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European Technical Assessment Body  
for construction products



## European Technical Assessment

ETA-12/0142  
of 25 November 2024

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

CELO bolt anchor BA plus, BA plus HD, BA plus A2, BA plus A4

Product family to which the construction product belongs

Mechanical fasteners for use in concrete

Manufacturer

CELO Befestigungssysteme GmbH  
Industriestraße 6  
86551 Aichach  
DEUTSCHLAND

Manufacturing plant

Plant 11

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 330232-01-0601, Edition 05/2021

This version replaces

ETA-12/0142 issued on 18 May 2021

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## Specific Part

### 1 Technical description of the product

The CELO bolt anchor BA plus is an anchor of sizes M6, M8, M10, M12, M16 and M20 made of electroplated carbon steel (BA plus), hot dip galvanized carbon steel (BA plus HD), stainless steel A2 (BA plus A2) or stainless steel A4 (BA plus A4) 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 to tension load (static and quasi-static loading)	See Annex B2 and C1
Characteristic resistance to shear load (static and quasi-static loading)	See Annex C2
Displacements (static and quasi-static loading)	See Annex C1 and C2
Characteristic resistance for seismic performance categorie C1	No performance assessed
Characteristic resistance and displacements for seismic performance categorie 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 European Assessment Document EAD No. 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 European Assessment Document**

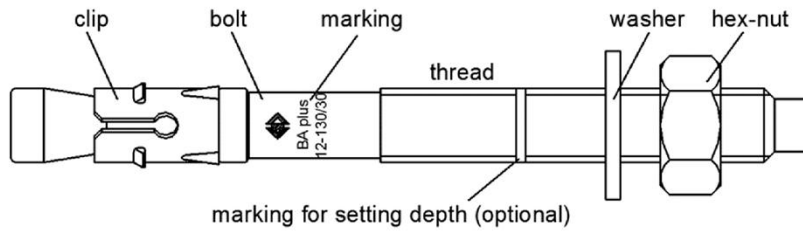
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 25 November 2024 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock  
Head of Section

*beglaubigt:*  
Tempel

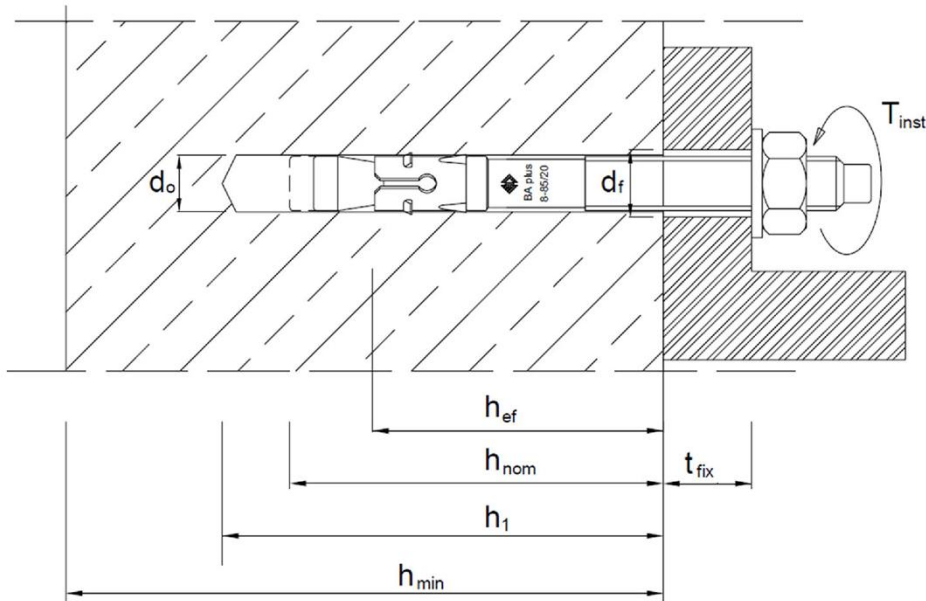
### CELO bolt anchor BA plus (assembling)



