Deutsches Institut für Bautechnik

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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-19/0332 of 10 July 2019

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	CLR Inox A4
Product family to which the construction product belongs	Mechanical fasteners for use in concrete
Manufacturer	Friulsider S.p.A. Via Trieste 1 33048 SAN. GIOVANNI AL NATISONE ITALIEN
Manufacturing plant	Plant 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	EAD 330232-00-0601

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Specific Part

1 Technical description of the product

The Betofast EVO II is an anchor made of galvanized or stainless steel in of sizes 8, 10 and 12. The anchor is screwed into a predrilled cylindrical drill hole. The special thread of the anchor cuts an internal thread into the member while setting. The anchorage is characterised by mechanical interlock in the special thread.

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 concrete screw 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 concrete screw 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 3
Characteristic resistance and displacements for seismic performance categories C1 and C2	No performance assessed
Durability	See Annex B 1

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Class A1
Resistance to fire	See Annex C 4 and C 5

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.

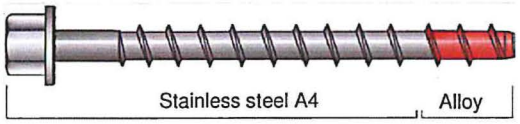
Issued in Berlin on 10 July 2019 by Deutsches Institut für Bautechnik

Dr.-Ing. Lars Eckfeldt
p.p. Head of Department

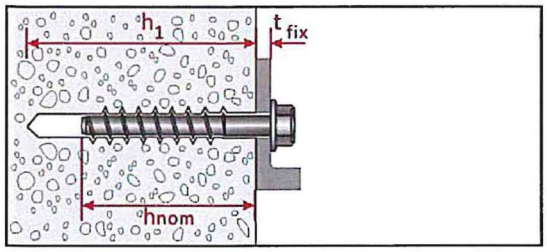
beglaubigt:
Baderschneider

Deutsches Institut für Bautechnik DIBt

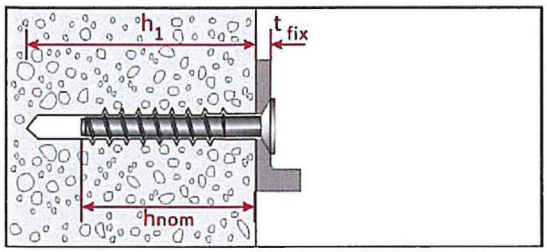
Product in the installed condition



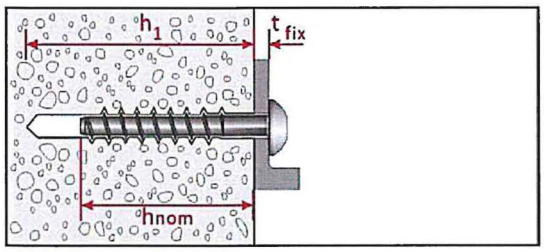
Stainless steel A4



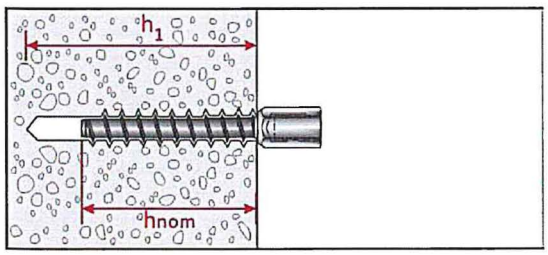
Hexagon Head : H, HF
A4 (8, 10, 12)



Countersunk Head : CS
A4 (8, 10)



Pan Head : PH
A4 (8, 10)



Hanger Bolt : HB
A4 (10-M12)

CLR Inox A4	Annex A1
Product description Installed condition	

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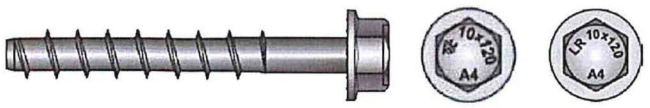
Table A1: Materials and screw types

Name	Material

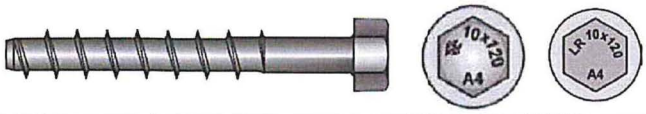
Screw fastener

Head marking	material
LR A4	Stainless steel 1.4401, 1.4404 (both A4)

