Deutsches Institut für Bautechnik

Public-law institution jointly founded by the federal states and the Federation

European Technical Assessment Body for construction products

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European Technical Assessment ETA-24/0027 of 27 January 2025

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 concrete screw BTS6-C1
Product family to which the construction product belongs	Mechanical fasteners for use in concrete
Manufacturer	CELO Befestigungssysteme GmbH Industriestraße 6 86551 Aichach GERMANY
Manufacturing plant	CELO plants
This European Technical Assessment contains	14 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

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Specific Part

1 Technical description of the product

The CELO concrete screw BTS6-C1 is an anchor in size 6 mm made of galvanised steel. 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 characterized by mechanical interlock in the special thread.

Product and product description are 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 C4
Characteristic resistance for seismic performance categorie C1	See Annex C3
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	See Annex C3

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

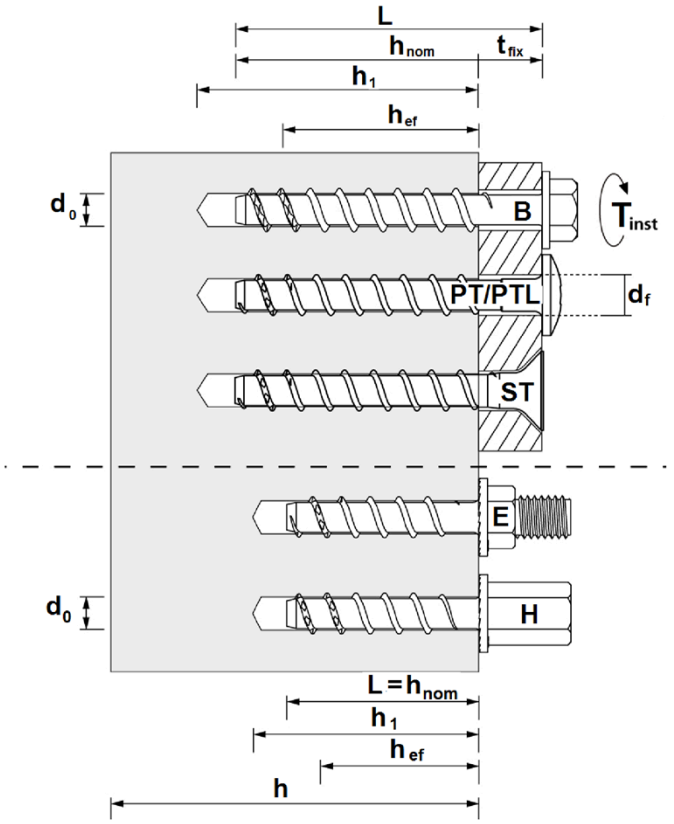
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited at Deutsches Institut für Bautechnik.

Issued in Berlin on 27 January 2025 by Deutsches Institut für Bautechnik

Dipl.-Ing. Beatrix Wittstock
Head of Section

beglaubigt:
Tempel

BTS6-C1 intended use in concrete C20/25-C50/60



h	=	thickness of member
h_1	=	depth of drill hole
h_{nom}	=	length of the anchor inside the hole
L	=	screw length
h_{ef}	=	effective anchorage depth
t_{fix}	=	thickness of fixture
T_{inst}	=	installation torque
d_o	=	nominal driller diameter
d_f	=	clearance hole diameter

CELO concrete screw BTS6-C1

Product description
Installed condition

Annex A1

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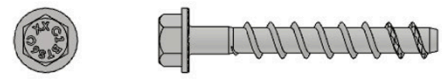
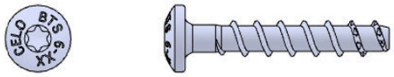
Table A2: Material and screw types

CELO concrete screw BTS6-C1			6
Nominal characteristic yield strength	f_{yk}	[N/mm²]	≥ 867
Nominal characteristic ultimate strength	f_{uk}	[N/mm²]	≥ 930
Elongation at rupture	A_5	[%]	≤ 8

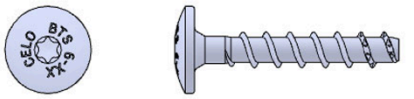
All parts carbon steel.
Coating: Grey Zn-Al flake coated or zinc plated and blue passivated ≥ 5 µm acc. EN ISO 4042



