Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment ETA-02/0020 of 1 June 2021

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	Drop-in Anchor E / ES
Product family to which the construction product belongs	Mechanical fastener for use in concrete
Manufacturer	MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach
Manufacturing plant	MKT Metall-Kunststoff-Technik GmbH & Co. KG Auf dem Immel 2 67685 Weilerbach
This European Technical Assessment contains	16 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	EAD 330232-01-0601 Edition 05/2021
This version replaces	ETA-02/0020 issued on 1 March 2016

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Specific Part

1 Technical description of the product

The Drop-in Anchor E / ES is a fastener made of galvanized steel, stainless steel or high corrosion resistant steel which is placed into a drilled hole and anchored by deformation-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 to tension load (static and quasi-static loading) Method A	See Annex B2, C1 to C2
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C3 to C4
Displacements	See Annex C5
Characteristic resistance and displacements for seismic performance category C1 and C2	No performance assessed

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	No performance assessed

3.3 Aspects of durability linked with the Basic Works Requirements

Essential characteristic	Performance
Durability	See Annex B1

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

In accordance with the European Assessment Document EAD 330232-01-0601 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 EAD

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 1 June 2021 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

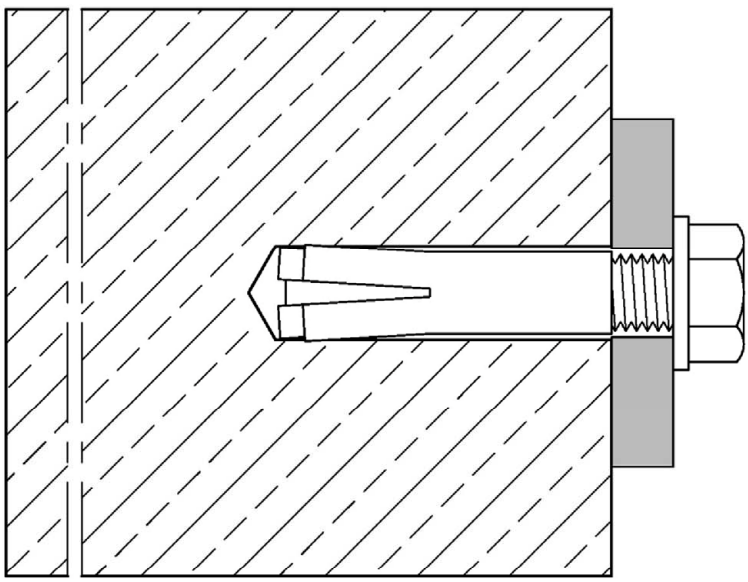
beglaubigt:
Lange

Deutsches Institut für Bautechnik DIBt

Drop-in Anchor E / ES

Anchor sizes and variations			
Drop-in Anchor E (without shoulder)		**Drop-in Anchor ES** (with shoulder)	
E M6x30		ES M6x30	
E M8x30 E M8x40		ES M8x30 ES M8x40	
E M10x40 E M12x50 E M12x80 E M16x65 E M16x80 E M20x80		ES M10x30 (zinc plated)	
		ES M10x40 ES M12x50 ES M12x80 ES M16x65 ES M16x80	

Installation situation



Drop-in Anchor E / ES	Annex A1
Product description Anchor sizes and variations / Installation situation	

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Table A1: Material

Part	Designation	Steel, zinc plated	Stainless steel A4	High corrosion resistant steel HCR
1	Anchor sleeve	Cold formed or machining steel, galvanized, EN ISO 4042:2018	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014, EN ISO 3506:2020	Stainless steel, 1.4529, 1.4565, EN 10088:2014, EN ISO 3506:2020
2	Cone	Cold formed or machining steel	Stainless steel (e.g. 1.4401, 1.4404, 1.4571) EN 10088:2014	

Requirements on the fastening screw or the threaded rod and nut according to the engineering documents:

- Minimum screw-in depth L_{sdmin} see Table B1
- The length of screw or the threaded rod shall be determined depending on the thickness of fixture t_{fix}, available thread length L_{th} (= maximum screw-in depth) and the minimum screw-in depth L_{sdmin}.
- A_5 > 8 % Ductility
- Materials
  - **Steel, zinc plated,** property class 4.6 / 4.8 / 5.6 / 5.8 or 8.8 according to EN ISO 898-1:2013 or EN ISO 898-2:2012
  - **Stainless steel A4** or **high corrosion resistant steel HCR,** property class 70 or 80 according to EN ISO 3506:2020

