0
EHS M12x50	EMS M12x50	EBB 16x50	BE M12x50 D			
EHS M16x65	EMS M16x65	EBB 20x65	BE M16x65	13,5	22	36,0
EHS M20x80	EMS M20x80	EBB 25x80	BE M20x80	16,4	27	50,0

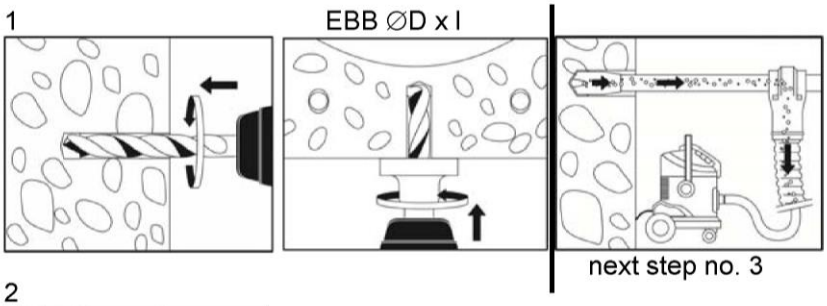
BTI drop-in anchor BE

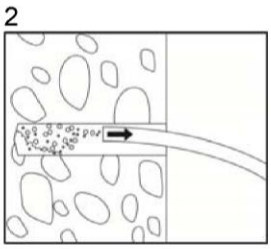
Intended Use
Setting & Drilling tools

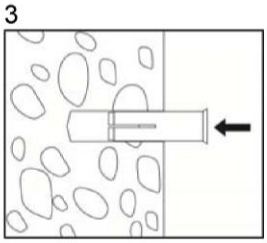
Annex B 3

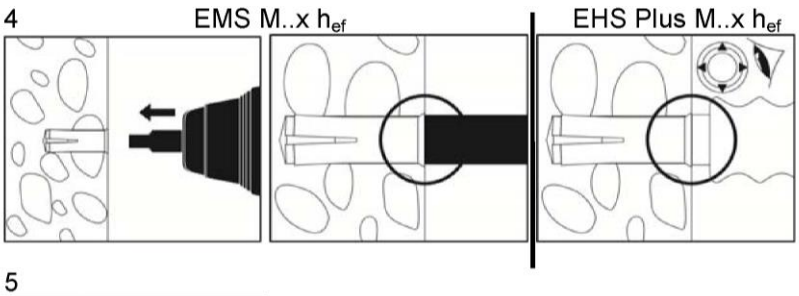
Deutsches Institut für Bautechnik DIBt

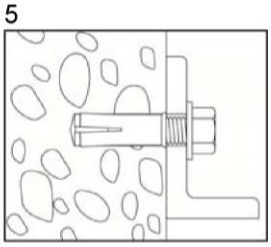
Installation instructions











No.	Description
1	Create drill hole with hammer drill or with hollow drill and vacuum cleaner
2	Clean from drill-dust
3	Set anchor till anchor is flush with surface of concrete
4	Expand the sleeve by driving the pin into the sleeve and control the correct setting
5	Fixation of fixture. Maximum installation torque max. T_{inst} must not be crossed

BTI drop-in anchor BE

Intended Use
Installation instructions

Annex B 4

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Table C1: Characteristic values for tension loads

BE		property class	M6x30[1)]	M8x30[1)]	M8x40	M10x30[1)]	M10x40	M12x50	M12x50 D	M16x65	M20x80
Inastallation safety factor	γ_{inst}	[-]	1,0								
Steel failure											
Characteristic resistance	$N_{Rk,s}$ [kN]	A4-50	10,1	18,3		29,0		42,1		78,3	122,4
Partial safety factor	γ_{Ms}		2,86								
Characteristic resistance	$N_{Rk,s}$ [kN]	A4-70	14,1	19,6		24,9		45,1	59,0	73,8	117,2
Partial safety factor	γ_{Ms}		1,87	1,5					1,87	1,5	
Characteristic resistance	$N_{Rk,s}$ [kN]	A4-80	16,1	19,6		24,9		45,1	59,0	73,8	117,2
Partial safety factor	γ_{Ms}		1,6	1,5							
Characteristic resistance	$N_{Rk,s}$ [kN]	steel 4.6	8,0	14,6		23,2		33,7		62,7	97,9
Partial safety factor	γ_{Ms}		2,0								
Characteristic resistance	$N_{Rk,s}$ [kN]	steel 5.6	10,1	18,3		29,0		42,1		78,3	122,4
Partial safety factor	γ_{Ms}		2,0								
Characteristic resistance	$N_{Rk,s}$ [kN]	steel 5.8	10,1	17,2		21,8		39,6	42,1	64,7	102,8
Partial safety factor	γ_{Ms}		1,5								
Characteristic resistance	$N_{Rk,s}$ [kN]	steel 8.8	13,5	17,2		21,8		39,6	53,3	64,7	102,8
Partial safety factor	γ_{Ms}		1,5								
Pull-out failure not decisive											
Concrete cone failure											
Effective anchorage depth	h_{ef}	[mm]	30		40	30	40	50		65	80
Characteristic spacing	$s_{cr,N}$	[mm]	90		120	90	120	150		195	240
Characteristic edge distance	$c_{cr,N}$	[mm]	45		60	45	60	75		97	120
Factor k_1	$k_{ucr,N}$	[-]	11,0								
Splitting failure											
Characteristic spacing	$s_{cr,sp}$	[mm]	210		280	210	320	350		455	560
Characteristic edge distance	$c_{cr,sp}$	[mm]	105		140	105	160	175		227	280

[1)] Only for application with statically indeterminate structural components.