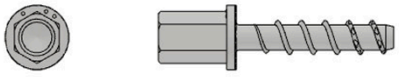
1. BTS6-C1 B or BL: Hexagonal head



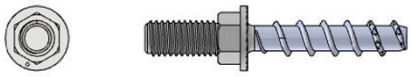
2. BTS6-C1 PT: Pan head



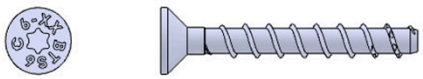
3. BTS6-C1 PTL: Pan head large



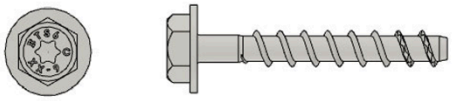
4. BTS6-C1 H: Internal thread M6, M8, and M10 or 1/4" or 3/8"



5. BTS6-C1 E: External thread M6, M8, M10 or 1/4", 5/16" or 3/8"



6. BTS6-C1 ST: Countersunk head

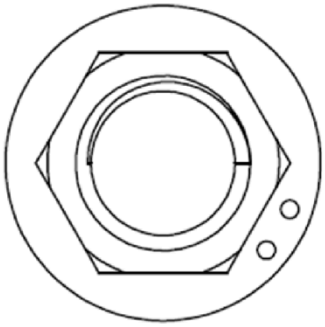


7. BTS6-C1 BT or BTL: Hexagonal head with TX-recess

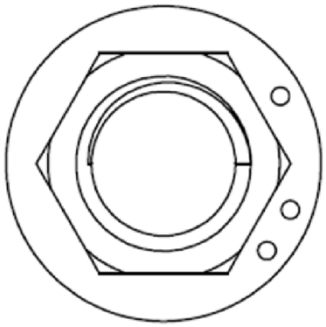
marking:	company name or logos (optional)	CELO or © or
	anchor name	BTS6 C1
	type (optional)	e.g. -B
	Diameter (optional)	6
	length	e.g. -65
Example:	**BTS6 C1 65**	

CELO concrete screw BTS6-C1	
Production description Material, screw types, marking	**Annex A2**

Marking for BTS-E and BTS-H:



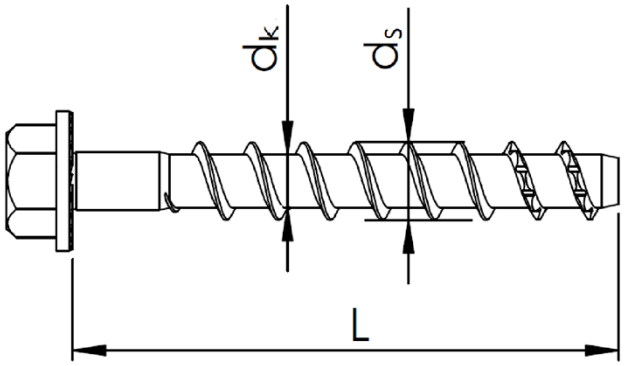
Two dots
for h_{nom} = 50mm



Three dots
for h_{nom} = 65mm

Table A3: Dimensions

CELO concrete screw BTS6-C1			**6**	
Nominal embedment depth		[mm]	h_{nom} 50	h_{nom} 65
Length	L≤	[mm]	350	
Thread outer diameter	d_s	[mm]	7,75	
Core diameter	d_k	[mm]	5,40	



CELO concrete screw BTS6-C1	
Production description Dimensions	**Annex A3**

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Specifications of Intended use

Anchorages subject to:

- static and quasi-static loads
- seismic action for performance category C1
- fire exposure

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,
- cracked and uncracked concrete.

Use conditions (Environmental conditions):

- The anchor may only be used in dry internal conditions.

Design:

- Anchorages are to be 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.).
- Design of fastenings according to EN 1992-4:2018 and EOTA Technical Report TR 055, edition February 2018.
- The design under shear load according to EN 1992-4:2018, Section 6.2.2 applies for all specified diameters d_f of clearance hole in the fixture acc. Annex B2, Table B2.1.

Installation:

- Hammer drilling only.
- Anchor installation carried out by appropriately qualified personal and under the supervision of the person responsible for technical matters of the site.
- After installation further turning of the anchor must not be possible.
- The head of the anchor is supported on the fixture and is not damaged.

