Deutsches Institut für Bautechnik

DIBt

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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-12/0142 of 7 November 2018

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	Apolo MEA Quick fix anchor BA plus
Product family to which the construction product belongs	Mechanical fasteners for use in concrete
Manufacturer	Apolo MEA Befestigungssysteme GmbH Industriestraße 6 86551 Aichach DEUTSCHLAND
Manufacturing plant	Plant 11 Plant 12
This European Technical Assessment contains	11 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 330232-00-0601
This version replaces	ETA-12/0142 issued on 8 February 2016

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Specific Part

1 Technical description of the product

The Apolo MEA Quick fix anchor BA plus is an anchor of sizes M6, M8, M10, M12, M16 and M20 made of galvanised steel which is placed into a drilled hole and anchored by torque-controlled expansion.

Product and 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)	See Annex C 1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C 2
Displacements (static and quasi-static loading)	See Annex C 1 and C 2
Characteristic resistance and displacements for seismic performance categories 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

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

In accordance with European Assessment Document 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 7 November 2018 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Tempel

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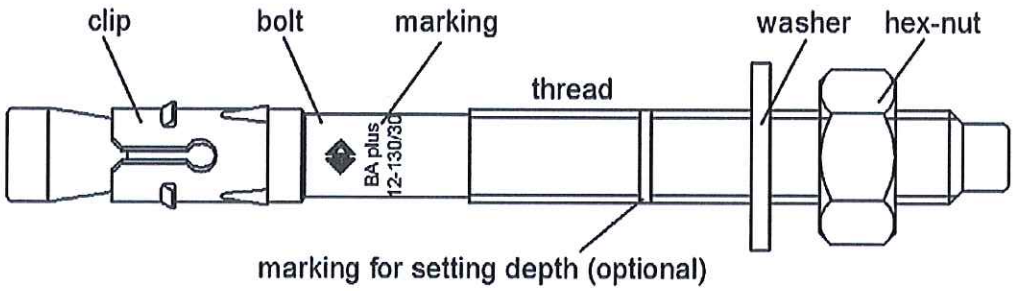
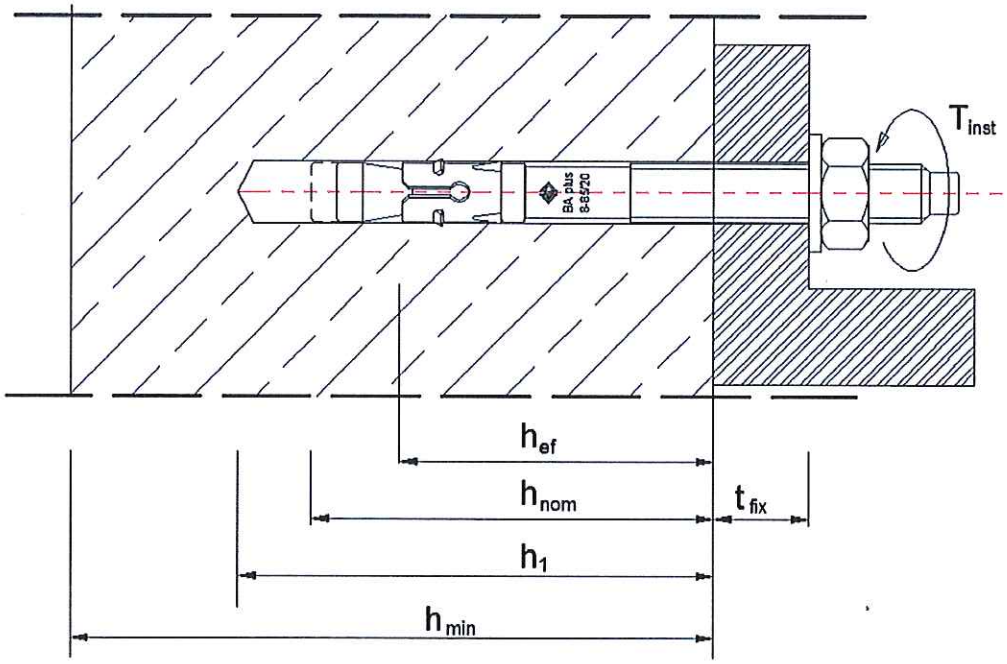
Apolo MEA Quick fix anchor BA plus (assembling)



