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European Technical Assessment

ETA-19/0280 of 15/05/2019

General Part

Technical Assessment Body issuing the European Technical Assessment	Instytut Techniki Budowlanej
Trade name of the construction product	LC, LC-A4 and LCL Wedge Anchors
Product family to which the construction product belongs	Fasteners for use in concrete for redundant non-structural applications
Manufacturer	LINK YAPI SAN. VE TIC. AS GOSB 1000 CD. NO:1016 CAYIROVA - GEBZE, KOCAELI Turkey
Manufacturing plant(s)	Manufacturing Plants no. 6 and 7
This European Technical Assessment contains	17 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) 330747-00-0601 "Fasteners for use in concrete for redundant non-structural systems"

Specific Part

1 Technical description of the product

The LC, LC-A4 and LCL Wedge Anchors are deformation-controlled expansion anchors in sizes of M6, M8, M10, M12, M16 and M20. The anchors LC and LCL are made of galvanized steel and LC-A4 are made of stainless steel.

The anchor is installed in a drilled hole and anchored by deformation-controlled expansion.

The description of the product is given in Annex A.

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

The performances given in Section 3 are only valid if the anchors are used in compliance with the specifications and conditions given in Annex B.

The performances given 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 the 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 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Anchors satisfy requirements for Class A1
Resistance to fire	See Annex C2

3.1.2 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Characteristic resistance for all load directions	See Annex C1
Edge distances and spacing	See Annex C1

3.2 Methods used for the assessment

The assessment of the anchors has been made in accordance with the European Assessment Document (EAD) 330747-00-0601 "Fasteners for use in concrete for redundant non-structural systems".

The assessment of the anchor in relation to the requirements for resistance to fire has been made in accordance with the EOTA Technical Report TR 020 "Evaluation of anchorages in concrete concerning resistance to fire".

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

According to Decision 97/161/EC of the European Commission the system 2+ of assessment and verification of constancy of performance (see Annex V to Regulation (EU) No 305/2011) applies.

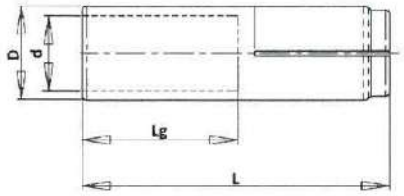
5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document (EAD)

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

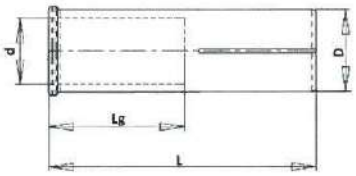
For type testing the results of the tests performed as part of the assessment for the European Technical Assessment shall be used unless there are changes in the production line or plant. In such cases the necessary type testing has to be agreed between Instytut Techniki Budowlanej and the notified body.

Issued in Warsaw on 15/05/2019 by Instytut Techniki Budowlanej

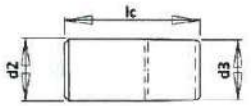
Anna Panek, MSc
Deputy Director of ITB



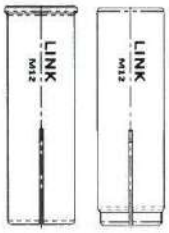
LC and LC-A4 sleeve



LCL sleeve



expansion plug



Marking:
Identifying mark – **LINK**
Size: Mxx (A4)
xx – thread size
A4 – for stainless steel

Table A1. Anchors LC – materials and dimensions

LC		**M6/25**	**M8/30**	**M10/40**	**M12/50**	**M16/65**	**M20/80**
Anchor length L	**[mm]**	25	30	40	50	65	80
Inner diameter d	**[mm]**	6	8	10	12	16	20
External diameter D	**[mm]**	8	10	12	15	20	25
Thread length Lg	**[mm]**	11	14	19	25	28	38
Anchor material	Steel in accordance with ASTM A510, SAE 1008 or SAE 1010; thickness of galvanizing > 5 μm $f_{uk} \geq 450$ N/mm² and $f_{yk} \geq 360$ N/mm²						
Fastening screw or threaded rod material	Steel, property class ≥ 4.8 according to EN-ISO 898-1; thickness of galvanizing > 5 μm						