Drop-in Anchor E / ES

Product description
Materials / Requirements

Annex A2

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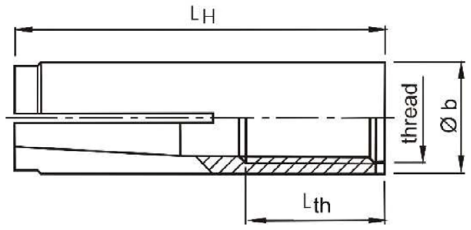
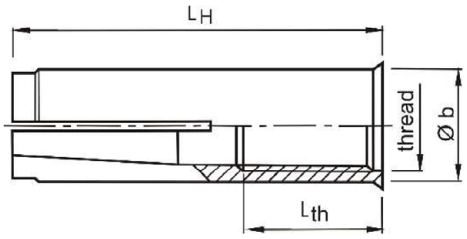
Anchor sleeve

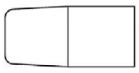
Anchor version without shoulder (E)



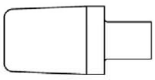
Anchor version with shoulder (ES)



Cone



M6x30 and M10x30



remaining sizes

Marking: see Table A2

e.g.: ◇ E M8x40

◇ identifying mark of manufacturing plant

E anchor identity (version without shoulder)

ES anchor identity (version with shoulder)

M8 size of thread

40 anchorage depth

additional marking

A4 stainless steel

HCR high corrosion resistant steel

Table A2: Dimensions and marking

Anchor size	Anchor sleeve				Marking			Cone
	thread	Ø b	L_H	L_{th}	Version E (without sleeve)	Version ES (with sleeve)	alternative	
M6x30	M6	8	30	13	◇ E M6x30	◇ ES M6x30	◇ E M6	
M8x30	M8	10	30	13	◇ E M8x30	◇ ES M8x30	◇ E M8	
M8x40	M8	10	40	20	◇ E M8x40	◇ ES M8x40	◇ E M8x40	
M10x30	M10	12	30	12	-	◇ ES M10x30	◇ E M10x30	
M10x40	M10	12	40	15	◇ E M10x40	◇ ES M10x40	◇ E M10	
M12x50	M12	15	50	18	◇ E M12x50	◇ ES M12x50	◇ E M12	
M12x80	M12	15	80	45	◇ E M12x80	◇ ES M12x80	◇ E M12x80	
M16x65	M16	19,7	65	23	◇ E M16x65	◇ ES M16x65	◇ E M16	
M16x80	M16	19,7	80	38	◇ E M16x80	◇ ES M16x80	◇ E M16x80	
M20x80	M20	24,7	80	34	◇ E M20x80	-	◇ E M20	

Dimensions in mm

Drop-in Anchor E / ES

Product description
Dimensions and marking

Annex A3

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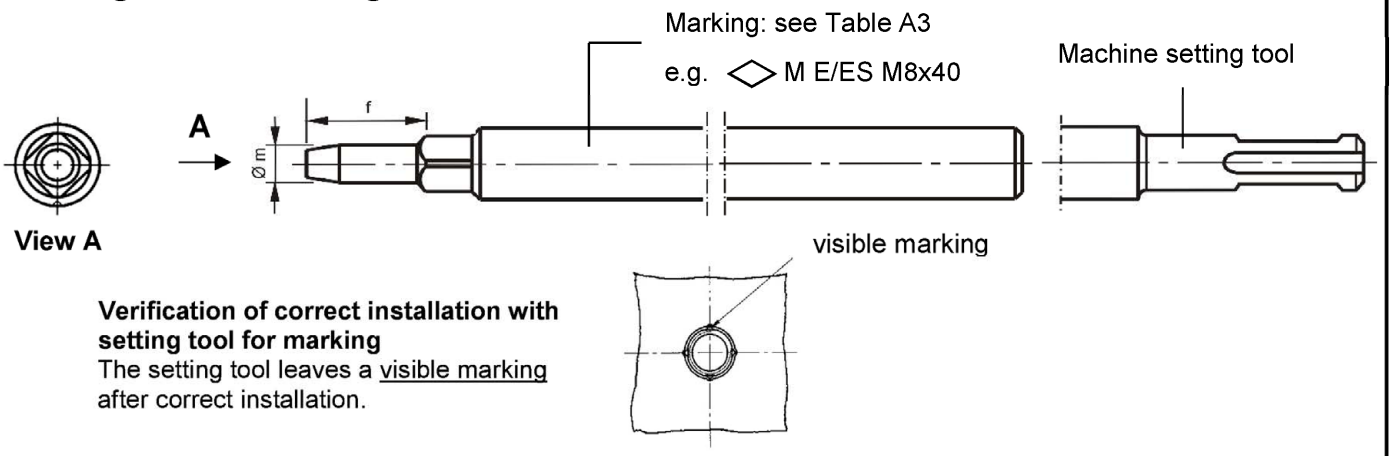
Setting tool for marking