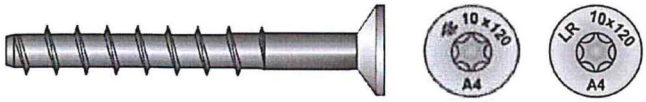
Anchor size / head types			8		10		12
			-H -HF	-CS -PH	-H -HF -HB	-CS -PH	-H -HF -CS -PH
Material			A4		A4		A4
Characteristic yield strength	f_{yk}	N/mm²	640	432	640	432	640
Characteristic tensile strength	f_{uk}	N/mm²	800	540	800	540	800
Elongation at rupture	As	[%]	≤ 8				



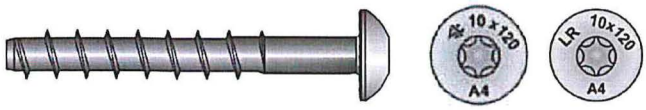
Hexagon washer head
1) H A4 size 8,10,12 (stainless A4)



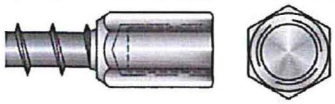
Hexagon washer head
2) HF A4 size 8,10,12 (stainless A4)



Countersunk head
3) CS A4 size 8,10 (stainless A4)



Pan head
4) PH A4 size 8,10 (stainless A4)



Hanger Bolt head
5) HB A4 size 10 with M12 internal thread (stainless A4)

CLR Inox A4	Annex A2
Product description Materials and screw types	

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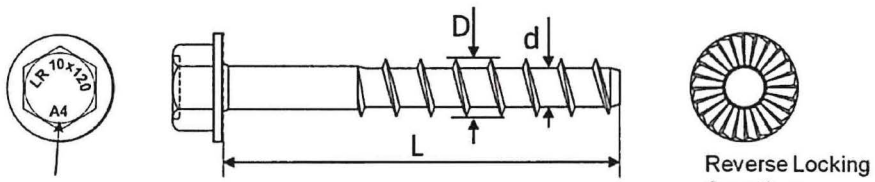
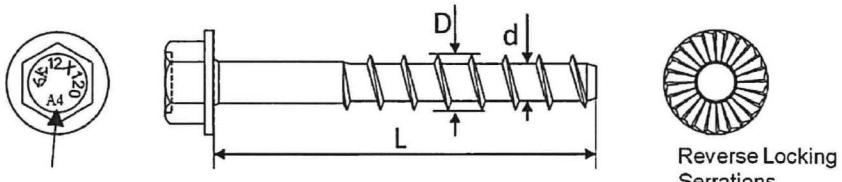
Table A2: Dimensions and markings

Fastener size			8		10		12
Head type			H, HF, PH	CS	H, HF, PH, HB	CS	H, HF
Material			A4	A4	A4	A4	A4
Embedment depth	h_{nom}	[mm]	85	85	100	100	120
Length of fastener	min L	[mm]	90	95	105	110	125
	max L	[mm]	150		150		150
Thread diameter	D	[mm]	9,9		12,5		14,3
Shaft diameter	d	[mm]	7,4		9,4		11,3
Thread pitch	p	[mm]	5,8		7,7		8,1



Head marking:
Identifying mark of producer: LR
Nominal size: e.g. 12mm
Length L: 120mm
Material: A4

or



Head marking:
Identifying mark of producer: SK
Nominal size: e.g. 12mm
Length L: 120mm
Material: A4

CLR Inox A4	Annex A3
Product description Dimensions and markings	

Specifications of Intended use

Anchorages subject to:

- Static and quasi-static loads: All sizes.
- Fire exposure: All sizes

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 or cracked concrete: all sizes.

Use conditions (Environmental conditions)

- Anchorages subject to dry internal conditions. (zinc plated steel and stainless steel)
- Anchorages subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions 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 or 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 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 are designed in accordance with EN 1992-4:2018 and Technical Report TR 055, February 2018.