Table A2. Anchor LC-A4 – materials and dimensions

LC-A4		**M6/25**	**M8/30**	**M10/40**	**M12/50**	**M16/65**
Anchor length L	**[mm]**	25	30	40	50	65
Inner diameter d	**[mm]**	6	8	10	12	16
External diameter D	**[mm]**	8	10	12	15	20
Thread length Lg	**[mm]**	11	14	19	25	28
Anchor material	Stainless steel 1.4401 according to EN 10088 (AISI 316) $f_{uk} \geq 500$ N/mm² and $f_{yk} \geq 210$ N/mm²					
Fastening screw or threaded rod material	Stainless steel 1.4401 in accordance with EN 10088; property class ≥ 70 according to EN ISO 3506					

LC, LC-A4 and LCL Wedge Anchors	**Annex A1**
Product description Characteristic of the product	of European Technical Assessment ETA-19/0280

Table A3. Anchors LCL – materials and dimensions

LCL		M6/25	M8/25	M8/30	M10/25	M10/40	M12/25	M12/50	M16/65	M20/80
Anchor length L	[mm]	25	25	30	25	40	25	50	65	80
Inner diameter d	[mm]	6	8	8	10	10	12	12	16	20
External diameter D	[mm]	8	10	10	12	12	15	15	20	25
Thread length Lg	[mm]	11	14	14	14	19	14	25	28	38
Anchor material	Steel in accordance with ASTM A510, SAE 1008 or SAE 1010; thickness of galvanizing > 5 µm $f_{uk} \geq 450$ N/mm² and $f_{yk} \geq 360$ N/mm²									
Fastening screw or threaded rod material	Steel, property class ≥ 4.8 according to EN-ISO 898-1, thickness of galvanizing > 5 µm - for anchoring in solid concrete elements Steel, property class ≥ 4.6 according to EN-ISO 898-1, thickness of galvanizing > 5 µm - for anchoring in precast hollow core slabs									

Table A4. Expansion plug materials and dimensions

Expansion plug		M6	M8	M10	M12	M16	M20
Rear diameter d_2	[mm]	4,90	6,40	8,00	10,30	13,55	16,55
Front diameter d_3	[mm]	4,15	5,10	6,80	7,80	12,20	14,95
Length l_c	[mm]	9,40	11,40	16,00	20,75	25,40	30,00
Expansion plug material	Steel in accordance with JISG3505, SWRM8K or SWRM10K; thickness of galvanizing > 5 µm or stainless steel 1.4401 according to EN 10088 (AISI 316)						

SPECIFICATION OF INTENDED USE

Anchorages subject to:

- Multiple use for non-structural applications: sizes from M6 to M20 (LC and LCL) and sizes from M6 to M16 (LC-A4).
- Static and quasi-static loads: sizes from M6 to M20 (LC and LCL) and sizes from M6 to M16 (LC-A4).
- Anchorages with requirements related to resistance to fire: sizes from M8 to M20 (LC and LCL) and sizes from M8 to M16 (LC-A4).

Base material:

- Reinforced or unreinforced, cracked or non-cracked normal weight concrete of strength class C20/25 at minimum to C50/60 at maximum according to EN 206.
- Solid concrete elements: sizes from M6 to M20 (LC, LCL) and M6 to M16 (LC-A4).
- Precast prestressed hollow core slabs (with w/e ≤ 4,2) strength class C40/50 to C50/60 according to EN 206: sizes from M6 to M12 (LCL).

Use conditions (environmental conditions):

- LC, LCL all sizes (galvanized steel) and LC-A4 size M6 (stainless steel): structures subject to dry internal conditions.
- LC-A4 sizes from M8 to M16 (stainless steel): structures subject to dry internal conditions and also in concrete subject to external atmospheric exposure (including industrial and marine environment) or exposure in permanently damp internal conditions if no particular aggressive conditions exist. Such particular aggressive conditions are e.g. permanent, alternating immersion in seawater or the splash zone of seawater, chloride atmosphere of 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 transmitted. 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 and quasi-static loads are designed in accordance with EN 1992-4:2018; the anchors LC, LC-A4 and LCL anchored in solid concrete elements according to design method B, the anchors LCL anchored in precast, prestressed hollow core slabs according to design method A.
- The design of anchorages under fire exposure has to consider the conditions given in the EOTA Technical Report TR 020.
- Fasteners are only to be used for multiple use for non-structural applications acc. to EAD 330747-00-0601.

