



**INSTYTUT TECHNIKI BUDOWLANEJ**  
PL 00-611 WARSZAWA  
ul. Filtrowa 1  
tel.: (+48 22) 825-04-71  
(+48 22) 825-76-55  
fax: (+48 22) 825-52-86  
[www.itb.pl](http://www.itb.pl)



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## European Technical Assessment

**ETA-18/1141  
of 31/12/2018**

### General Part

**Technical Assessment Body issuing the  
European Technical Assessment**

Instytut Techniki Budowlanej

**Trade name of the construction product**

Betsi

**Product family to which the construction  
product belongs**

Torque controlled expansion anchor of sizes  
M8, M10, M12, M16 and M20 for use in non-  
cracked concrete

**Manufacturer**

SIHGA GmbH  
Gewerbepark Kleinreith 4  
4694 Ohlsdorf  
Austria

**Manufacturing plant**

Plant 1

**This European Technical Assessment  
contains**

12 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**

European Assessment Document (EAD)  
"Mechanical fasteners for use in concrete"  
EAD 330232-00-0601

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## Specific Part

### 1 Technical description of the product

The Betsi anchor in the sizes M8, M10, M12, M16 and M20 is made of galvanized steel. The anchor is placed into a drill hole and anchored by torque-controlled expansion.

An illustration and the description of the product are given in Annex A.

### 2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

The performances given in Annex C are only valid if the anchor is used in compliance with the specifications and conditions given in Annex B.

The provisions made in this European Technical Assessment are based on an assumed working life of the anchor of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer or Technical Assessment Body, 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 Performance of the product

##### 3.1.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristic resistance to tension load (static and quasi-static loading), displacements	Annex C1
Characteristic resistance to shear load (static and quasi-static loading), displacements	Annex C2

##### 3.1.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchors satisfy requirements for Class A1
Resistance to fire	No performance assessed

#### 3.2 Methods used for the assessment

The assessment of the products has been made in accordance with the EAD 330232-00-0601 "Mechanical fasteners for use in concrete".



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


According to Decision 96/582/EC of the European Commission the system 1 of assessment and verification of constancy of performance applies (see Annex V to Regulation (EU) No 305/2011).

**5 Technical details necessary for the implementation of the AVCP system, as provided in the applicable European Assessment Document (EAD)**

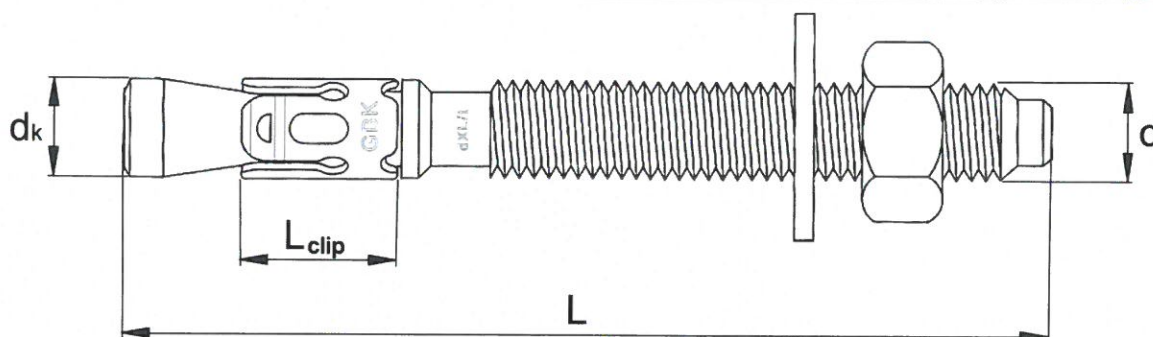
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited in Instytut Techniki Budowlanej.