Installation:

- Hammer drilling only.
- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- In case of aborted hole: new drilling at a minimum distance away of twice the depth of the aborted hole or smaller distance if the aborted hole is filled with high strength mortar and if under shear or oblique tension load it is not the direction of the load application.
- After installation further turning of the anchor shall not be possible.
- The head of the anchor must be fully engaged on the fixture and show no signs of damage.

CLR Inox A4	Annex B1
Intended Use Specifications	

Table B1: Installation parameters

Fastener size			8			10				12
Head type			**H HF**	**CS**	**PH**	**H HF**	**HB**	**CS**	**PH**	**H HF**
Material			**Stainless A4**							
Diameter of drill bit	d_0	[mm]	8			10				12
Embedment depth	h_{nom}	[mm]	85			100				120
Min. hole depth in concrete	$h_1 \geq$	[mm]	95			110				130
Effective embedment depth	h_{ef}	[mm]	51,9			58,7				75,6
Clearance hole	d_f	[mm]	11			13				15
Thickness of fixture	t_{fix}	[mm]	5-65	10-65	5-65	5-50	5-50	10-50	5-50	5-30
Installation torque	T_{inst}	[Nm]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]	-[1)]
Wrench size (types: H, HF, HB)	WS	[mm]	13	-	-	17	19	-	-	19
Torx size (types: CS, PH)	TX	-	-	45		-	-	50		-
Max. torque moment, machine setting	$T_{max} \leq$	[Nm]	120	120	120	185	185	185	185	185

[1)] For the installation of the C and B head types only impact screw driver can be used.

Table B2: Minimum thickness of member, Minimum spacing and edge distance

Fastener size			8	10	12
Head type			**H, HF, CS, PH**	**H, HF, CS, PH, HB**	**H,HF**
Material			**A4**	**A4**	**A4**
Minimum member thickness	h_{min}	[mm]	125	140	170
Minimum edge distance	c_{min}	[mm]	50	60	70
Minimum spacing	s_{min}	[mm]	50	60	70

CLR Inox A4

Intended Use
Installation parameters

Annex B2

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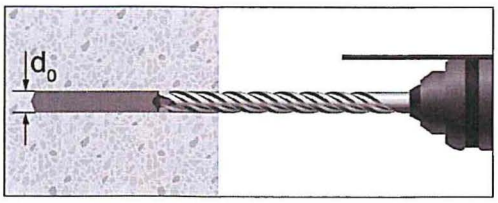
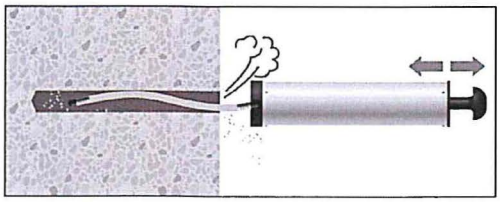
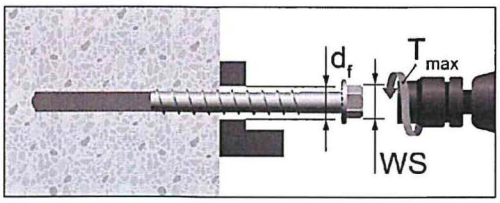
Installation instruction



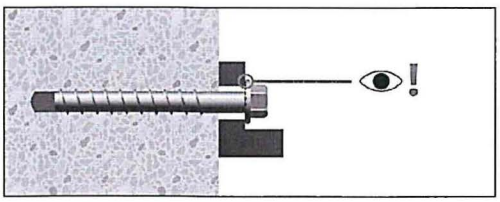
Drill the hole to the bore hole depth $\mathbf{h_1}$.



Clean the hole.



Screw in the anchor by using a torque wrench or an impact screw driver.
In case of using torque wrench: T_{inst} acc. to Table B1.
In case of using impact screw driver: T_{max} acc. to Table B1
WS= Wrench Size



Control of complete setting, full contact of screw head with fixture part.

