

Approval body for construction products  
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and  
Laender Governments



## European Technical Assessment

**ETA-12/0400**  
**of 1 March 2016**

English translation prepared by DIBt - Original version in German language

### General Part

Technical Assessment Body issuing the  
European Technical Assessment:

Trade name of the construction product

Product family  
to which the construction product belongs

Manufacturer

Manufacturing plant

This European Technical Assessment  
contains

This European Technical Assessment is  
issued in accordance with Regulation (EU)  
No 305/2011, on the basis of

This version replaces

Deutsches Institut für Bautechnik

TILCA Drop-in Anchor ED / ED-K

Deformation-controlled expansion anchor for use in  
non-cracked concrete

Egli, Fischer & Co. AG  
Befestigungstechnik  
Gotthardstraße 6  
8022 ZÜRICH  
SCHWEIZ

Werk1, Deutschland

16 pages including 3 annexes which form an integral part  
of this assessment

Guideline for European technical approval of "Metal  
anchors for use in concrete", ETAG 001 Part 4:  
"Deformation controlled expansion anchors", April 2013,  
used as European Assessment Document (EAD)  
according to Article 66 Paragraph 3 of Regulation (EU)  
No 305/2011.

ETA-12/0400 issued on 5 September 2012

**European Technical Assessment**

**ETA-12/0400**

English translation prepared by DIBt

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**Specific Part****1 Technical description of the product**

The TILCA Drop-in Anchor ED / ED-K is an anchor made of galvanised steel, made of stainless steel or high corrosion resistant steel which is placed into a drilled hole and anchored by deformation-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 for tension and shear loads as well as bending moments in concrete	See Annex C 1 to C 4
Edge distances and spacing	See Annex C 1 to C 2
Displacements under tension and shear loads	See Annex C 5

**3.2 Safety in case of fire (BWR 2)**

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

**3.3 Safety in use (BWR 4)**

The essential characteristics regarding Safety in use are included under the Basic Works Requirement Mechanical resistance and stability.

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

In accordance with guideline for European technical approval ETAG 001, April 2013, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011, 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.

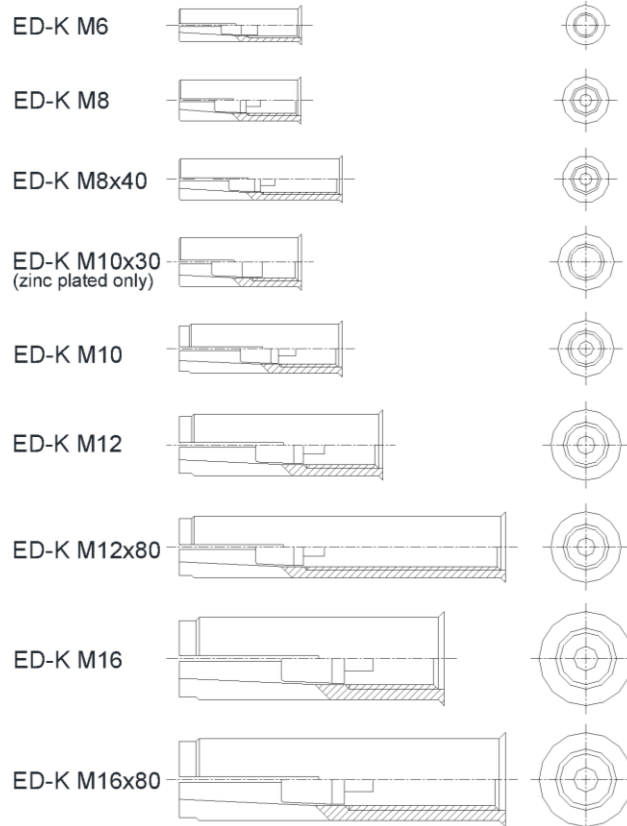
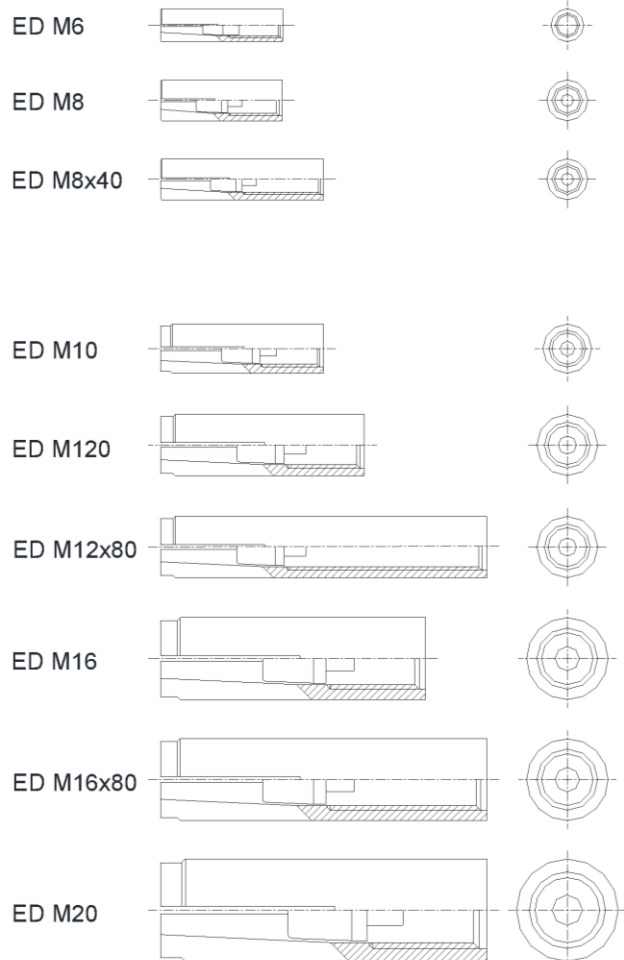
Issued in Berlin on 1 March 2016 by Deutsches Institut für Bautechnik