CELO concrete screw BTS6-C1	
Intended use Specifications of intended use	**Annex B1**

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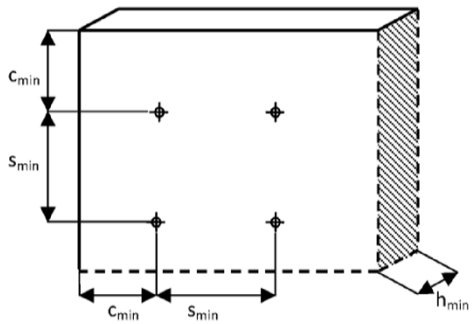
Table B2.1: Installation data

CELO concrete screw BTS6-C1			6	
Nominal anchorage depth	**h_{nom}**	**[mm]**	**50**	**65**
Nominal drill bit diameter	d_o	[mm]	6	
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	6,40	
Clearance hole diameter	$d_f \leq$	[mm]	9	
Depth of drill hole	$h_1 \geq$	[mm]	h_{nom} + 5 mm	
Distance between plug position and prestressing steel	$a_p \geq$	[mm]	50	
Effective anchorage depth	h_{ef}	[mm]	39	54
Maximum installation torque	max T_{inst}	[Nm]	15	
Max. nominal torque for installation with an impact screw driver	$T_{imp,max}$	[Nm]	150	
Wrench size (for Hex head)	SW	[mm]	10/13 [1)]	
TX recess			TX 30	
Max. thickness of fixture	t_{fix}	[mm]	115	100

[1)] SW10 or SW13 for all types with HEX head or external/internal thread

Table B2.2: Minimum thickness, spacing and edge distance in concrete

CELO concrete screw BTS6-C1			6	
Nominal anchorage depth	**h_{nom}**	**[mm]**	**50**	**65**
Minimum thickness of member	h_{min}	[mm]	100	110
Minimum spacing	s_{min}	[mm]	40	40
Minimum edge distance	c_{min}	[mm]	40	40



CELO concrete screw BTS6-C1	
Intended use Installation data, minimum thickness, spacing and edge distance	**Annex B2**

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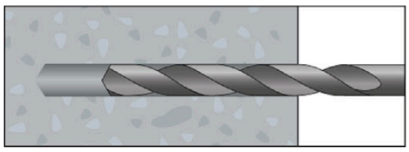
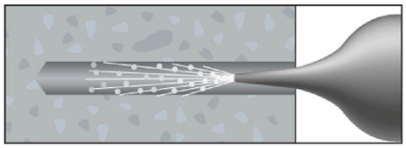
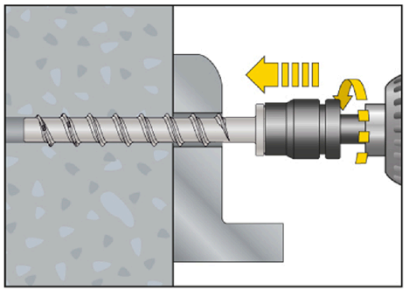
Installation instruction BTS6-C1 in concrete



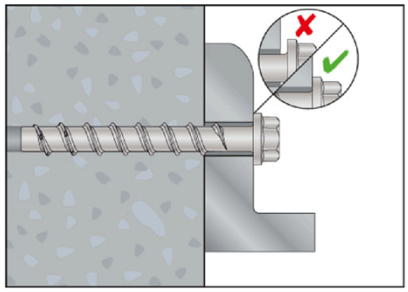
1. Drill the hole with a hammer drill



2. Clean the hole



3. Install the anchor with a torque wrench or an Impact Screw Driver using some pressure.



4. After installation
   Further turning of the anchor is not possible.

CELO concrete screw BTS6-C1	
Intended use Installation instruction	**Annex B3**

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Table C1: Characteristic tensile resistance in cracked and uncracked concrete C20/25 to C50/60. Design method A

CELO concrete screw BTS6-C1			6	
Nominal anchor depth	$h_{nom} \geq$	**[mm]**	**50**	**65**
Steel failure for tension load				
Characteristic tensile resistance	$N_{Rk,s}$	[kN]	20	20
Partial safety factor under tension load	$\gamma_{Ms,N}$	[-]	1,4	1,4
Pull out failure in uncracked concrete				
Resistance to pull out failure in uncracked concrete C20/25	$N_{Rk,p,ucr}$	[kN]	7	12
Increasing factors for $N_{Rk,p,ucr} = N_{Rk,p\ (C20/25)} \cdot \Psi_c$	Ψ_c	C30/37	1,16	1,10
		C40/50	1,32	1,19
		C50/60	1,48	1,29
Pull out failure in cracked concrete				
Resistance to pull out failure in cracked concrete C20/25	$N_{Rk,p,cr}$	[kN]	2,5	5,5
Increasing factors for $N_{Rk,p,cr} = N_{Rk,p\ (C20/25)} \cdot \Psi_c$	Ψ_c	C30/37	1,03	1,22
		C40/50	1,05	1,41
		C50/60	1,08	1,58
Concrete cone failure and splitting				
Effective embedment depth	h_{ef}	[mm]	39	54
Characteristic spacing	$s_{cr,N}$	[mm]	3 x h_{ef}	
Characteristic edge distance	$c_{cr,N}$	[mm]	1,5 x h_{ef}	
Splitting failure spacing	$s_{cr,sp}$	[mm]	160	160
Splitting failure edge distance	$c_{cr,sp}$	[mm]	80	80
Factor for non-cracked concrete	$k_{ucr,N}$	[-]	11,0	
Factor for cracked concrete	$k_{cr,N}$	[-]	7,7	
Installation factor	γ_{inst}	[-]	1,2	