Verification of correct installation with setting tool for marking
The setting tool leaves a visible marking after correct installation.

Setting tool

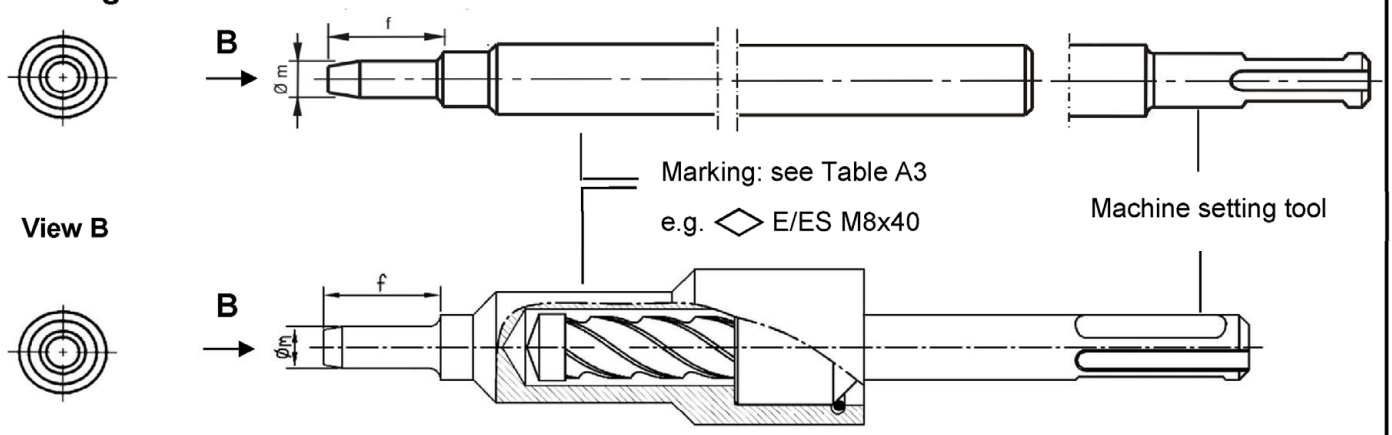


Table A3: Dimensions and marking of setting tools

Anchor size	Ø m	f	Setting tool for marking		Setting tool	
			Marking	alternative	**Marking**	alternative
M6x30	4,9	17	◇ M E/ES M6x30	◇ M E M6	◇ E/ES M6x30	◇ E M6
M8x30	6,4	18	◇ M E/ES M8x30	◇ M E M8	◇ E/ES M8x30	◇ E M8
M8x40	6,4	28	◇ M E/ES M8x40	◇ M E M8x40	◇ E/ES M8x40	◇ E M8x40
M10x30	8,0	18	◇ M ES M10x30	◇ M E M10x30	◇ ES M10x30	◇ E M10x30
M10x40	8,0	24	◇ M E/ES M10x40	◇ M E M10	◇ E/ES M10x40	◇ E M10
M12x50	10,0	30	◇ M E/ES M12x50	◇ M E M12	◇ E/ES M12x50	◇ E M12
M12x80	10,0	60	◇ M E/ES M12x80	◇ M E M12x80	◇ E/ES M12x80	◇ E M12x80
M16x65	13,5	36	◇ M E/ES M16x65	◇ M E M16	◇ E/ES M16x65	◇ E M16
M16x80	13,5	51	◇ M E/ES M16x80	◇ M E M16x80	◇ E/ES M16x80	◇ E M16x80
M20x80	16,5	50	◇ M E M20x80	◇ M E M20	◇ E M20x80	◇ E M20