Andreas Kummerow  
p.p. Head of Department

*beglaubigt:*  
Baderschneider

## Drop-in Anchor E / ES

### Anchor size

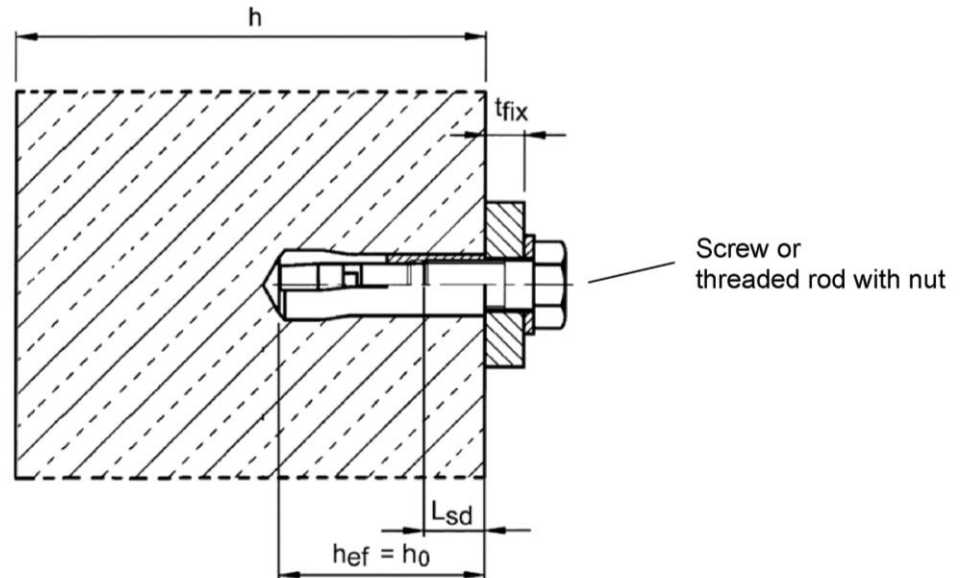


## TILCA Drop-in Anchor ED / ED-K

Product description  
Anchor size

Annex A1

## Installation situation



**Table A1: Designations of anchor parts and material**

Part	Designation	Steel, zinc plated	Stainless steel A4	High corrosion resistant steel HCR
1	Anchor sleeve	Cold formed or machining steel, zinc plated, EN ISO 4042:1999	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4362, EN 10088:2005, Property class 70, acc. to EN ISO 3506:2010	Stainless steel, 1.4529, 1.4565, EN 10088:2005, Property class 70, acc. to EN ISO 3506:2010
2	Cone	Steel for cold forming acc. to EN 10263-2:2001	Stainless steel, 1.4401, 1.4404, 1.4571, 1.4362, EN 10088:2005	