Marking:	brand marking	Logo or company name
	Type	BA plus
	Size	M ... (i.e. M12)
	Length	L (i.e. 130)
	Max. thickness of fixture	t_{fix} (i.e. 30)

Example: BA plus 12-130/30

Apolo MEA Quick fix anchor BA plus (after installation)



h_{nom} = setting depth
h_1 = depth of drill hole (deepest point)
h_{min} = min. thickness of concrete member
t_{fix} = thickness of fixture
h_{ef} = effective anchorage depth

Apolo MEA Quick fix anchor BA plus	Annex A1
Product description Marking and installed condition	

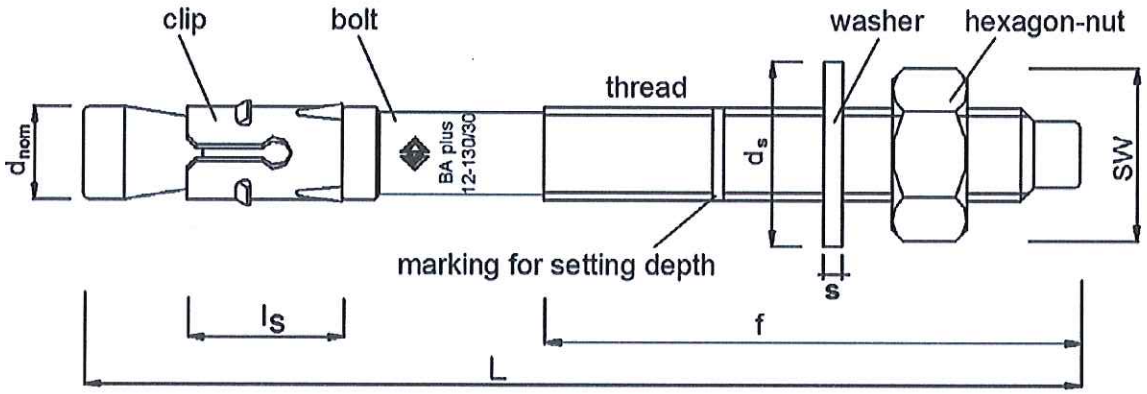


Table 1: Designation, materials and strength

Designation	material	strength
bolt	cold form steel or free cutting steel	M6: $f_{uk} \geq 900$ N/mm², $f_{yk} \geq 720$ N/mm² M8: $f_{uk} \geq 750$ N/mm², $f_{yk} \geq 650$ N/mm² M10: $f_{uk} \geq 670$ N/mm², $f_{yk} \geq 540$ N/mm² M12: $f_{uk} \geq 630$ N/mm², $f_{yk} \geq 500$ N/mm² M16: $f_{uk} \geq 600$ N/mm², $f_{yk} \geq 510$ N/mm² M20: $f_{uk} \geq 510$ N/mm², $f_{yk} \geq 410$ N/mm²
clip	cold steel strip acc. EN 10130, C490, C1035/C1045	≥ 128 HV 10 or HV 1
washer	cold steel strip	≥ 140 HV 10 or HV 1
nut	Steel, size acc. DIN 934 or EN 4032	class 8 (DIN EN ISO 898-2)

all parts zinc plated and blue passivated ≥ 5 µm acc. EN ISO 4042

Table 2: Dimensions

anchor		bolt			clip	washer		hex-nut
		length overall	length overall	bolt-Ø	length	thickness	outer-Ø	Wrench size
type	size	L	f	d_{nom}	l_s	s	d_s	SW
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
BA plus	**M6**	55 - 150	acc. drawing	6	13,3	≥ 1,4	≥ 12	10
BA plus	**M8**	65 - 365	acc. drawing	8	13,5	≥ 1,4	≥ 16	13
BA plus	**M10**	75 - 375	acc. drawing	10	20,5	≥ 1,7	≥ 19	17
BA plus	**M12**	100 - 500	acc. drawing	12	20,0	≥ 2,2	≥ 23	19
BA plus	**M16**	120 - 615	acc. drawing	16	24,0	≥ 2,7	≥ 29	24
BA plus	**M20**	160 - 640	acc. drawing	20	28,8	≥ 2,7	≥ 35	30

Apolo MEA Quick fix anchor BA plus	Annex A2
Product description Designation, materials and anchor dimensions	

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Specification of intended use

Anchorages subject to:
- Static and quasi-static loads.