CLR Inox A4	Annex B3
Intended Use Installation Instruction	

Table C1: Characteristic resistance under tension loading

Fastener size			**8**			**10**				**12**
Head type			**H HF**	**CS**	**PH**	**H HF**	**HB**	**CS**	**PH**	**H HF**
Material			**Stainless steel A4**							
Steel failure										
Characteristic resistance	$N_{Rk,s}$	[kN]	33,0	22,3	22,3	53,7	53,7	36,2	36,2	78,1
Partial factor	γ_{Ms} [1)]	[-]	1,5			1,5				1,5
Pull-out failure										
Characteristic resistance in cracked concrete C20/25	$N_{Rk,p}$	[kN]	4,5	4,5	4,0	7,0	7,0	7,0	7,0	12,0
Characteristic resistance in uncracked concrete C20/25	$N_{Rk,p}$	[kN]	9,0	5,5	4,0	16,0	16,0	10	7,0	25,0
Increasing factors for $N_{Rk,p}$ in cracked or uncracked concrete	ψ_c	C30/37	1,22							
		C40/50	1,41							
		C50/60	1,58							
Installation factor	γ_{inst}	[-]	1,4			1,0				1,2
Concrete cone failure										
Effective embedment depth	h_{ef}	[mm]	51,9			58,7				75,6
Characteristic edge distance	$c_{cr,N}$	[mm]	$1{,}5h_{ef}$							
Characteristic spacing	$s_{cr,N}$	[mm]	$3h_{ef}$							
Factor for cracked concrete	k_{cr}	[-]	7,7							
Factor for uncracked concrete	k_{ucr}	[-]	11,0							
Splitting failure										
Characteristic resistance in uncracked concrete C20/25	$N^0_{Rk,sp}$	[kN]	$N^0_{Rk,sp} = N_{Rk,p}$							
Characteristic edge distance for splitting	$c_{cr,sp}$	[mm]	$1{,}5h_{ef}$							
Characteristic anchor spacing for splitting	$s_{cr,sp}$	[mm]	$3h_{ef}$							

[1)] In absence of other national regulations.

CLR Inox A4	**Annex C1**
Performance Characteristic values under tension loading	

Table C2: Characteristic resistance under shear loading

Fastener size			**8**		**10**		**12**
Head type			H HF	CS PH	H HF, HB	CS PH	H HF
Material			A4		A4		A4
Setting depth	h_{nom}	[mm]	85		100		120
Effective embedment depth	h_{ef}	[mm]	51,9		58,7		75,6
Steel failure without lever arm							
Characteristic resistance	$V^0_{Rk,s}$	[kN]	16,5	11,2	26,8	18,1	39,0
Ductility factor	k_7	[-]	0,8				
Partial factor	γ_{Ms} [1)]	[-]	1,25		1,25		1,25
Steel failure with lever arm							
Characteristic resistance	$M^0_{Rk,s}$	[Nm]	35,9	24,2	74,4	50,2	130.6
Partial factor	γ_{Ms} [1)]	[-]	1,25		1,25		1,25
Concrete pryout failure							
k-factor	k_8	[-]	1,0				2,0
Partial factor	γ_{Mcp} [1)]	[-]	1,5				
Concrete edge failure							
Effective length of anchor	ℓ_f	[mm]	51,9		58,7		75,6
Outside diameter of fastener	d_{nom}	[mm]	7,25		9,24		11,15
Partial factor	γ_{Mc} [1)]	[-]	1,5				

1) In absence of other national regulations.

CLR Inox A4	**Annex C2**
Performance Characteristic values under shear loading	

Table C3: Displacements under tension loads for non-cracked and cracked concrete

Fastener size	Material	Head type	Concrete	Tension load N	Displacement	
					δ_{N0}	$\delta_{N\infty}$
[-]	[-]	[-]	[-]	[kN]	[mm]	[mm]
8	Stainless steel A4	H/HF	cracked C20/25	1,5	0,1	0,8
		CS		1,5		
		PH		1,4		
10		H/HF/HB		3,3	0,2	1,0
		CS				
		PH				
12		H/HF		4,8	0,3	1,2
8	Stainless steel A4	H/HF	uncracked C20/25	3,1	0,1	0,8
		CS		1,8		
		PH		1,4		
10		H/HF/HB		7,6	0,1	1,0
		CS		4,8		
		PH		3,3		
12		H/HF		9,9	0,3	1,2