CELO concrete screw BTS6-C1	
Performances Design method A, characteristic tensile load values	**Annex C1**

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Table C2: Characteristic resistance to shear load failure in cracked and uncracked concrete C20/25 to C50/60.

CELO concrete screw BTS6-C1			6	
Nominal anchor depth	**$h_{nom} \geq$**	**[mm]**	**50**	**65**
Steel failure without lever arm				
Characteristic resistance to shear load	$V^{o}_{Rk,s}$	[kN]	8,95	8,95
Partial safety factor under shear load	$\gamma_{Ms,v}$	[-]	1,5	1,5
Steel failure with lever arm				
Characteristic resistance to shear load with lever arm	$M^{o}_{Rk,s}$	[Nm]	17,25	17,25
Partial safety factor under shear load	$\gamma_{Ms,v}$	[-]	1,5	1,5
Resistance to concrete pry our failure				
Factor for pry-out failure	k_8	[-]	1,00	1,00
Resistance to concrete edge failure				
Outside diameter of the fastener	d_{nom}	[mm]	6	6
Effective length for transfer of shear load	$l_f = h_{ef}$	[mm]	39	54
Installation factor	γ_{inst}	[-]	1,2	1,2

CELO concrete screw BTS6-C1	
Performances Characteristic shear load values	**Annex C2**

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Table C3.1: Characteristic values for seismic performance category C1

CELO concrete screw BTS6-C1			6	
Nominal anchor depth	$h_{nom} \geq$	[mm]	**50**	**65**
Steel failure for tension load				
Characteristic steel resistance to tension load	$N_{Rk,s,C1}$	[kN]	20	20
Partial safety factor under tension load	$\gamma_{Ms,N}$	[-]	1,4	1,4
Pull out failure for tension load				
Characteristic pull out resistance to tension load	$N_{Rk,p,C1}$	[kN]	2,50	5,50
Installation factor	γ_{inst}	[-]	1,2	1,2
Steel failure for shear load				
Characteristic steel resistance to shear load	$V_{Rk,s,C1}$	[kN]	8,59	8,59
Partial safety factor under shear load	$\gamma_{Ms,V}$	[-]	1,5	1,5

Table C3.2: Characteristic load resistance under fire exposure for use in concrete C20/25 – C50/60

CELO concrete screw BTS6-C1					
	Fire resistance class	**Fire resistance**		h_{nom} **= 50 mm**	h_{nom} **= 65 mm**
Characteristic load resistance	R 30	$F_{Rk,fi}$	[kN]	0,21	0,21
	R 60	$F_{Rk,fi}$	[kN]	0,19	0,19
	R 90	$F_{Rk,fi}$	[kN]	0,15	0,15
	R 120	$F_{Rk,fi}$	[kN]	0,11	0,11
Spacing and edge distance under fire exposure					
Spacing distance for R 30 – R 120		$s_{cr,fi}$	[mm]	160	216
Edge distance for R 30 – R 120		$c_{cr,fi}$	[mm]	80	108
The edge distance shall be ≥ 300 mm, in case of fire attack from more than one side.					

CELO concrete screw BTS6-C1	
Performances Characteristic values for seismic performance category C1 and fire resistance	**Annex C3**

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Table C4.1: Displacement under tension loads

CELO concrete screw BTS6-C1			h_{nom} = 50 mm	h_{nom} = 65 mm
Tension load	F	[kN]	1,19	2,62
Displacements	δ_{No}	[mm]	0,24	0,23
Displacements	$\delta_{N\infty}$	[mm]	0,34	0,33

Table C4.2: Displacement under shear loads

CELO concrete screw BTS6-C1			h_{nom} = 50 mm	h_{nom} = 65 mm
Shear load	V	[kN]	4,26	
Displacements	δ_{Vo}	[mm]	0,32	
Displacements	$\delta_{V\infty}$	[mm]	0,48	

CELO concrete screw BTS6-C1	
Performances Displacements	**Annex C4**