Dimensions in mm

Drop-in Anchor E / ES

Product description
Setting tools / Dimensions and marking

Annex A4

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Specifications of intended use

Anchorages subject to:

- Static and quasi-static loads

Base materials:

- Compacted, reinforced or unreinforced normal weight concrete, without fibres according to EN 206:2013 + A1:2016
- Uncracked concrete
- Strength classes C20/25 to C50/60 according to EN 206:2013 + A1:2016

Use conditions (Environmental conditions):

- Structures subject to dry internal conditions (all materials)
- For all other conditions applies:
  Use according to EN 1993-1-4:2015 corresponding to corrosion resistance class CRC according to Annex A2, Table A1:
  - Stainless steel A4: CRC III
  - High corrosion resistant steel HCR: CRC V
- Anchor types M6x30 A4 and M8x30 A4 only for dry internal exposure

Design:

- Anchorages are designed under the responsibility of an engineer experienced in anchorages and concrete work.
- Verifiable calculation notes and drawings are 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.).
- The strength class and the length of the fastening screw or threaded rod shall be defined by the designing engineer
- Design of fastenings according EN 1992-4:2018 (and TR 055, if necessary)
- Anchor sizes M6x30, M8x30 and M10x30 for statically indeterminate structural components only, when in case of failure, the load can be distributed to other fasteners.

Installation:

- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools
- Drill hole by hammer drilling or vacuum drilling

Drop-in Anchor E / ES	Annex B1
Intended use Specifications	

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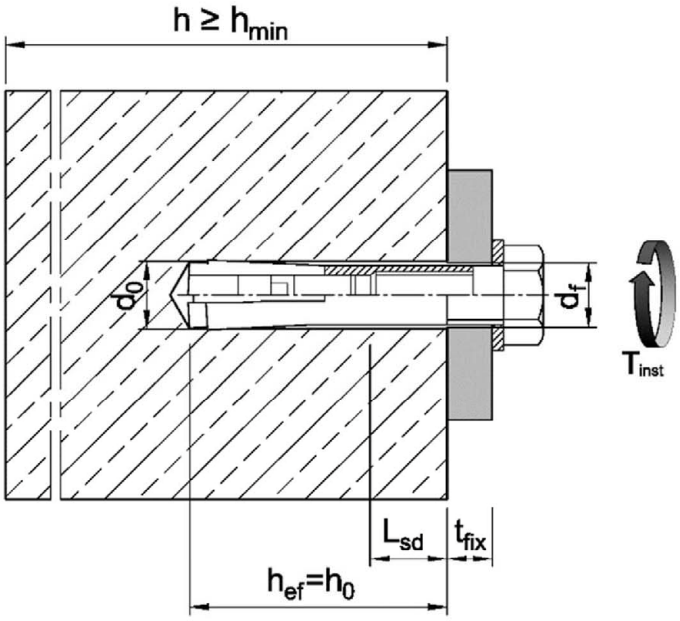
Table B1: Installation parameters

Anchor size			M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M12x80	M16x65	M16x80	M20x80
Depth of drill hole	h_0 =	[mm]	30	30	40	30	40	50	80	65	80	80
Drill hole diameter	d_0 =	[mm]	8	10	10	12	12	15	15	20	20	25
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,45	10,45	12,5	12,5	15,5	15,5	20,55	20,55	25,55
Max. installation torque [1]	$T_{inst} \leq$	[Nm]	4	8	8	15	15	35	35	60	60	120
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	9	9	12	12	14	14	18	18	22
Thread length	L_{th}	[mm]	13	13	20	12	15	18	45	23	38	34
Minimum screw-in depth	L_{sdmin}	[mm]	7	9	9	10	11	13	13	18	18	22
Steel, zinc plated												
Minimum thickness of member	h_{min}	[mm]	100	100	100	120	120	130	130	160	160	200
Minimum spacing	s_{min}	[mm]	55	60	80	100	100	120	120	150	150	160
Minimum edge distance	c_{min}	[mm]	95	95	95	115	135	165	165	200	200	260
Stainless steel A4, HCR												
Minimum thickness of member	h_{min}	[mm]	100	100	100	-	130	140	140	160	160	250
Minimum spacing	s_{min}	[mm]	50	60	80	-	100	120	120	150	150	160
Minimum edge distance	c_{min}	[mm]	80	95	95	-	135	165	165	200	200	260