Installation:

- 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 specifications and drawings and using the appropriate tools.
- Check of concrete being well compacted, e.g. without significant voids.
- Positioning of the drill holes without damaging the reinforcement.
- 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.
- Anchor installation such that the effective anchorage depth is complied with.
- Anchor expansion by impact on the cone (expansion plug) of the anchor.

LC, LC-A4 and LCL Wedge Anchors	**Annex B1** of European Technical Assessment ETA-19/0280
Intended use Intended use	

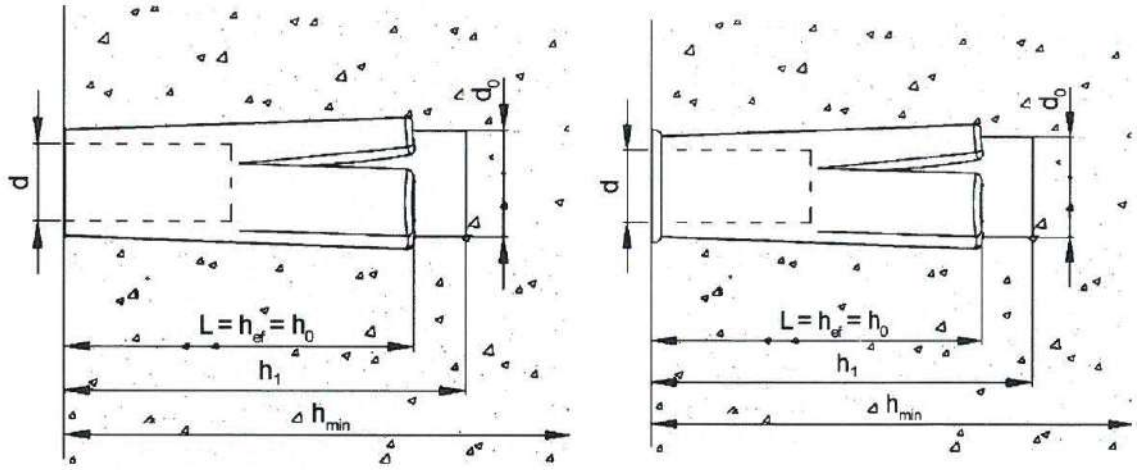
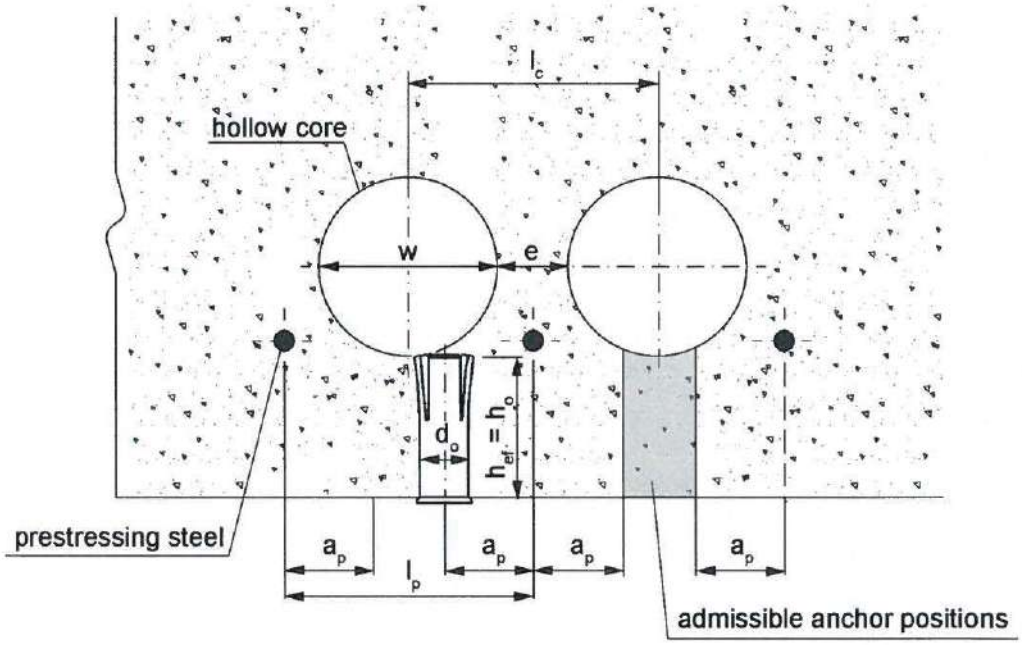