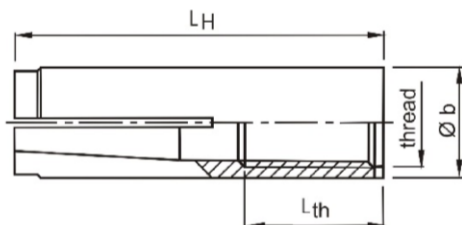
### TILCA Drop-in Anchor ED / ED-K

**Product description**  
Installation situation and material

**Annex A2**

## Anchor sleeve

Anchor version without shoulder (ED)

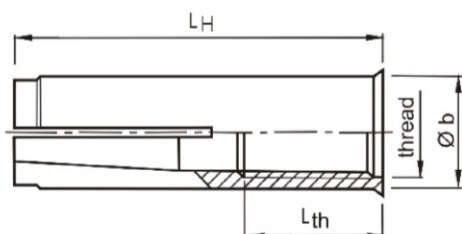


Marking: see Table A2

e.g.:  $\diamond$  E M8x40

$\diamond$  Identifying mark of manufacturing plant  
E Anchor identity (version without shoulder)  
ES Anchor identity (version with shoulder)  
M8 Size of thread  
40 Anchorage depth

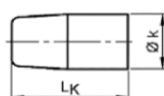
Anchor version with shoulder (ED-K)



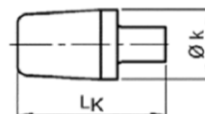
A4 additional marking  
of stainless steel A4

HCR additional marking of  
high corrosion resistant steel

## Cone



Size M6x30 and M10x30



Size M8x30 – M20x80

Table A2: Dimensions and marking

Anchor size	Anchor sleeve				Cone		Marking		
	thread	Ø b	L <sub>H</sub>	L <sub>th</sub>	Ø k	L <sub>K</sub>	version E	version ES	alternatively
M6	M6	8	30	13	5,0	13	$\diamond$ E M6x30	$\diamond$ ES M6x30	$\diamond$ E M6
M8	M8	10	30	13			$\diamond$ E M8x30	$\diamond$ ES M8x30	$\diamond$ E M8
M8x40	M8	10	40	20	6,5	12	$\diamond$ E M8x40	$\diamond$ ES M8x40	$\diamond$ E M8x40
M10x30	M10	12	30	12			-	$\diamond$ ES M10x30	$\diamond$ E M10x30
M10	M10	12	40	15	8,2	16	$\diamond$ E M10x40	$\diamond$ ES M10x40	$\diamond$ E M10
M12	M12	15	50	18			$\diamond$ E M12x50	$\diamond$ ES M12x50	$\diamond$ E M12
M12x80	M12	15	80	45	10,3	20	$\diamond$ E M12x80	$\diamond$ ES M12x80	$\diamond$ E M12x80
M16	M16	19,7	65	23			$\diamond$ E M16x65	$\diamond$ ES M16x65	$\diamond$ E M16
M16x80	M16	19,7	80	38	13,8	29	$\diamond$ E M16x80	$\diamond$ ES M16x80	$\diamond$ E M16x80
M20	M20	24,7	80	34			$\diamond$ E M20x80	-	$\diamond$ E M20