[1] If the screw or threaded rod is otherwise secured against unscrewing, the torque can be omitted



Drop-in Anchor E / ES

Intended use
Installation parameters

Annex B2

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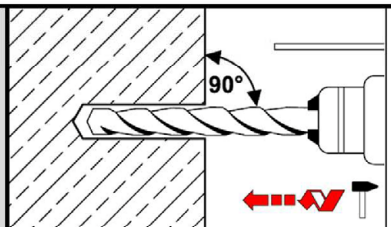
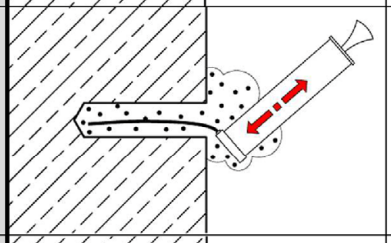
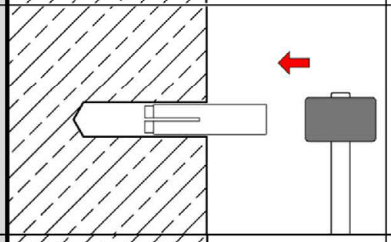
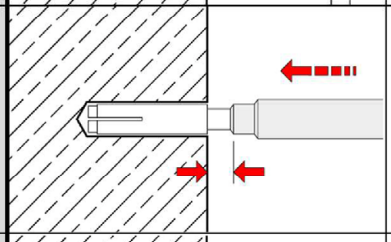
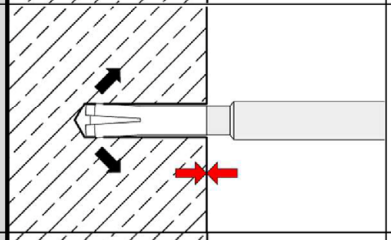
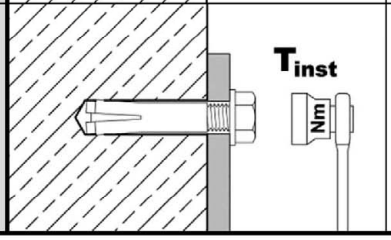
Installation instructions

1		Drill hole perpendicular to concrete surface. Using vacuum drill bit proceed with step 3.
2		Blow out dust. Alternatively, vacuum clean down to the bottom of the hole.
3		Drive in anchor.
4		Drive in cone by using setting tool.
5		Shoulder of setting tool must fit on anchor rim.
6		Turn in screw or threaded rod with nut, observe minimum screw-in depth (see Annex B2). Apply installation torque T_{inst}.

Drop-in Anchor E / ES

Intended use
Installation instructions

Annex B3

Deutsches Institut für Bautechnik DIBt

Table C1: Characteristic values for **tension loads, zinc plated steel**

Anchor size					M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M12x80	M16x65 M16x80	M20x80
Installation factor		γ_{inst}	[-]		1,2								
Steel failure													
Characteristic resistance	property class	4.6	$N_{Rk,s}$	[kN]	8,0	14,6		23,2		33,7		62,8	98,0
		4.8			8,0	14,6		18,0	20,2	33,7		62,8	98,0
		5.6			10,0	18,3		18,0	20,2	42,1		78,3	122,4
		5.8			10,0	17,6	18,3	18,0	20,2	40,2	42,1	67,1	106,4
		8.8			15,0	17,6	19,9	18,0	20,2	40,2	43,0	67,1	106,4
Partial factor	property class	4.6	γ_{Ms} [1]	[-]	2,0								
		5.6			2,0			1,5		2,0			
		4.8			1,5							1,6	
		5.8											
		8.8											
Pull-out failure													
Characteristic resistance in concrete C20/25			$N_{Rk,p}$	[kN]	8,1	8,1	9,0	8,1	12,4	17,4	17,4	25,8	35,2
Increasing factor			ψ_C	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$		$\left(\frac{f_{ck}}{20}\right)^{0,3}$	$\left(\frac{f_{ck}}{20}\right)^{0,5}$					
Splitting													
Characteristic resistance in concrete C20/25			$N^0_{Rk,sp}$	[kN]	min ($N_{Rk,p}$; $N^0_{Rk,c}$)								
Characteristic edge distance			$c_{cr,sp}$	[mm]	95	95	95	115	135	165		200	260
Characteristic spacing			$s_{cr,sp}$	[mm]	2 · $c_{cr,sp}$								
Concrete cone failure													
Effective anchorage depth			h_{ef}	[mm]	30	30	40	30	40	50	80	65 80 [2]	80
Characteristic edge distance			$c_{cr,N}$	[mm]	1,5 h_{ef}								
Characteristic spacing			$s_{cr,N}$	[mm]	2 · $c_{cr,N}$								
Factor	uncracked concrete		$k_{ucr,N}$	[-]	11,0								
	cracked concrete		$k_{cr,N}$	[-]	No performance assessed								