Table B1: Installation parameters of LC, LC-A4 and LCL anchors in solid concrete elements

Anchor size	Drill hole diameter	Drill hole depth	Effective anchorage depth	Installation torque (max)	Thickness of concrete member (min)	Screwing depth (min)	Screwing depth (max)	Diameter of clearance hole in the fixture
	[mm]	[mm]	[mm]	[Nm]	[mm]	[mm]	[mm]	[mm]
	d_0	h_1	$h_{ef} = h_o$	max T_{inst}	h_{min}	$l_{s,\,min}$	$l_{s,\,max}$	d_f
M6/25	8	27	25	4,5	80	6	11	7
M8/25	10	27	25	11	30	8	13	9
M8/30	10	32	30	11	80	8	13	9
M10/25	12	27	25	22	30	10	15	12
M10/40	12	42	40	22	80	10	15	12
M12/25	15	27	25	38	30	12	20	14
M12/50	15	52	50	38	100	12	20	14
M16/65	20	67	65	98	130	16	25	18
M20/80	25	82	80	130	160	20	35	22

LC, LC-A4 and LCL Wedge Anchors	**Annex B2**
Intended use Installation parameters – solid concrete elements	of European Technical Assessment ETA-19/0280

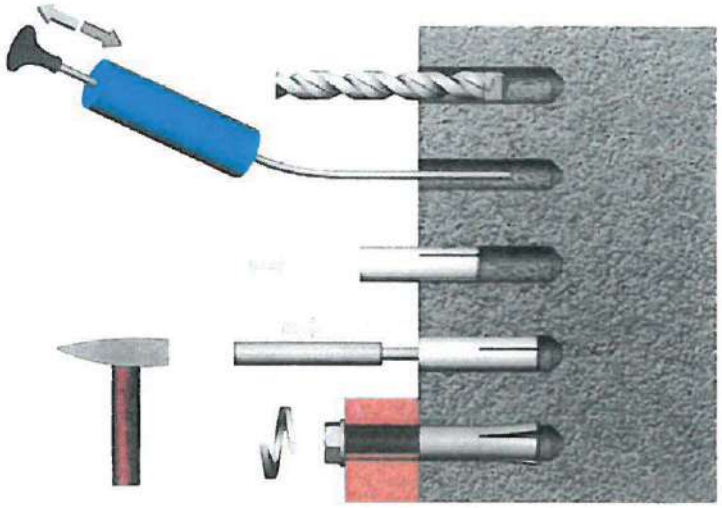


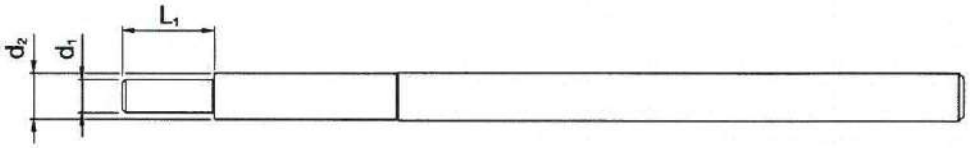
Core width / Web thickness; w / e	≤ 4,2
Core distance	$l_c \geq 100$ mm
Prestressing steel	$l_p \geq 100$ mm
Distance between anchor position and prestressing steel	$a_p \geq 50$ mm

Table B2: Installation parameters of LCL anchors in precast, prestressed hollow core slabs

Anchor size	Drill hole diameter	Drill hole depth	Effective anchorage depth	Installation torque (max)	Screwing depth (min)	Screwing depth (max)	Diameter of clearance hole in the fixture
	[mm]	[mm]	[mm]	[Nm]	[mm]	[mm]	[mm]
	d_0	h_0	h_{ef}	max T_{inst}	$l_{s,min}$	$l_{s,max}$	d_f
M6/25	8	25	25	4,5	6	11	7
M8/30	10	30	30	11	8	13	9
M10/40	12	40	40	22	10	15	12
M12/50	15	50	50	38	12	20	14

LC, LC-A4 and LCL Wedge Anchors	**Annex B3** of European Technical Assessment ETA-19/0280
Intended use Installation parameters – precast, prestressed hollow core slabs	