Base materials:
- Reinforced or unreinforced normal weight concrete without fibres according to EN 206:2013.
- Strength classes C20/25 to C50/60 according to EN 206:2013.
- Uncracked concrete.

Use conditions (Environmental conditions):
- Structures subject to dry internal conditions.

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.).
- Anchorages under static or quasi-static actions are designed in accordance with FprEN 1992-4:2017 and EOTA Technical Report TR 055

Installation:
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters of the site.
- Anchor installation in accordance with the manufacturer's specifications and drawings and using the appropriate tools.
- Hole drilling by hammer drilling only.
- Positioning of the drill holes without damaging the reinforcement.

Apolo MEA Quick fix anchor BA plus	Annex B1
Intended use Specification	

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Table 3: Installation data

Apolo MEA Quick fix anchor BA plus			size M6	size M8	size M10	size M12	size M16	size M20
nominal driller diameter	d_0	[mm]	6	8	10	12	16	20
max. cutting diameter of drill bit	$d_{cut,max} \leq$	[mm]	6,40	8,45	10,45	12,50	16,50	20,55
depth of drill hole (deepest point)	$h_1 \geq$	[mm]	48	60	65	90	110	130
effective anchorage depth	$h_{ef} \geq$	[mm]	35	45	50	70	85	100
setting depth	$h_{nom} \geq$	[mm]	40	54	59	84	99	114
diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	9	12	14	18	22
thickness of fixture	$t_{fix,min...max}$	[mm]	0...100	0...300	0...300	0...400	0...500	0...500
wrench size of the nut	SW	[mm]	10	13	17	19	24	30
Required installation torque moment	T_{inst}	[Nm]	8	15	30	50	110	180

Table 4: Minimum thickness of concrete member, min. spacing and edge distance

Apolo MEA Quick fix anchor BA plus			size M6	size M8	size M10	size M12	size M16	size M20
minimum thickness of member	h_{min}	[mm]	100	100	120	160	200	200
minimum spacing	s_{min}	[mm]	50	50	120	70	100	160
minimum edge distance	c_{min}	[mm]	50	50	90	90	100	150

Apolo MEA Quick fix anchor BA plus	Annex B2
Intended use Installation data, minimum thickness, min. spacing and edge distance	

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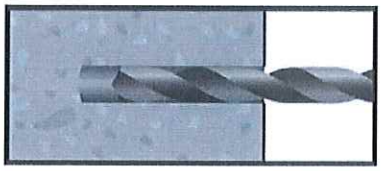
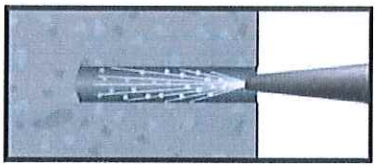
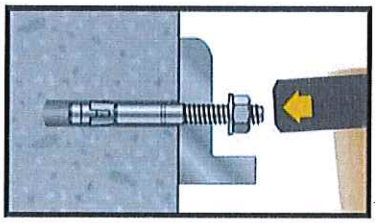
Installation instruction of the Apolo MEA quick fix anchor BA plus



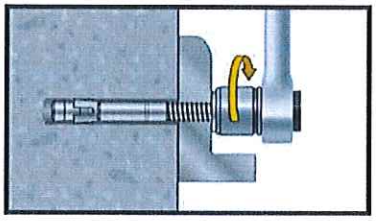
1. Drill the hole with a hammer drill



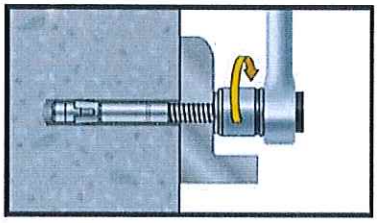
2. Clean the borehole



3. Hammer in the anchor (consider the defined setting depth)



4. Apply the required installation torque T_{inst} by using a torque wrench



5. After installation

Apolo MEA Quick fix anchor BA plus	Annex B3
Intended use Installation instruction	