For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

Issued in Warsaw on 31/12/2018 by Instytut Techniki Budowlanej



Anna Panek, MSc  
Deputy Director of ITB



**Marking:**

- expansion sleeve: **GBK** (marking identifying the product)
- bolt: **dXL/t** (d – diameter, L – length, t – thickness of fixed element)
- one letter marking on the tip of the bolt, according to table below:

Marking letter	Length L [mm]
A	60 – 67
B	68 – 80
C	81 – 87
D	88 – 92
E	93 – 97
F	98 – 105
G	106 – 112
H	113 – 117
I	118 – 122
J	123 – 127
K	128 – 135
L	136 – 142
M	143 – 147
N	148 – 155
O	156 – 165
P	166 – 175
Q	176 – 190
R	191 – 210
S	211 – 230
T	231 – 255
U	256 – 275
V	276 – 290
W	291 – 315
X	316 – 345
Y	346 – 375
Z	376 – 400

<b>Betsi</b>	<b>Annex A1</b> of European Technical Assessment ETA-18/1141
<b>Product description</b> Anchor	

**Table A1: Betsi anchor dimensions**

Type of anchor			d [mm]	d <sub>k</sub> [mm]	L [mm]	L <sub>clip</sub> [mm]	SW <sup>2)</sup> [mm]
Size	Marking	t <sub>fix</sub> <sup>1)</sup> [mm]					
M8	GBK M8	2 – 92	8	7,8	60 – 150	15	13
M10	GBK M10	5 – 135	10	9,8	70 – 200	18	17
M12	GBK M12	3 – 278	12	11,8	85 – 360	20	19
M16	GBK M16	5 – 285	16	15,8	120 – 400	24	24
M20	GBK M20	5 – 135	20	19,8	140 – 270	28	30

<sup>1)</sup> thickness of the fixed element<sup>2)</sup> torque wrench width**Betsi****Product description**  
Dimensions**Annex A2**  
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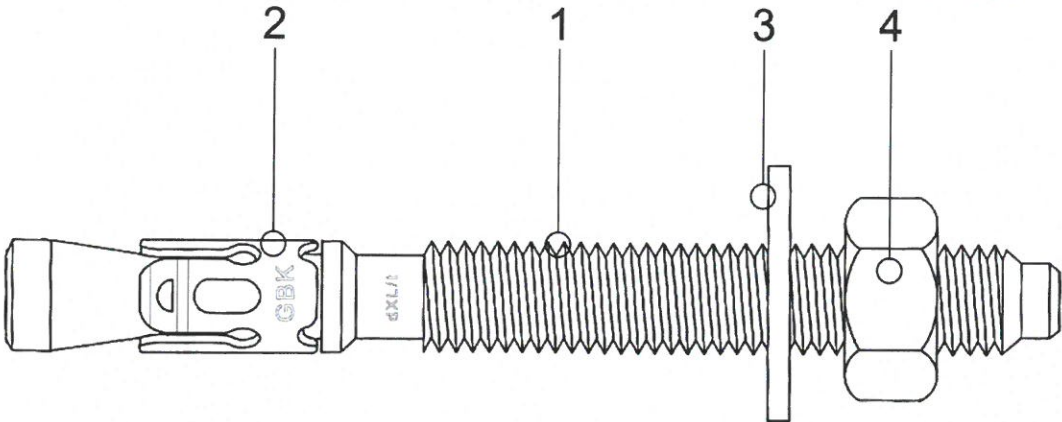


Table A2: Materials

Part	Designation	Material	Coating
1	Bolt	Cold-formed steel, $f_{uk} \geq \begin{cases} 500 \text{ MPa for M8 - M16} \\ 480 \text{ MPa for M20} \end{cases}$ $f_{yk} \geq 400 \text{ MPa}$	Zinc plated $\geq 5 \mu\text{m}$ EN ISO 4042
2	Expansion clip	Cold-formed steel	
3	Washer	ISO 7089 (DIN 125-A) or ISO 7093 (DIN 9021)	
4	Hexagon nut	EN ISO 898-2 carbon steel class 8 / DIN 934 carbon	

Betsi

Product description  
Materials

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### Specification of intended use

**Anchorage subject to:**

- Static and quasi-static loads.

**Base material:**

- Reinforced or unreinforced normal weight concrete of strength classes C20/25 at minimum and C50/60 at maximum according to EN 206.
- Non-cracked concrete.

**Use conditions (environmental conditions):**

- Structures subject to dry internal conditions.

**Design:**

- The anchorages under static and quasi-static loads are designed in accordance with EOTA Technical Report TR 055, under the responsibility of an engineer experienced in anchorages and concrete work.
- The position of the anchor is indicated on the design drawings.
- Verifiable calculation notes and drawings are taking account of the loads to be transmitted.