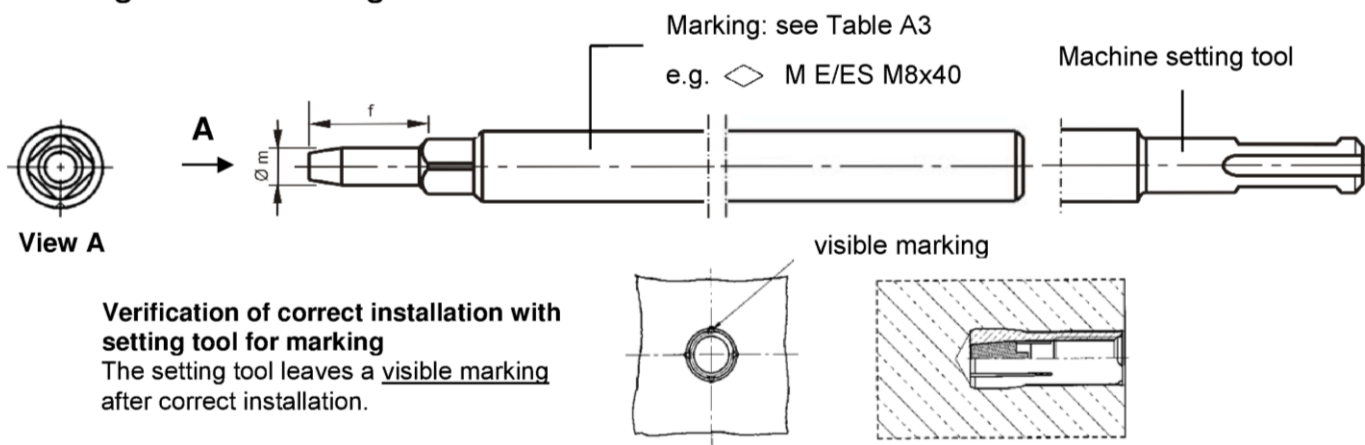
Dimensions in mm

## TILCA Drop-in Anchor ED / ED-K

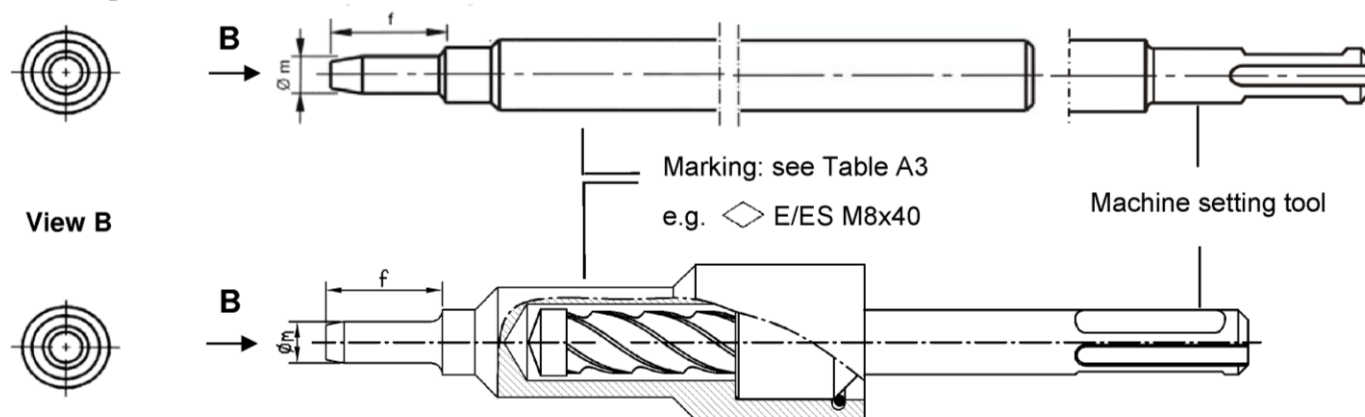
Product description  
Dimensions and marking

Annex A3

### Setting tool for marking



### Setting tool



**Table A3: Dimensions and marking of setting tools**

Anchor size	Ø m	f	Setting tool for marking		Setting tool	
			Marking	Alternative marking	Marking	Alternative marking
M6	4,9	17	◇ M E/ES M6x30	◇ M E M6	◇ E/ES M6x30	◇ E M6
M8	6,4	18	◇ M E/ES M8x30	◇ M E M8	◇ E/ES M8x30	◇ E M8
M8x40	6,4	28	◇ M E/ES M8x40	◇ M E M8x40	◇ E/ES M8x40	◇ E M8x40
M10x30	8,0	18	◇ M ES M10x30	◇ M E M10x30	◇ ES M10x30	◇ E M10x30
M10	8,0	24	◇ M E/ES M10x40	◇ M E M10	◇ E/ES M10x40	◇ E M10
M12	10,0	30	◇ M E/ES M12x50	◇ M E M12	◇ E/ES M12x50	◇ E M12
M12x80	10,0	60	◇ M E/ES M12x80	◇ M E M12x80	◇ E/ES M12x80	◇ E M12x80
M16	13,5	36	◇ M E/ES M16x65	◇ M E M16	◇ E/ES M16x65	◇ E M16
M16x80	13,5	51	◇ M E/ES M16x80	◇ M E M16x80	◇ E/ES M16x80	◇ E M16x80
M20	16,5	50	◇ M E M20x80	◇ M E M20	◇ E M20x80	◇ E M20

Dimensions in mm

### TILCA Drop-in Anchor ED / ED-K

**Product description**  
Setting tools, dimensions and marking

**Annex A4**



## Specifications of intended use

### Anchorage subject to:

- Static and quasi-static loads

### Base materials:

- Reinforced or unreinforced normal weight concrete according to EN 206-1:2000
- Non-cracked concrete
- Strength classes C20/25 to C50/60 according to EN 206-1:2000

### Use conditions:

- Structures subject to dry internal conditions (zinc plated steel, stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure including industrial and marine environment or exposure to permanently damp internal condition, if no particular aggressive conditions exist (stainless steel or high corrosion resistant steel).
- Structures subject to external atmospheric exposure and to permanently damp internal condition, if other particular aggressive conditions (high corrosion resistant steel).