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Table 5: Design method A - Characteristic values for tension loads

Apolo MEA Quick fix anchor BA plus			size M6	size M8	size M10	size M12	size M16	size M20
Steel failure								
characteristic resistance	$N_{Rk,s}$	[kN]	12,1	17,2	27,5	40,0	70,0	109,3
partial safety factor	γ_{Ms}	[-]	1,5	1,4	1,49	1,51	1,41	1,5
Pull out failure								
characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	17	16	24	32	50
increasing factors for $N_{Rk,p}$	Ψ_c	C25/30	1,10	1,00	1,10	1,08	1,10	1,10
		C30/37	1,22	1,00	1,22	1,16	1,22	1,22
		C40/50	1,41	1,00	1,41	1,28	1,41	1,41
		C50/60	1,58	1,00	1,58	1,39	1,58	1,58
installation factor	γ_{inst}	[-]	1,0	1,0	1,0	1,0	1,2	1,2
Concrete cone failure								
effective anchorage depth	h_{ef}	[mm]	35	45	50	70	85	100
factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0					
spacing	$s_{cr,N}$	[mm]	3 h_{ef}					
edge distance	$c_{cr,N}$	[mm]	1,5 h_{ef}					
installation factor	γ_{inst}	[-]	1,0	1,0	1,0	1,0	1,2	1,2
Concrete splitting failure								
spacing (splitting)	$s_{cr,sp}$	[mm]	190	190	240	390	400	400
edge distance (splitting)	$c_{cr,sp}$	[mm]	95	100	120	125	160	225
installation factor	γ_{inst}	[-]	1,0	1,0	1,0	1,0	1,2	1,2

Table 6: Displacements under tension loads

Apolo MEA Quick fix anchor BA plus			size M6	size M8	size M10	size M12	size M16	size M20
tension load	N	[kN]	3,6	8,1	6,3	11,4	12,7	21,5
displacements	δ_{N0}	[mm]	0,2	1,2	1,3	1,3	0,7	0,4
displacements	$\delta_{N\infty}$	[mm]	0,6	1,6	1,9	1,6	1,6	1,5

Apolo MEA Quick fix anchor BA plus	Annex C1
Performances Characteristic values of tension load resistance, displacement	

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Table 7: Design method A - Characteristic values for shear loads

Apolo MEA Quick fix anchor BA plus			size M6	size M8	size M10	size M12	size M16	size M20
Steel failure with or without lever arm								
characteristic shear load resistance	$V_{Rk,s}$	[kN]	6,4	13,7	19,4	16,8	30,6	50,5
characteristic bending moment	$M^0_{Rk,s}$	[Nm]	9,8	28,1	50,1	82,6	199,8	267,5
factor	k_7	[-]	1,0	1,0	1,0	1,0	1,0	1,0
partial safety factor	γ_{Ms}	[-]	1,5	1,5	1,5	1,26	1,5	1,5
Concrete pryout failure								
factor for pry out failure	k_8	[-]	1,0	1,0	1,0	2,0	2,0	2,0
installation factor	γ_{inst}	[-]	1,0					
Concrete edge failure								
effective length of anchor under shear load	l_f	[mm]	35	45	50	70	85	100
effective external diameter of anchor	d_{nom}	[mm]	6	8	10	12	16	20
installation factor	γ_{inst}	[-]	1,0					

Table 8: Displacements under shear loads

Apolo MEA Quick fix anchor BA plus			size M6	size M8	size M10	size M12	size M16	size M20
shear load	V	[kN]	3,1	6,5	9,2	9,6	14,8	24,0
displacements	δ_{V0}	[mm]	0,7	0,9	1,9	0,8	1,5	1,0
displacements	$\delta_{V\infty}$	[mm]	1,1	1,4	2,9	1,2	2,3	1,5

Apolo MEA Quick fix anchor BA plus	Annex C2
Performances Characteristic values of shear load resistance, displacement	