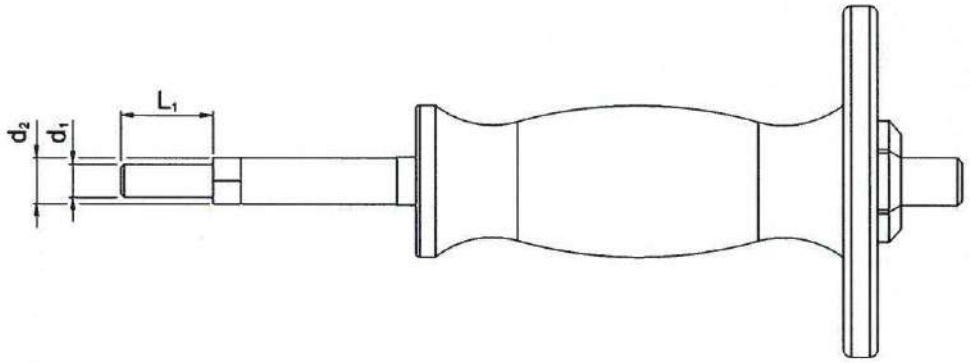
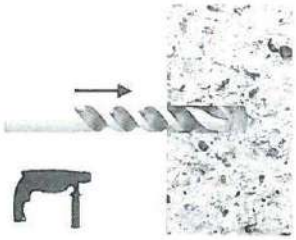


Table B3: Installation tools

Installation tools		M6/25	M8/25	M8/30	M10/25	M10/40	M12/25	M12/50	M16/65	M20/80
Diameter d_1	mm	5,0	6,6	6,6	8,3	8,3	10,2	10,2	13,5	16,8
Diameter d_2	mm	7,5	9,5	9,5	11,5	11,5	14,5	14,5	19,5	24,5
Length L_1	mm	14,8	17,0	18,0	17,0	23,0	17,0	28,0	33,0	47,0

LC, LC-A4 and LCL Wedge Anchors	**Annex B4** of European Technical Assessment ETA-19/0280
Intended use Installation instruction – general	

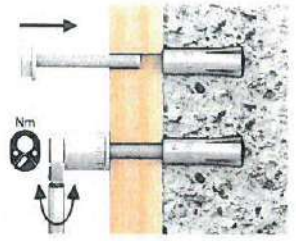


Drill a hole of required diameter and depth.

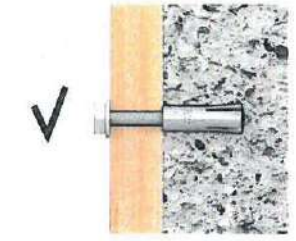
Clear the hole of drilling dust and debris (using blowpump).

Insert wedge anchor, slotted end first.

Use the setting tool to drive the internal wedge into the anchor.

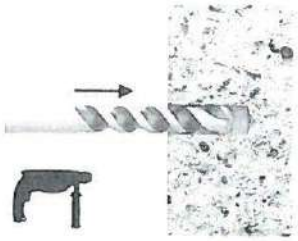


Insert bolt or stud through fixture and tighten to the recommended torque.

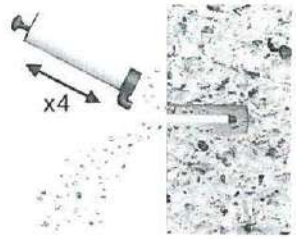


After installation.

LC, LC-A4 and LCL Wedge Anchors	**Annex B5**
Intended use Installation instruction – LC and LC-A4 anchor in solid concrete element	of European Technical Assessment ETA-19/0280



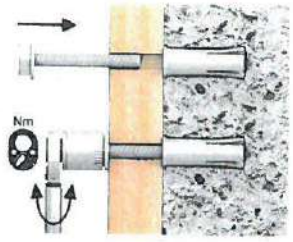
Drill a hole of required diameter and depth.



Clear the hole of drilling dust and debris (using blowpump).

Insert wedge anchor, slotted end first.

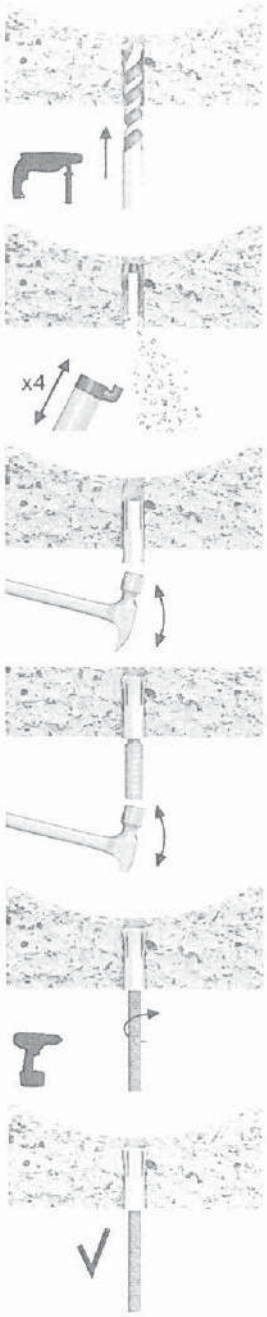
Use the setting tool to drive the internal wedge into the anchor.