Note: Particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of indoor 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.).
- The strength class and the length of the fastening screw or threaded rod shall be defined by the designing engineer
- Anchorages under static or quasi-static actions are designed in accordance with:
  - ETAG 001, Annex C, design method A, Edition August 2010 or
  - CEN/TS 1992-4:2009, Annex C, design method A

### Installation:

- Anchor installation carried out by appropriately qualified personnel 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,
- Drill hole by hammer drilling only,
- Positioning of the drill holes without damaging the reinforcement.

## TILCA Drop-in Anchor ED / ED-K

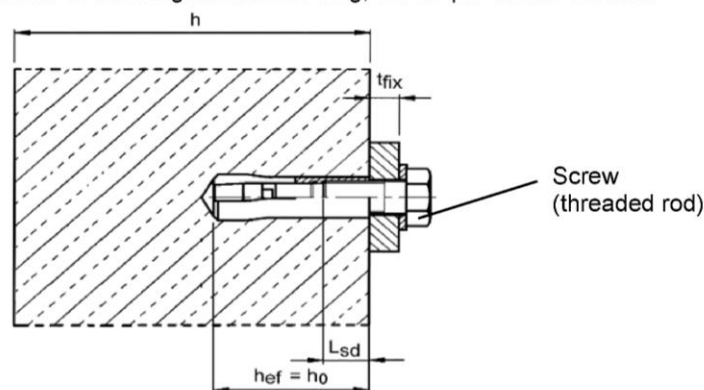
Intended use  
Specifications

Annex B1

**Table B1: Installation parameters**

Anchor size		M6	M8	M8x40	M10x30	M10	M12	M12x80	M16	M16x80	M20
Depth of drill hole	$h_0 =$ [mm]	30	30	40	30	40	50	80	65	80	80
Drill hole diameter	$d_0 =$ [mm]	8	10	10	12	12	15	15	20	20	25
Cutting diameter of drill bit	$d_{cut} \leq$ [mm]	8,45	10,45	10,45	12,5	12,5	15,5	15,5	20,55	20,55	25,55
Max. installation torque <sup>1)</sup>	$T_{inst} \leq$ [Nm]	4	8	8	15	15	35	35	60	60	120
Diameter of clearance hole in the fixture	$d_f \leq$ [mm]	7	9	9	12	12	14	14	18	18	22
Available thread length	$L_{th}$ [mm]	13	13	20	12	15	18	45	23	38	34
Minimum screw-in depth	$L_{sdmin}$ [mm]	7	9	9	10	11	13	13	18	18	22
<b>Steel, zinc plated</b>											
Minimum thickness of member	$h_{min}$ [mm]	100	100	100	120	120	130	130	160	160	200
Minimum spacing	$s_{min}$ [mm]	55	60	80	100	100	120	120	150	150	160
Minimum edge distance	$c_{min}$ [mm]	95	95	95	115	135	165	165	200	200	260
<b>Stainless steel A4, HCR</b>											
Minimum thickness of member	$h_{min}$ [mm]	100	100	100	-	130	140	140	160	160	250
Minimum spacing	$s_{min}$ [mm]	50	60	80	-	100	120	120	150	150	160
Minimum edge distance	$c_{min}$ [mm]	80	95	95	-	135	165	165	200	200	260

<sup>1)</sup> If the screw or threaded rod is otherwise secured against unscrewing, the torque can be omitted.