[1] in absence of other national regulations
[2] for M16x80

Drop-in Anchor E / ES

Performance
Characteristic values for **tension loads, zinc plated steel**

Annex C1

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Table C2: Characteristic values for **tension loads, stainless steel A4, HCR**

Anchor size			M6x30	M8x30	M8x40	M10x40	M12x50 M12x80	M16x65 M16x80	M20x80
Installation factor	γ_{inst}	[-]	1,0						
Steel failure									
Characteristic resistance (property class 70)	$N_{Rk,s}$	[kN]	14,1	23,3		29,4	50,2	83,8	133,0
Characteristic resistance (property class 80)	$N_{Rk,s}$	[kN]	17,5	23,3		29,4	50,2	83,8	133,0
Partial factor	γ_{Ms} [1)]	[-]	1,87						
Pull-out failure									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	8,1	8,1	11,0	12,4	17,4	25,8	35,2
Increasing factor	ψ_c	[-]	$\left(\frac{f_{ck}}{20}\right)^{0,5}$		$\left(\frac{f_{ck}}{20}\right)^{0,3}$	$\left(\frac{f_{ck}}{20}\right)^{0,5}$			
Splitting failure									
Characteristic resistance in concrete C20/25	$N^0_{Rk,sp}$	[kN]	min ($N_{Rk,p}$; $N^0_{Rk,c}$)						
Edge distance	$c_{cr,sp}$	[mm]	80	95	95	135	165	200	260
Spacing	$s_{cr,sp}$	[mm]	2 · $c_{cr,sp}$						
Concrete cone failure									
Effective anchorage depth	h_{ef}	[mm]	30	30	40	40	50 80 [2)]	65 80 [2)]	80
Edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}						
Spacing	$s_{cr,N}$	[mm]	2 · $c_{cr,N}$						
Factor: uncracked concrete	$k_{ucr,N}$	[-]	11,0						
Factor: cracked concrete	$k_{cr,N}$	[-]	No performance assessed						

[1)] in absence of other national regulations
[2)] for M12x80 and M16x80

Drop-in Anchor E / ES

Performance
Characteristic values for **tension loads, stainless steel A4, HCR**

Annex C2

Deutsches Institut für Bautechnik DIBt

Table C3: Characteristic values for **shear loads, zinc plated steel**

Anchor size				M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M12x80	M16x65 M16x80	M20x80
Steel failure without lever arm												
Characteristic resistance	property class 4.6	$V^0_{Rk,s}$	[kN]	4,0	7,3		11,6	9,6	16,8		31,3	49,0
	property class 4.8			4,0	7,3		10,1	10,1	16,9		31,3	49,0
	property class 5.6			5,0	9,1		10,1	9,6	21,1		39,2	61,2
	property class 5.8			5,0	6,9		10,1	7,2	19,4	21,1	33,5	53,2
	property class 8.8			5,0	6,9		10,1	7,2	19,4	21,5	33,5	53,2
Partial factor	property class 4.6	γ_{Ms} [1]	[-]	1,67								
	property class 5.6			1,67			1,25	1,67				
	property class 4.8			1,25							1,33	
	property class 5.8											
	property class 8.8											
Duktilitätsfaktor		k_7	[-]	1,0								
Steel failure with lever arm												
Characteristic bending resistance	property class 4.6	$M^0_{Rk,s}$	[Nm]	6,1	15		30		52		133	259
	property class 4.8											
	property class 5.6			7,6	19		37		65		166	324
	property class 5.8											
	property class 8.8			12	30		59	60	105		266	519
Partial factor	property class 4.6	γ_{Ms} [1]	[-]	1,67								
	property class 5.6											
	property class 4.8			1,25								
	property class 5.8											
	property class 8.8											
Factor of ductility		k_7	[-]	1,0								
Concrete pry-out failure												
Pry-out factor		k_8	[-]	1,0					1,5	2,0		
Concrete edge failure												
Effective length of fastener in shear loading		l_f	[mm]	30	30	40	30	40	50	80	65 80 [2]	80
Outside diameter of fastener		d_{nom}	[mm]	8	10		12		15		20	25