**Installation of anchors:**

- Anchor installation carried out by appropriately qualified personnel and under the supervision of the person responsible for technical matters of the site.
- Use of the anchor only as supplied by the manufacturer without exchanging any component of the anchor.
- Anchor installation in accordance with the manufacturer's specification and drawings and using the appropriate tools.
- Checks before placing the anchor to ensure that the strength class of the concrete in which the anchor is to be placed is in the range given and is not lower than that of the concrete to which the characteristic loads apply.
- Check of concrete being well compacted, e.g. without significant voids.
- Effective anchorage depth, edge distances and spacings not less than the specified values without minus tolerances.
- Positioning of the drill holes without damaging the reinforcement.
- Hole drilling by hammer drill.
- Cleaning of the hole of drilling dust.
- Application of the torque moment using a calibrated torque wrench.
- 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 drill hole is filled with high strength mortar and if under shear or oblique tension load it is not in the direction of load application.

<b>Betsi</b>	<b>Annex B1</b>  of European Technical Assessment ETA-18/1141
<b>Intended use Specifications</b>	



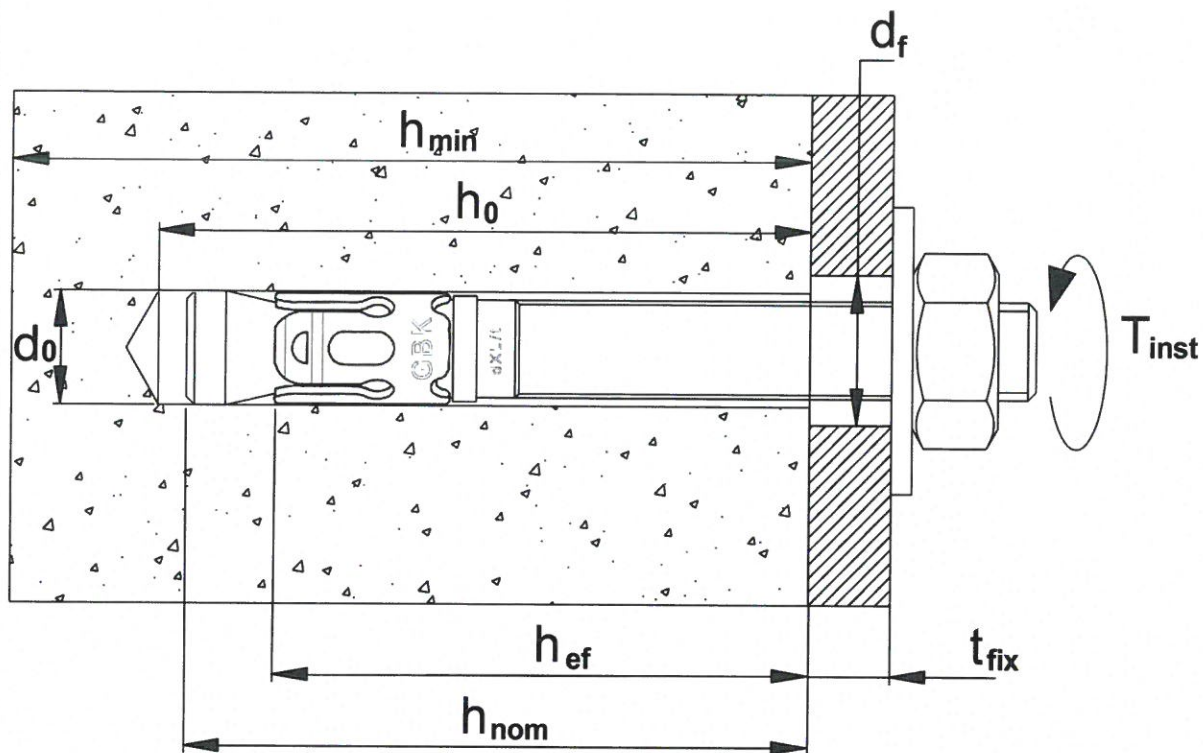


Table B1: Installation parameters

Anchor size		M8	M10	M12	M16	M20
Effective anchorage depth	$h_{ef}$ [mm]	45	50	60	85	100
Nominal drill hole diameter	$d_0$ [mm]	8	10	12	16	20
Depth of drill hole	$h_0 \geq$ [mm]	60	65	80	110	125
Embedment depth	$h_{nom} \geq$ [mm]	50	55	70	100	115
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	9	12	14	18	22
Installation torque	$T_{inst}$ [Nm]	20	35	55	100	150
Minimum thickness of member	$h_{min}$ [mm]	100	100	120	170	200
Minimum spacing	$s_{min}$ [mm]	61	68	81	115	135
Minimum edge distance	$c_{min}$ [mm]	61	68	81	115	135