Marking:	brand marking	Logo or company name
	Type BA Plus electroplated	BA plus
	Type BA Plus hot dipped galvanized	BA plus HD
	Type BA Plus stainless steel	BA plus A2 or BA plus A4
	Size	M ... (e.g. M12)
	Length	L (e.g. 130)
	Max. thickness of fixture	$t_{fix}$ (e.g. 30)

Examples: BA plus 12-130/30 BA plus HD 12-130/30 BA plus A2 12-130/30

### CELO bolt anchor BA plus (after installation)

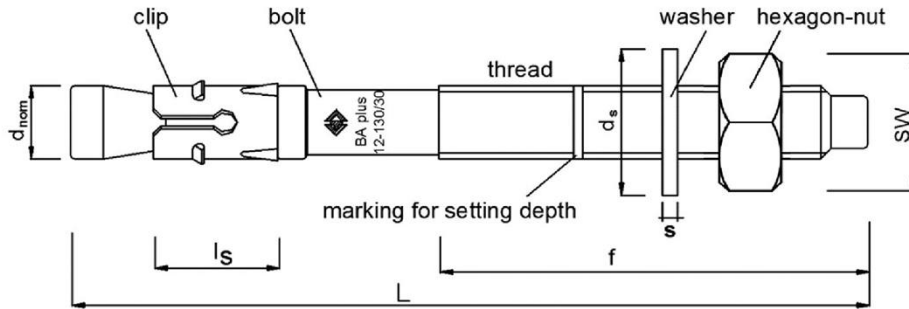


$h_{nom}$	=	setting depth
$h_1$	=	depth of drill hole (deepest point)
$h_{min}$	=	min. thickness of concrete member
$t_{fix}$	=	thickness of fixture
$h_{ef}$	=	effective anchorage depth
$d_o$	=	nominal drill hole diameter
$d_f$	=	diameter of clearance hole in the fixture

CELO bolt anchor BA plus

**Product description**  
Marking and installed condition

Annex A1



**Table 2.1: Designation and materials for carbon steel versions BA plus and BA plus HD**

Designation	Material <sup>1) 2)</sup>
Bolt	Cold formed wire rod or free cutting carbon steel
Clip	Coated cold formed carbon steel strip acc. EN 10130:2006 or stainless steel strip
Washer	Carbon steel
Nut	Carbon steel, property class 8

<sup>1)</sup> BA plus: all parts are electroplated and blue passivated  $\geq 5 \mu\text{m}$  acc. EN ISO 4042:2022

<sup>2)</sup> BA plus HD: bolt, washer and nut are hot dipped galvanized  $\geq 50 \mu\text{m}$  acc. EN ISO 10684:2004+AC:2009

**Table 2.2: Designations and materials for stainless steel versions BA plus A2 / A4**

Designation	Material <sup>3) 4)</sup>
Bolt	Cold formed or free cutting stainless steel
Clip	Stainless steel A2 strip
Washer	Stainless steel
Nut	Stainless steel, property class 70 or 80

<sup>3)</sup> BA plus A2: CRC II acc. EN 1993-1-4:2006+A1:2015. All parts are made of stainless steel A2

<sup>4)</sup> BA plus A4: CRC III acc. EN 1993-1-4:2006+A1:2015. Bolt, washer, nut are made of stainless steel A4

**Table 2.3: Dimensions**

anchor	size	bolt			clip	washer		hex-nut
		length overall	length of thread	bolt- $\phi$	length of clip	thickness	outer- $\phi$	Wrench size
type	size	L	f	d <sub>nom</sub>	l <sub>s</sub>	s	d <sub>s</sub>	SW
		[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
BA plus	M6	55 - 150	acc. drawing	6	13,3	$\geq 1,4$	$\geq 12$	10
BA plus	M8	65 - 365	acc. drawing	8	13,5	$\geq 1,4$	$\geq 16$	13
BA plus	M10	75 - 375	acc. drawing	10	20,5	$\geq 1,7$	$\geq 19$	17
BA plus	M12	100 - 500	acc. drawing	12	20,0	$\geq 2,2$	$\geq 23$	19
BA plus	M16	120 - 615	acc. drawing	16	24,0	$\geq 2,7$	$\geq 29$	24
BA plus	M20	160 - 640	acc. drawing	20	28,8	$\geq 2,7$	$\geq 35$	30

CELO bolt anchor BA plus

**Product description**  
Designation, materials and anchor dimensions

Annex A2

### Specification of intended use

#### **Anchorage 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.
- Strength classes C20/25 to C50/60 according to EN 206:2013+A1:2016.
- Uncracked concrete.