Insert bolt or stud through fixture and tighten to the recommended torque.

After Installation.

LC, LC-A4 and LCL Wedge Anchors	**Annex B6**
Intended use Installation instruction – LCL anchor in solid concrete element	of European Technical Assessment ETA-19/0280



Drill a hole of required diameter and depth.

Clear the hole of drilling dust and debris (using blowpump).

Insert wedge anchor, slotted end first.

Use the setting tool to drive the internal wedge into the anchor.

Insert bolt or stud through fixture and tighten to the recommended torque.

After installation.

LC, LC-A4 and LCL Wedge Anchors	**Annex B7**
Intended use Installation instruction – LCL anchor in precast, prestressed hollow core slabs	of European Technical Assessment ETA-19/0280

Table C1: Characteristic resistance – LC – in solid concrete elements

LC			Property class	M6/25	M8/30	M10/40	M12/50	M16/65	M20/80
All load directions (fastening screw or threaded rod property class ≥ 4.8)									
Characteristic resistance in cracked and non-cracked concrete C20/25 to C50/60	F_{Rk}	[kN]	≥ 4.8	1,52	3,01	4,57	6,43	13,31	17,38
Partial safety factor	γ_2 (1)	[–]	–	1,2					
Spacing	s_{cr}	[mm]		200				260	320
Edge distance	c_{cr}	[mm]		150				195	240
Shear load with lever arm									
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	4.8	6	15	30	52	133	260
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	5.8	8	19	37	66	167	325
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	6.8	9	23	45	79	200	390
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	8.8	12	30	60	105	267	520
Partial safety factor	γ_{Ms} (1)	[–]	–	1,25					

(1) in the absence of other national regulations

Table C2: Characteristic resistance – LC-A4 – in solid concrete elements

LC-A4			Property class	M6/25	M8/30	M10/40	M12/50	M16/65
All load directions (fastening screw or threaded rod property class A4-70)								
Characteristic resistance in cracked and non-cracked concrete C20/25 to C50/60	F_{Rk}	[kN]	A4-70	1,00	2,01	3,20	4,59	8,27
Partial safety factor	γ_2 (1)	[–]	–	1,2				
Spacing	s_{cr}	[mm]		200				260
Edge distance	c_{cr}	[mm]		150				195
Shear load with lever arm								
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	A4-70	11	26	52	92	233
Partial safety factor	γ_{Ms} (1)	[–]	–	1,25				

(1) in the absence of other national regulations

Table C3: Characteristic resistance – LCL – in solid concrete elements

LCL			Property class	M6/ 25	M8/ 25	M8/ 30	M10/ 25	M10/ 40	M12/ 25	M12/ 50	M16/ 65	M20/ 80
All load directions (fastening screw or threaded rod property class ≥ 4.8)												
Characteristic resistance in cracked and non-cracked concrete C20/25 to C50/60	F_{Rk}	[kN]	≥ 4.8	1,52	1,09	3,01	1,77	4,57	2,28	6,43	13,31	17,38
Partial safety factor	γ_2 (1)	[–]	–	1,2								
Spacing	s_{cr}	[mm]		200							260	320
Edge distance	c_{cr}	[mm]		150							195	240
Shear load with lever arm												
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	4.8	6	15	15	30	30	52	52	133	260
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	5.8	8	19	19	37	37	66	66	167	325
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	6.8	9	23	23	45	45	79	79	200	390
Characteristic bending resistance	$M^0_{Rk,s}$	[Nm]	8.8	12	30	30	60	60	105	105	267	520
Partial safety factor	γ_{Ms} (1)	[–]	–	1,25								

(1) in the absence of other national regulations

Table C4: Characteristic resistance – LCL – in precast, prestressed hollow core slabs