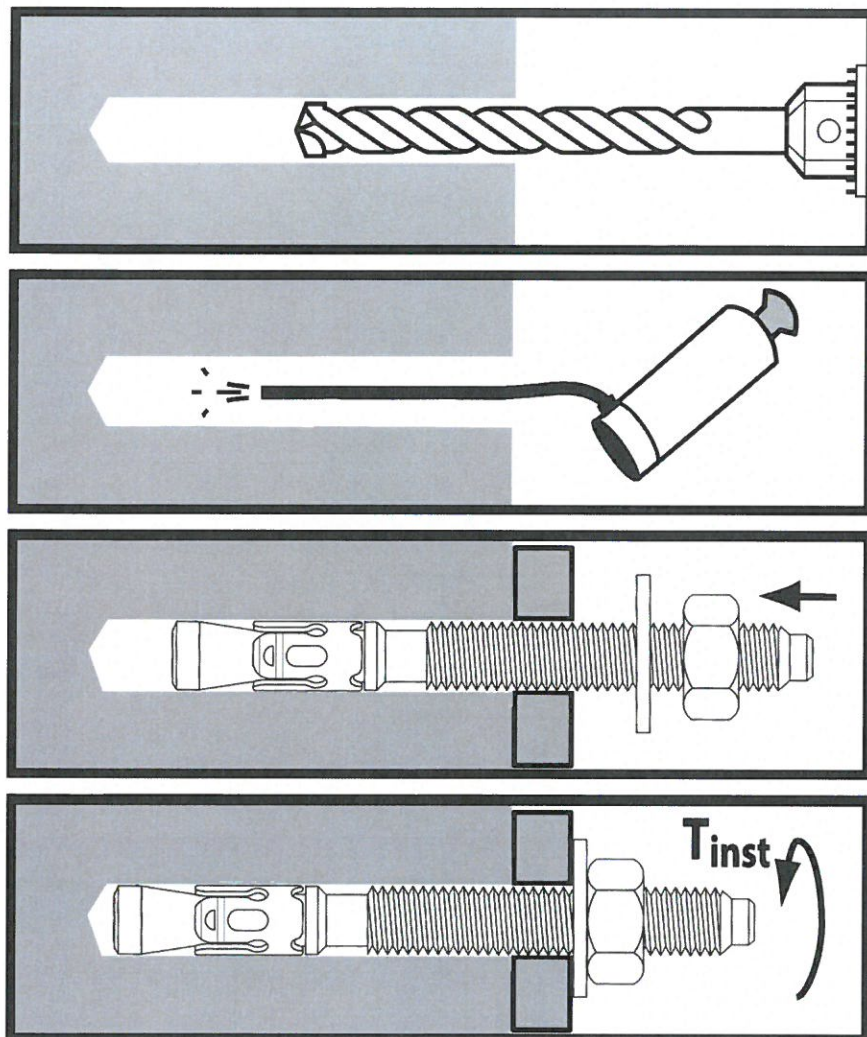
Betsi

Intended use  
Installation parameters

Annex B2

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# Installation instruction



**Betsi**

**Intended use**  
Installation instruction

**Annex B3**  
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**Table C1: Design method A, characteristic values for tension loads**