#### **Use conditions (Environmental conditions):**

- All BA plus types:  
Structures subject to dry internal conditions.
- BA plus A2 or A4:  
BA plus A2: CRC II acc. EN 1993-1-4:2006+A1:2015  
BA plus A4: CRC III acc. EN 1993-1-4:2006+A1:2015  
corresponding to corrosion resistance classes Annex A, Table A3 for stainless steel of this norm

#### **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 EN 1992-4:2018 and EOTA Technical Report TR 055, Edition February 2018

#### **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.

CELO bolt anchor BA plus

**Intended use**  
Specification

Annex B1



**Table 3: Installation data**

CELO bolt anchor BA plus (all types)			size	size	size	size	size	size
			M6	M8	M10	M12	M16	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	$T_{inst}$	[Nm]	8	15	30	50	110	180

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

CELO bolt anchor BA plus (all types)			size	size	size	size	size	size
			M6	M8	M10	M12	M16	M20
minimum thickness of concrete 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

CELO bolt anchor BA plus

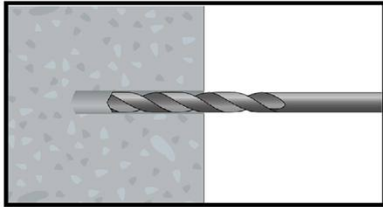
**Intended use**

Installation data, minimum thickness, min. spacing and edge distance

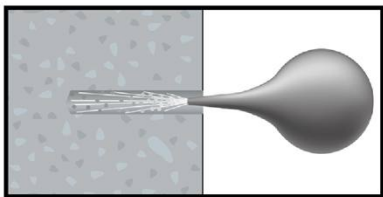
Annex B2



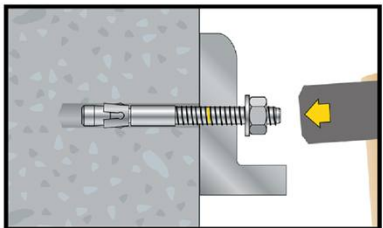
### Installation instruction of the CELO bolt anchor BA plus