**Requirements of the fastening screw or the threaded rod and nut according to the engineering documents:**

- Minimum screw-in depth  $L_{sdmin}$  see Table B1
- The length of screw or the threaded rod shall be determined depending on the thickness of fixture  $t_{fix}$ , available thread length  $L_{th}$  (= maximum screw-in depth) and the minimum screw-in depth  $L_{sdmin}$ .
- $A_5 > 8 \%$  ductility

**Steel, zinc plated**

- Property class 4.6 / 5.6 / 5.8 or 8.8 according to EN ISO 898-1:2013 or EN ISO 898-2:2012

**Stainless steel A4**

- Material 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088:2005
- Property class 70 or 80 according to EN ISO 3506:2010

**High corrosion resistant steel (HCR)**

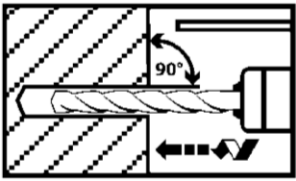
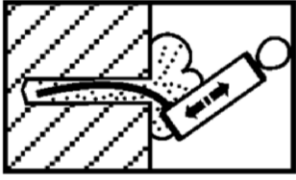
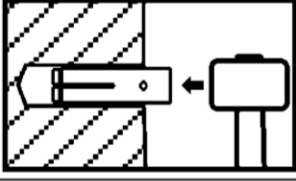
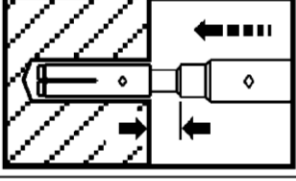
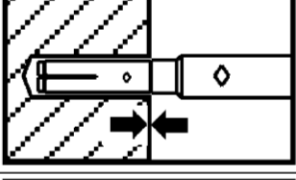
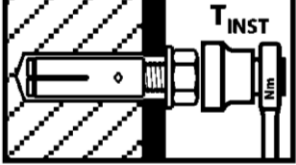
- Material 1.4529; 1.4565 acc. to EN 10088:2005
- Property class 70 or 80 acc. to EN ISO 3506:2010

**TILCA Drop-in Anchor ED / ED-K**

**Intended use**  
Installation parameters

**Annex B2**

## Installation instructions

1		Drill hole perpendicular to concrete surface.
2		Blow out dust.
3		Drive in anchor.
4		Drive in cone by using setting tool.
5		Shoulder of setting tool must fit on anchor rim.
6		Apply installation torque $T_{inst}$ by using calibrated torque wrench.

**TILCA Drop-in Anchor ED / ED-K**

**Intended use**  
Installation instructions

**Annex B3**

**Table C1: Characteristic values for tension loads, zinc plated steel**

Anchor size			M6 <sup>1)</sup>	M8 <sup>1)</sup>	M8x40	M10x30 <sup>1)</sup>	M10	M12	M12x80	M16 M16x80	M20
Installation safety factor	$\gamma_2 = \gamma_{inst}$	[-]	1,2								
Steel failure											
Characteristic resistance Steel 4.6	$N_{Rk,s}$	[kN]	8,0	14,6	23,2		33,7		62,8	98,0	
Partial safety factor	$\gamma_{Ms}$	[-]	2,0								
Characteristic resistance Steel 5.6	$N_{Rk,s}$	[kN]	10,0	18,3	18,0	20,2	42,1		78,3	122,4	
Partial safety factor	$\gamma_{Ms}$	[-]	2,0		1,5		2,0				
Characteristic resistance Steel 5.8	$N_{Rk,s}$	[kN]	10,0	17,6	18,3	18,0	20,2	40,2	42,1	67,1	106,4
Partial safety factor	$\gamma_{Ms}$	[-]	1,5							1,6	
Characteristic resistance Steel 8.8	$N_{Rk,s}$	[kN]	15,0	17,6	19,9	18,0	20,2	40,2	43,0	67,1	106,4
Partial safety factor	$\gamma_{Ms}$	[-]	1,5							1,6	
Pull-out failure											
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	2)	2)	9	2)	2)	2)		2)	2)
Increasing factor for $N_{Rk,p}$	$\psi/C$	[-]	$\left(\frac{f_{ck,cube}}{25}\right)^{0,3}$								
Concrete cone failure and splitting											
Effective anchorage depth	$h_{ef}$	[mm]	30	30	40	30	40	50		65	80
Spacing (edge distance)	$s_{cr,N} (= 2 c_{cr,N})$	[mm]	3 $h_{ef}$								
	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	190	190	190	230	270	330		400	520
Factor acc. to CEN/TS 1992-4	$k_{ucr}$	[-]	10,1								

<sup>1)</sup> Use restricted to anchoring of structural components statically indeterminate