[1] in absence of other national regulations
[2] for M16x80

Drop-in Anchor E / ES

Performance
Characteristic values for **shear loads, zinc plated steel**

Annex C3

Deutsches Institut für Bautechnik DIBt

Table C4: Characteristic values for **shear loads, stainless steel A4, HCR**

Anchor size			M6x30	M8x30	M8x40	M10x40	M12x50	M12x80	M16x65	M16x80	M20x80
Steel failure without lever arm											
Characteristic resistance (property class 70)	$V^0_{Rk,s}$	[kN]	7,0	10,6		13,4	25,1		41,9		66,5
Characteristic resistance (property class 80)	$V^0_{Rk,s}$	[kN]	8,7	10,6		13,4	25,1		41,9		66,5
Partial factor	γ_{Ms} [1)]	[-]	1,56								
Factor of ductility	k_7	[-]	1,0								
Steel failure with lever arm											
Characteristic bending resistance (property class 70)	$M^0_{Rk,s}$	[Nm]	11	26		52	92		233		454
Partial factor	γ_{Ms} [1)]	[-]	1,56								
Characteristic bending resistance (property class 80)	$M^0_{Rk,s}$	[Nm]	12	30		60	105		266		519
Partial factor	γ_{Ms} [1)]	[-]	1,33								
Factor of ductility	k_7	[-]	1,0								
Concrete pry-out failure											
Pry-out factor	k_8	[-]	1,0	1,7				2,0			
Concrete edge failure											
Effective length of fastener in shear loading	l_f	[mm]	30	30	40	40	50	80	65	80	80
Outside diameter of fastener	d_{nom}	[mm]	8	10		12	15		20		25

[1)] in absence of other national regulations

Drop-in Anchor E / ES

Performance
Characteristic values for **shear loads, stainless steel A4, HCR**

Annex C4

Deutsches Institut für Bautechnik DIBt

Table C5: Displacements under tension loads

Anchor size			M6x30	M8x30	M8x40	M10x30	M10x40	M12x50 M12x80	M16x65 M16x80	M20x80
Steel, zinc plated										
Tension load in uncracked concrete	N	[kN]	3	3	3,6	3,3	4,8	6,4	10	14,8
Displacements	δ_{N0}	[mm]	0,24							
	$\delta_{N\infty}$	[mm]	0,36							
Stainless steel A4 / HCR										
Tension load in uncracked concrete	N	[kN]	4	4	4,3	- [1)]	6,1	8,5	12,6	17,2
Displacements	δ_{N0}	[mm]	0,12							
	$\delta_{N\infty}$	[mm]	0,24							

[1)] Anchor version is not part of the ETA

Table C6: Displacements under shear loads

Anchor size			M6x30	M8x30	M8x40	M10x30	M10x40	M12x50 M12x80	M16x65 M16x80	M20x80
Steel, zinc plated										
Shear load in uncracked concrete	V	[kN]	2	4	4	5,7	4,0	11,3	18,8	32,2
Displacements	δ_{V0}	[mm]	0,9	0,9	1,0	1,5	0,6	1,2	1,2	1,6
	$\delta_{V\infty}$	[mm]	1,3	1,3	1,5	2,3	0,9	1,9	1,9	2,4
Stainless steel A4 / HCR										
Shear load in uncracked concrete	V	[kN]	3,5	5,2	5,2	- [1)]	6,5	11,5	19,2	30,4
Displacements	δ_{V0}	[mm]	1,9	1,1	0,7	- [1)]	1,0	1,7	2,4	2,6
	$\delta_{V\infty}$	[mm]	2,8	1,6	1,0	- [1)]	1,5	2,6	3,6	3,8

[1)] Anchor version is not part of the ETA

Drop-in Anchor E / ES

Performance
Displacements

Annex C5