Table C4: Displacements under shear loads for non-cracked and cracked concrete

Fastener size	Material	Head type	Concrete	Shear load V	Displacement	
					δ_{V0}	$\delta_{V\infty}$
[-]	[-]	[-]	[-]	[kN]	[mm]	[mm]
8	Stainless steel A4	H/HF	Cracked and uncracked C20/25	9,4	1,8	2,7
		CS		6,4		
		PH				
10		H/HF/HB		15,3		
		CS		10,3		
		PH				
12		H/HF		22,3		

CLR Inox A4	Annex C3
Performance Displacements under tension and shear loading	

Table C5: Characteristic tension resistance values for resistance to fire

Fastener size					8		10	12
Head type					H HF CS	PH	H HF HB CS PH	H HF CS PH
Material					A4		A4	A4
Steel failure								
Characteristic resistance	R30	$N_{Rk,s,fi}$	[kN]		0,8		1,7	2,9
	R60	$N_{Rk,s,fi}$	[kN]		0,7		1,3	2,4
	R90	$N_{Rk,s,fi}$	[kN]		0,5		1,0	2,0
	R120	$N_{Rk,s,fi}$	[kN]		0,4		0,9	1,6
Pull-out failure								
Characteristic resistance in concrete ≥ C20/25	R30 R60 R90	$N_{Rk,p,fi}$	[kN]		1,1	1,0	1,8	3,0
	R120	$N_{Rk,p,fi}$	[kN]		0,9	0,8	1,4	2,4
Concrete cone failure								
Characteristic resistance in concrete ≥ C20/25	R30 R60 R90	$N^0_{Rk,c,fi}$	[kN]		3,3		4,5	8,6
	R120	$N^0_{Rk,c,fi}$	[kN]		2,7		3,6	6,8
Effective embedment depth		h_{ef}	[mm]		51,9		58,7	75,6
Minimum member thickness		h_{min}	[mm]		125		140	170
Spacing		$s_{cr,N,fi}$	[mm]		$4h_{ef}$			
		s_{min}	[mm]		50		60	70
Edge distance		$c_{cr,N,fi}$	[mm]		$2h_{ef}$			
Fire exposure from one side only		c_{min}	[mm]		50		60	70
Fire exposure from more than one side					≥ 300 mm			

1) In absence of other national regulations.

CLR Inox A4	Annex C4
Performance Characteristic values for resistance to fire (tension)	

Table C6: Characteristic shear resistance values for resistance to fire

Fastener size				**8**	**10**	**12**
Head type				all	all	all
Material				A4	A4	A4
Steel failure without level arm						
Characteristic resistance	R30	$V_{Rk,s,fi}$	[kN]	0,8	1,7	2,9
	R60	$V_{Rk,s,fi}$	[kN]	0,7	1,3	2,4
	R90	$V_{Rk,s,fi}$	[kN]	0,5	1,0	2,0
	R120	$V_{Rk,s,fi}$	[kN]	0,4	0,9	1,6
Steel failure with level arm						
Characteristic resistance	R30	$M^0_{Rk,p,fi}$	[Nm]	0,9	2,3	4,9
	R60	$M^0_{Rk,p,fi}$	[Nm]	0,7	1,9	4,0
	R90	$M^0_{Rk,p,fi}$	[Nm]	0,5	1,5	3,3
	R120	$M^0_{Rk,p,fi}$	[Nm]	0,45	1,3	2,6
Pry-out failure						
k_8			[-]	1	1	2
Characteristic resistance	R30	$V_{Rk,cp,fi}$	[kN]	3,3	4,5	17,1
	R60					
	R90					
	R120	$V_{Rk,cp,fi}$	[kN]	2,7	3,6	13,7
Concrete edge failure						
Characteristic resistance	≤ R90	$V_{Rk,c,fi}$	[kN]	$V^0_{Rk,c,fi} = 0.25 * V^0_{Rk,c}$ [2)]		
	R120	$V_{Rk,c,fi}$	[kN]	$V^0_{Rk,c,fi} = 0.20 * V^0_{Rk,c}$ [2)]		

1) In absence of other national regulations.

2) $V^0_{Rk,c}$ = characteristic resistance for concrete edge failure in cracked concrete C20/C25 under normal temperature calculated acc. to EN 1992-4: 2018.

CLR Inox A4	**Annex C5**
Performance Characteristic values for resistance to fire (shear)	