<sup>2)</sup> Pull-out is not decisive

**TILCA Drop-in Anchor ED / ED-K**

**Performance**  
Characteristic values for tension loads, zinc plated steel

**Annex C1**

**Table C2: Characteristic values for tension loads, stainless steel A4, HCR**

Anchor size			M6 <sup>1)</sup>	M8 <sup>1)</sup>	M8x40	M10	M12 M12x80	M16 M16x80	M20
Installation safety factor		$\gamma_2 = \gamma_{inst}$	[-]	1,0					
Steel failure									
Characteristic resistance (property class 70)	$N_{Rk,s}$	[kN]	14,1	23,3		29,4	50,2	83,8	133,0
Characteristic resistance (property class 80)	$N_{Rk,s}$	[kN]	17,5	23,3		29,4	50,2	83,8	133,0
Partial safety factor	$\gamma_{Ms}$	[-]	1,87						
Pull-out failure									
Characteristic resistance in concrete C20/25	$N_{Rk,p}$	[kN]	2)	2)	9	2)	2)	2)	2)
Increasing factor for $N_{Rk,p}$	$\psi/C$	[-]			$\left(\frac{f_{ck,cube}}{25}\right)^{0,5}$				
Concrete cone failure and splitting									
Effective anchorage depth	$h_{ef}$	[mm]	30 <sup>3)</sup>	30	40	40	50	65	80
Spacing (edge distance)	$s_{cr,N} (= 2 c_{cr,N})$	[mm]	3 $h_{ef}$						
	$s_{cr,sp} (= 2 c_{cr,sp})$	[mm]	160	190	190	270	330	400	520
Factor acc. to CEN/TS 1992-4	$k_{ucr}$	[-]	10,1						

<sup>1)</sup> Use restricted to anchoring of structural components statically indeterminate

<sup>2)</sup> Pull-out is not decisive.

<sup>3)</sup> For proof against concrete cone failure as per ETAG 001, annex C or CEN/TS 1992-4-4,  $N_{Rk,c}$  must be multiplied by the factor  $(25/f_{ck,cube})^{0,2}$ .

**TILCA Drop-in Anchor ED / ED-K**

**Performance**  
Characteristic values for tension loads, stainless steel A4, HCR

**Annex C2**

**Table C3: Characteristic values for shear loads, zinc plated steel**

Anchor size			M6 <sup>1)</sup>	M8 <sup>1)</sup>	M8x40	M10x30 <sup>1)</sup>	M10	M12	M12x80	M16 M16x80	M20
Steel failure without lever arm											
Characteristic resistance Steel 4.6	V <sub>Rk,s</sub>	[kN]	4,0	7,3		11,6	9,6	16,8		31,3	49,0
Partial safety factor	γ <sub>Ms</sub>	[-]	1,67								
Characteristic resistance Steel 5.6	V <sub>Rk,s</sub>	[kN]	5,0	9,1		10,1	9,6	21,1		39,2	61,2
Partial safety factor	γ <sub>Ms</sub>	[-]	1,67			1,25	1,67				
Characteristic resistance Steel 5.8	V <sub>Rk,s</sub>	[kN]	5,0	6,9		10,1	7,2	19,4	21,1	33,5	53,2
Partial safety factor	γ <sub>Ms</sub>	[-]	1,25							1,33	
Characteristic resistance Steel 8.8	V <sub>Rk,s</sub>	[kN]	5,0	6,9		10,1	7,2	19,4	21,5	33,5	53,2
Partial safety factor	γ <sub>Ms</sub>	[-]	1,25							1,33	
Factor of ductility	k <sub>2</sub>	[-]	1,0								
Steel failure with lever arm											
Characteristic resistance Steel 4.6	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	6,1	15		30	30	52		133	259
Partial safety factor	γ <sub>Ms</sub>	[-]	1,67								
Characteristic resistance Steel 5.6	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	7,6	19		37	37	65		166	324
Partial safety factor	γ <sub>Ms</sub>	[-]	1,67								
Characteristic resistance Steel 5.8	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	7,6	19		37	37	65		166	324
Partial safety factor	γ <sub>Ms</sub>	[-]	1,25								
Characteristic resistance Steel 8.8	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	12	30		59	60	105		266	519
Partial safety factor	γ <sub>Ms</sub>	[-]	1,25								
Factor of ductility	k <sub>2</sub>	[-]	1,0								
Concrete pry-out failure											
Factor k acc. to ETAG 001, Annex C or k <sub>3</sub> acc. to CEN/TS	k <sub>(3)</sub>	[-]	1,0					1,5		2,0	
Concrete edge failure											
Effective length of anchor under shear loading	l <sub>f</sub>	[mm]	30	30	40	30	40	50		65	80
Outside diameter of anchor	d <sub>nom</sub>	[mm]	8	10	10	12	12	15		20	25