LCL			M6/25	M8/30	M10/40	M12/50
Steel failure						
Partial safety factor	γ_{Ms} (1)	[–]	1,25	1,25	1,25	1,25
Pullout failure						
Characteristic resistance in precast prestressed hollow core slabs of strength class C40/50 to C50/60	$N^0_{Rk,p}$	[kN]	3,5	4,0	14,0	16,0
Partial safety factor	γ_2 2) = γ_{inst} (3)(4)	[–]	1,4	1,4	1,4	1,2
Concrete cone failure						
Factor for non-cracked concrete	k_1 2) = k_{ucr} (3)	[–]	10,1	10,1	10,1	10,1
Factor for non-cracked concrete	$k_{ucr,N}$ (4)	[–]	11,0	11,0	11,0	11,0
Installation safety factor	γ_2 2) = γ_{inst} (3)(4)	[–]	1,4	1,4	1,4	1,2
Characteristic spacing	$s_{cr,N}$	[mm]	200	200	200	200
Characteristic edge distance	$c_{cr,N}$	[mm]	100	100	100	100
Steel failure with lever arm						
Characteristic bending resistance for class ≥ 4.8	$M^0_{Rk,s}$	[Nm]	6	15	30	52
Characteristic bending resistance for class ≥ 5.8	$M^0_{Rk,s}$	[Nm]	8	19	37	66
Characteristic bending resistance for class ≥ 6.8	$M^0_{Rk,s}$	[Nm]	9	23	45	79
Characteristic bending resistance for class ≥ 8.8	$M^0_{Rk,s}$	[Nm]	12	30	60	105
Partial safety factor	γ_{Ms} (1)	[–]	1,25	1,25	1,25	1,25
Concrete edge failure						
Minimum member thickness	h_{min}	[mm]	30	30	30	30
Minimum edge distance	c_{min}	[mm]	35	40	55	70
Minimum spacing	s_{min}	[mm]	100	100	100	100

(1) in the absence of other national regulations
(2) parameter for design acc. ETAG 001 Annex C
(3) parameter for design acc. CEN/TS 1992-4-4:2009
(4) parameter for design acc. EN 1992-4:2018

Table C5: Characteristic resistance under fire exposure in solid concrete elements C20/25 to C50/60 – LC and LCL

Fire resistance class	LC and LCL		M8/25	M8/30	M10/25	M10/40	M12/25	M12/50	M16/65	M20/80
All load directions										
R30	Characteristic resistance $F_{Rk,fi}$ (1),(2)	[kN]	0,1	0,4	0,2	0,9	0,3	1,6	3,1	4,3
R60		[kN]	0,1	0,3	0,2	0,8	0,3	1,3	2,4	3,7
R90		[kN]	0,1	0,3	0,2	0,6	0,3	1,1	2,0	3,2
R120		[kN]	0,1	0,2	0,2	0,5	0,2	0,8	1,6	2,5
Spacing	$s_{cr,fi}$	[mm]	$4 \times h_{ef}$							
Edge distance	$c_{cr,fi}$	[mm]	$2 \times h_{ef}$							
The design method covers anchors with a fire attack from one side only. In case of fire attack from more than one side, the edge distance shall be ≥ 300 mm.										

(1) in the absence of other national regulations a partial safety factor $\gamma_{m,fi} = 1,0$ is recommended
(2) fastening screw or threaded rod property class no less than 4.8

Table C6: Characteristic resistance under fire exposure in solid concrete elements C20/25 to C50/60 – LC-A4

Fire resistance class	LC-A4		M8/30	M10/40	M12/50	M16/65
All load directions						
R30	Characteristic resistance $F_{Rk,fi}$ (1),(2)	[kN]	0,5	0,8	1,1	2,1
R60		[kN]	0,5	0,8	1,1	2,1
R90		[kN]	0,5	0,8	1,1	2,1
R120		[kN]	0,4	0,6	0,9	1,6
Spacing	$s_{cr,fi}$	[mm]	$4 \times h_{ef}$			
Edge distance	$c_{cr,fi}$	[mm]	$2 \times h_{ef}$			
The design method covers anchors with a fire attack from one side only. In case of fire attack from more than one side, the edge distance shall be ≥ 300 mm.						

(1) in the absence of other national regulations a partial safety factor $\gamma_{m,fi} = 1,0$ is recommended
(2) fastening screw or threaded rod property class no less than A4-70