Anchor size		M8	M10	M12	M16	M20
Steel failure						
Characteristic resistance	$N_{Rk,s}$ [kN]	18,3	29,0	42,2	78,5	117,6
Modulus of elasticity	$E_s$ [N/mm <sup>2</sup> ]	210 000				
Partial safety factor	$\gamma_{Ms}^{1)}$	1,50				
Pull-out failure						
Characteristic resistance in non-cracked concrete C20/25	$N_{Rk,p}$ [kN]	9	12	16	16	30
Installation safety factor	$\gamma_2^{2)}) = \gamma_{inst}^{3)4)})$	1,2	1,2	1,2	1,2	1,0
Increasing factor for concrete C30/37	$\psi_c$	1,22	1,22	1,22	1,22	1,22
Increasing factor for concrete C40/50		1,41	1,41	1,41	1,41	1,41
Increasing factor for concrete C50/60		1,55	1,55	1,55	1,55	1,55
Concrete cone failure and splitting failure						
Effective anchorage depth	$h_{ef}$ [mm]	45	50	60	85	100
Factor for non-cracked concrete	$k_1^{2)}) = k_{ucr}^{3)})$	10,1	10,1	10,1	10,1	10,1
Factor for non-cracked concrete	$k_1^{4)}) = k_{ucr,N}^{4)})$	11,0	11,0	11,0	11,0	11,0
Spacing	$s_{cr,N}$ [mm]	135	150	180	255	300
Edge distance	$c_{cr,N}$ [mm]	68	75	90	128	150
Characteristic resistance for splitting	$N_{Rk,s}^{0,2)}) = N_{Rk}^{0,3)}) = N_{Rk,sp}^{0,4)})$ [kN]	9	12	16	16	30
Characteristic spacing	$s_{cr,sp}$ [mm]	225	250	300	425	500
Characteristic edge distance	$c_{cr,sp}$ [mm]	113	125	150	213	250
Installation safety factor	$\gamma_2^{2)}) = \gamma_{inst}^{3)4)})$	1,2	1,2	1,2	1,2	1,0
1) in absence of other national regulations 2) parameter for design according to ETAG 001 Annex C 3) parameter for design according to CEN/TS 1992-4-4:2009 4) parameter for design according to FprEN 1992-4:2016						

**Table C2: Displacements under tension loads**

Anchor size		M8	M10	M12	M16	M20
Tension load	$N$ [kN]	3,8	5,0	8,7	9,8	14,4
Displacement	$\delta_{NO}$ [mm]	0,8	1,9	3,7	3,7	3,7
	$\delta_{N_{\infty}}$ [mm]	1,2	1,2	1,2	1,2	1,2

**Betsi****Performances**

Design method A, characteristic values for tension loads, displacements

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**Table C3: Design method A, characteristic values for shear loads**

Anchor size		M8	M10	M12	M16	M20
Steel failure without lever arm						
Characteristic resistance	$V_{Rk,s}^{2)3)} = V_{Rk,s}^{0)4)} [kN]$	9,2	14,5	21,1	39,3	58,8
Ductility factor	$k^{2)} = k_2^{3)} = k_7^{4)}$	0,8	0,8	0,8	0,8	0,8
Partial safety factor	$\gamma_{Ms}^{1)}$	1,25				
Steel failure with lever arm						
Characteristic bending resistance	$M_{Rk,s}^0 [Nm]$	18,8	37,4	65,6	166,6	311,8
Partial safety factor	$\gamma_{Ms}^{1)}$	1,25				
Concrete pry-out failure						
Concrete pry-out failure factor	$k^{2)} = k_3^{3)} = k_8^{4)}$	1,0	1,0	2,0	2,0	2,0
Partial safety factor	$\gamma_{Mc}^{1)}$	1,5				
Concrete edge failure						
Effective length of anchor under shear loading	$l_f [mm]$	45	50	60	85	100
Outside diameter of anchor	$d_{nom} [mm]$	8	10	12	16	20
Partial safety factor	$\gamma_{Mc}^{1)}$	1,5				
1) in absence of other national regulations 2) parameter for design according to ETAG 001 Annex C 3) parameter for design according to CEN/TS 1992-4-4:2009 4) parameter for design according to FprEN 1992-4:2016						

**Table C4: Displacements under shear loads**

Anchor size		M8	M10	M12	M16	M20
Shear load	$V [kN]$	2,7	6,2	8,3	13,7	25,1
Displacement	$\delta_{v0} [mm]$	0,5	0,9	0,9	0,9	1,9
	$\delta_{v\infty} [mm]$	0,7	1,3	1,3	1,3	2,8

**Betsi****Performances**

Design method A, characteristic values for shear loads, displacements

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