BTI drop-in anchor BE

Performances
Characteristic values for tension loads

Annex C 1

Deutsches Institut für Bautechnik DIBt

Table C2: Characteristic values for shear loads

BE		property class	M6x30[1)]	M8x30[1)]	M8x40	M10x30[1)]	M10x40	M12x50	M12x50 D	M16x65	M20x80
Factor for ductility	k_7 [-]		1,0								
Steel failure without lever arm											
Characteristic resistance	$V_{Rk,s}$ [kN]	A4-50	5,0	9,2		14,5		21,1		39,2	61,2
Partial safety factor	γ_{Ms}		2,38								
Characteristic resistance	$V_{Rk,s}$ [kN]	A4-70	7,0	9,8		12,4		22,6	29,5	37	59
Partial safety factor	γ_{Ms}		1,56	1,25					1,56	1,25	
Characteristic resistance	$V_{Rk,s}$ [kN]	A4-80	8,0	9,8		12,4		22,6	30,4	36,9	58,6
Partial safety factor	γ_{Ms}		1,33	1,25							
Characteristic resistance	$V_{Rk,s}$ [kN]	steel 4.6	4,0	7,3		11,6		16,9		31	49
Partial safety factor	γ_{Ms}		1,67								
Characteristic resistance	$V_{Rk,s}$ [kN]	steel 5.6	5,0	9,2		14,5		21,1		39	61
Partial safety factor	γ_{Ms}		1,67								
Characteristic resistance	$V_{Rk,s}$ [kN]	steel 5.8	5,0	8,6		10,9		19,8	21,1	32	51
Partial safety factor	γ_{Ms}		1,25								
Characteristic resistance	$V_{Rk,s}$ [kN]	steel 8.8	6,8	8,6		10,9		19,8	27	32	51
Partial safety factor	γ_{Ms}		1,25								
Steel failure with lever arm											
Characteristic resistance	$M^0_{Rk,s}$ [Nm]	A4-50	8	19		37		66		166	324
Partial safety factor	γ_{Ms}		2,38								
Characteristic resistance	$M^0_{Rk,s}$ [Nm]	A4-70	11	26		52		92		232	454
Partial safety factor	γ_{Ms}		1,56								
Characteristic resistance	$M^0_{Rk,s}$ [Nm]	A4-80	12	30		60		105		266	519
Partial safety factor	γ_{Ms}		1,33								
Characteristic resistance	$M^0_{Rk,s}$ [Nm]	Stahl 4.6	6,1	15		30		52		133	259
Partial safety factor	γ_{Ms}		1,67								
Characteristic resistance	$M^0_{Rk,s}$ [Nm]	Stahl 5.6	7,6	19		37		66		166	324
Partial safety factor	γ_{Ms}		1,67								
Characteristic resistance	$M^0_{Rk,s}$ [Nm]	Stahl 5.8	7,6	19		37		66		166	324
Partial safety factor	γ_{Ms}		1,25								
Characteristic resistance	$M^0_{Rk,s}$ [Nm]	Stahl 8.8	12	30		60		105		266	517
Partial safety factor	γ_{Ms}		1,25								

[1)] Only for application with statically indeterminate structural components.

BTI drop-in anchor BE

Performances
Characteristic values for shear loads

Annex C 2

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Table C3: Characteristic values for shear loads

BE			M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M12x50 D	M16x65	M20x80
Concrete pry out failure											
Factor	k_8	[-]	1,74		1,88	1,74	1,88	2,0			
Installation safety factor	γ_{inst}	[-]	1,0								
Concrete edge failure											
Effective length of anchor in shear loading	$l_f = h_{ef}$	[mm]	30		40	30	40	50		65	80
Effective diameter of anchor	$\varnothing\ d_{nom}$	[mm]	8	10		12		15	16	20	25

BTI drop-in anchor BE

Performances
Characteristic values for shear loads

Annex C 3

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Table C4.1: Displacements under tension and shear loads for BE in galvanised steel

BE			M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M12x50 D	M16x65	M20x80
Tension load in C20/25 to C50/60	N	[kN]	4,0		6,1	4,0	6,1	8,5		12,6	17,2
Displacement	δ_{No}	[mm]	0,1								
	$\delta_{N\infty}$	[mm]	0,2								
Shear load in C20/25 to C50/60	V	[kN]	3,9	4,9	6,2			11,3	15,2	18,5	29,4
Displacement	δ_{Vo}	[mm]	0,95	1,00		1,05		1,10		1,40	1,80
	$\delta_{V\infty}$	[mm]	1,40	1,50		1,60		1,70		2,10	2,70

Table C4.2: Displacements under tension and shear loads for BE in stainless steel

BE A4			M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M12x50 D	M16x65	M20x80
Tension load in C20/25 to C50/60	N	[kN]	4,0		6,1	4,0	6,1	8,5		12,6	17,2
Displacement	δ_{No}	[mm]	0,1								
	$\delta_{N\infty}$	[mm]	0,2								
Shear load in C20/25 to C50/60	V	[kN]	3,2	5,6	7,1			12,9	13,5	21,1	33,5
Displacement	δ_{Vo}	[mm]	0,95	1,00		1,05		1,10		1,40	1,80
	$\delta_{V\infty}$	[mm]	1,40	1,50		1,60		1,70		2,10	2,70

BTI drop-in anchor BE

Performances
Displacements

Annex C 4