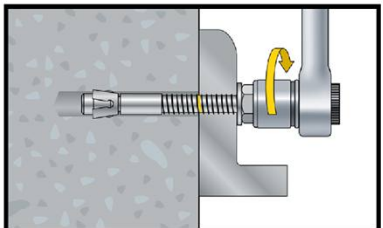
1. Drill the hole with a hammer drill



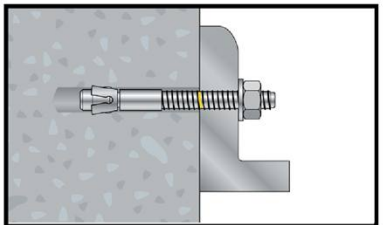
2. Clean the hole



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

CELO bolt anchor BA plus

**Intended use**  
Installation instruction

Annex B3

**Table 5: Characteristic resistance under tension loads**

CELO bolt anchor BA plus			size	size	size	size	size	size
			M6*	M8	M10	M12	M16	M20*
<b>Steel failure for carbon steel (zinc plated or HD)</b>								
characteristic resistance	$N_{Rk,s}$	[kN]	11,9	18,8	27,7	39,6	69,6	107,1
partial safety factor	$\gamma_{Ms}$	[-]	1,5					
<b>Steel failure for stainless steel (A2 or A4)</b>								
characteristic resistance	$N_{Rk,s}$	[kN]	-*	17,5	28,9	44,0	81,2	-*
partial safety factor	$\gamma_{Ms}$	[-]	1,87					
<b>Pull out failure</b>								
characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	7,5	$\geq N_{Rk,c}^{**}$	16	24	32	50
increasing factors for $N_{Rk,p}$ $N_{Rk,p} = N_{Rk,p(C20/25)} * \psi_c$	$\psi_c$	C25/30	1,10	1,10	1,10	1,08	1,10	1,10
		C30/37	1,22	1,22	1,22	1,16	1,22	1,22
		C40/50	1,41	1,41	1,41	1,28	1,41	1,41
		C50/60	1,58	1,58	1,58	1,39	1,58	1,58
installation factor	$\gamma_{inst}$	[-]	1,0				1,2	
<b>Concrete cone failure</b>								
effective anchorage depth	$h_{ef}$	[mm]	35	45	50	70	85	100
factor for uncracked concrete	$k_{ucr,N}$	[-]	11,0					
factor for cracked concrete	$k_{cr,N}$	[-]	No performance assessed					
spacing	$s_{cr,N}$	[mm]	3 $h_{ef}$					
edge distance	$c_{cr,N}$	[mm]	1,5 $h_{ef}$					
installation factor	$\gamma_{inst}$	[-]	1,0				1,2	
<b>Concrete splitting failure</b>								
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,sp}^0$	[kN]	min ( $N_{Rk,p}$ ; $N_{Rk,c}^0$ )					
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	$\gamma_{inst}$	[-]	1,0				1,2	

\* M6 and M20: not applicable for HD and A2 or A4 versions

\*\*  $N_{Rk,c}^0$  according to EN 1992-4:2018

**Table 6: Displacements under tension loads**

CELO bolt anchor BA plus			size	size	size	size	size	size
			M6*	M8	M10	M12	M16	M20*
tension load	N	[kN]	3,6	7,1	7,6	11,4	12,7	19,5
displacements	$\delta_{N0}$	[mm]	0,2	0,2	1,3	1,3	0,7	0,4
displacements	$\delta_{N\infty}$	[mm]	0,6	0,6	1,9	1,6	1,6	1,5

CELO bolt anchor BA plus

**Performances**

Characteristic values under tension load, displacement

Annex C1

**Table 7: Characteristic resistance under shear loads**

CELO bolt anchor BA plus			size	size	size	size	size	size
			M6*	M8	M10	M12	M16	M20*
<b>Steel failure with or without lever arm for carbon steel (zinc plated or HD)</b>								
characteristic resistance	$V_{RK,S}^0$	[kN]	5,4	12,8	21,4	27,2	50,0	62,8
characteristic bending moment	$M_{RK,S}^0$	[Nm]	10,7	26,2	50,1	82,6	191,5	331,0
factor	$k_7$	[-]	1,0					
partial safety factor	$\gamma_{Ms}$	[-]	1,25					
<b>Steel failure with or without lever arm for stainless steel (A2 or A4)</b>								
characteristic resistance	$V_{RK,S}^0$	[kN]	-*	12,8	20,3	29,5	55,0	-*
characteristic bending moment	$M_{RK,S}^0$	[Nm]	-*	26,2	52,3	91,7	233,1	-*
factor	$k_7$	[-]	-*	1,0	1,0	1,0	1,0	-*
partial safety factor	$\gamma_{Ms}$	[-]	1,56					
<b>Concrete pryout failure</b>								
factor for pry out failure	$k_8$	[-]	1,0			2,0		
installation factor	$\gamma_{inst}$	[-]	1,0					
<b>Concrete edge failure</b>								
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	$\gamma_{inst}$	[-]	1,0					

\* M6 and M20: not applicable for HD and A2 or A4 versions

**Table 8: Displacements under shear loads**

CELO bolt anchor BA plus			size	size	size	size	size	size
			M6*	M8	M10	M12	M16	M20*
shear load	$V$	[kN]	3,1	7,9	12,2	15,5	28,6	36,1
displacements	$\delta_{V_0}$	[mm]	1,3	1,1	1,1	1,6	1,8	1,8
displacements	$\delta_{V_\infty}$	[mm]	1,9	1,6	1,7	2,3	2,7	2,7

\* M6 and M20: not applicable for HD and A2 or A4 versions

CELO bolt anchor BA plus	Annex C2
<b>Performances</b> Characteristic values under shear load, displacement	