<sup>1)</sup> Use restricted to anchoring of structural components statically indeterminate

**TILCA Drop-in Anchor ED / ED-K**

**Performance**  
Characteristic values for shear loads, zinc plated steel

**Annex C3**



**Table C4: Characteristic values for shear loads, stainless steel A4, HCR**

Anchor size			M6 <sup>1)</sup>	M8 <sup>1)</sup>	M8x40	M10	M12 M12x80	M16 M16x80	M20
Steel failure without lever arm									
Characteristic resistance (property class 70)	V <sub>Rk,s</sub>	[kN]	7,0	10,6		13,4	25,1	41,9	66,5
Characteristic resistance (property class 80)	V <sub>Rk,s</sub>	[kN]	8,7	10,6		13,4	25,1	41,9	66,5
Partial safety factor	γ <sub>Ms</sub>	[-]	1,56						
Factor of ductility	k <sub>2</sub>	[-]	1,0						
Steel failure with lever arm									
Characteristic resistance (property class 70)	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	11	26		52	92	233	454
Partial safety factor	γ <sub>Ms</sub>	[-]	1,56						
Characteristic resistance (property class 80)	M <sup>0</sup> <sub>Rk,s</sub>	[Nm]	12	30		60	105	266	519
Partial safety factor	γ <sub>Ms</sub>	[-]	1,33						
Factor of ductility	k <sub>2</sub>	[-]	1,0						
Concrete pry-out failure									
Factor k acc. to ETAG 001, Annex C or k <sub>3</sub> acc. to CEN/TS	k <sub>(3)</sub>	[-]	1,0	1,7		1,7		2,0	
Concrete edge failure									
Effective length of anchor under shear loading	l <sub>f</sub>	[mm]	30	30	40	40	50	65	80
Outside diameter of anchor	d <sub>nom</sub>	[mm]	8	10	10	12	15	20	25

<sup>1)</sup> Use restricted to anchoring of structural components statically indeterminate

**TILCA Drop-in Anchor ED / ED-K**

**Performance**  
Characteristic values for **shear loads, stainless steel A4, HCR**

**Annex C4**

**Table C5: Displacements under tension loads**

Anchor size			M6	M8	M8x40	M10x30	M10	M12 M12x80	M16 M16x80	M20
Steel zinc plated										
Tension load in non-cracked concrete	N	[kN]	3	3	3,6	3,3	4,8	6,4	10	14,8
Displacement	$\delta_{N0}$	[mm]	0,24							
	$\delta_{N\infty}$	[mm]	0,36							
Stainless steel A4 / HCR										
Tension load in non-cracked concrete	N	[kN]	4	4	4,3	-	6,1	8,5	12,6	17,2
Displacement	$\delta_{N0}$	[mm]	0,12							
	$\delta_{N\infty}$	[mm]	0,24							

**Table C6: Displacements under shear loads**

Anchor size			M6	M8	M8x40	M10x30	M10	M12 M12x80	M16 M16x80	M20
<b>Steel zinc plated</b>										
Shear load in non-cracked concrete	V	[kN]	2	4	4	5,7	4,0	11,3	18,8	32,2
Displacement	$\delta_{V0}$	[mm]	0,9	0,9	1,0	1,5	0,6	1,2	1,2	1,6
	$\delta_{V\infty}$	[mm]	1,3	1,3	1,5	2,3	0,9	1,9	1,9	2,4
<b>Stainless steel A4 / HCR</b>										
Shear load in non-cracked concrete	V	[kN]	3,5	5,2	5,2	-	6,5	11,5	19,2	30,4
Displacement	$\delta_{V0}$	[mm]	1,9	1,1	0,7	-	1,0	1,7	2,4	2,6
	$\delta_{V\infty}$	[mm]	2,8	1,6	1,0	-	1,5	2,6	3,6	3,8

**TILCA Drop-in Anchor ED / ED-K**

**Performance  
Displacements**

**Annex C5**